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- Animated educational video using health belief model on the knowledge of anemia prevention among female adolescents: An intervention study
- Prevalence and description of digital device use among preschool children: A cross-sectional study in Kota Setar District, Kedah
- Prevalence of smartphone addiction and its associated factors among pre-clinical medical and dental students in a public university Malaysia

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About MFP

The ***Malaysian Family Physician*** (MFP) is the official journal of the Academy of Family Physicians of Malaysia (AFPM). It is jointly published by the Family Medicine Specialist Association (FMSA) of Malaysia. The MFP is published three times a year. It also started an Online First section in January 2021, where accepted articles are published online ahead of the issue.

Goal: The MFP is an international journal that disseminates quality knowledge and clinical evidence relevant to primary care. The journal acts as the voice of family physicians, researchers and other members of the primary care team on clinical practice issues.

Scope: The MFP publishes:

i. Research – Original Articles and Reviews
ii. Education – Case Reports/Clinical Practice Guidelines/Test Your Knowledge. We only encourage case reports that have the following features:
   1. Novel aspects
   2. Important learning points
   3. Relevant to family practice
iii. Invited debate, commentary, discussion, letters, online, comment, and editorial on topics relevant to primary care.
iv. A Moment in the Life of a Family Physician – We encourage submission of a short narrative to share perspectives, voice, views and opinions about a family physician's experience that has affected their practice or life.
   Read our Information for Authors section to learn more about these article types.

Strength: MFP is the only primary care research journal in Malaysia and one of very few in the region. It is open access and fully online. The journal is indexed in Scopus and has a strong editorial team and an established pool of readers with increasing recognition both locally and internationally.

Circulation: The journal is freely available online.

Publisher: Academy of Family Physicians of Malaysia

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Articles are accepted for publication on condition that they are contributed solely to the Malaysian Family Physician. Neither the Editorial Board nor the Publisher accepts responsibility for the views and statements of authors expressed in their contributions. All papers will be subjected to peer review. The Editorial Board further reserves the right to edit and reject papers. Authors are advised to adhere closely to the instructions given below to avoid delays in publication.

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   - Use left-aligned paragraph formatting rather than full justification.
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MAIN MANUSCRIPT

For every article submitted, please follow the requirements according to the type of article.

Original Research (Including Clinical Audit Article)

The original research (including clinical audit) should be conducted in the primary care setting on a topic of relevance to family practice. Both qualitative and quantitative studies are welcome. The length should **not exceed 3000 words with a maximum of 5 tables or figures and 30 references**. Please include the following sub-headings in the manuscript:

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14. **How does this paper make a difference in general practice?:** This section should be written in bullet points (up to five points) and must not exceed 100 words.
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Review

All types of review articles, including narrative review, scoping reviews and systematic reviews are accepted for publication in MFP. A comprehensive review of the literature with a synthesis of practical information for practising doctors is expected. For a systematic review, the PRISMA checklist (https://www.equator-network.org/reporting-guidelines/prisma/) must be followed. For a scoping review, the PRISMA-ScR checklist (https://www.equator-network.org/reporting-guidelines/prisma-scr/) should be followed. The length should **not exceed 4000 words with a maximum of 5 tables or figures and 40 references**. Please include the following sub-headings in the manuscript:

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Case Report

Case reports should preferably be less-commonly seen cases that have an educational value for practising doctors. Only case reports that are **novel, have important learning points and relevant to family practice** will be accepted for publication in this journal. The case report must be written in a **patient-centred manner instead of a disease-centred focus**. The length should **not exceed 1500 words and cite no more than 20 references**. Before submitting the case report, the authors must ensure that the patient's identity is protected both in the text and pictures. This patient consent form must be signed and uploaded during submission. Please include the following sub-headings in the manuscript:

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The CPG should be relevant to primary care. Its length should **not exceed 4000 words and 40 references**. An abstract is required (no more than 300 words) together with the keywords. The CPG review should be written with case vignettes to illustrate its application in primary care practice.

1. **Title:** State the scope of the CPG, include the latest version or year for revised CPGs.
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4. **Case Summary:** Describe the case.
5. **Questions:** State the questions.
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We encourage submission of a short narrative to share perspectives, voice, views and opinions about a family physician's experience that has affected their practice or life. It could be about being a doctor, educator, administrator/management, researcher, student or even patient. This type of article should be a **reflective piece of about 500 words in length**, and can be accompanied with photo(s). The journal also accepts articles which anchor on the photo(s) as the main content, this can be accompanied with captions (not more than 100 words) that describe the photo(s) with author's reflection on it.

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    2. Author, 2019
    3. Author, 2016
    4. Hashim S, Ayub ZN, Mohamed Z, et al. The prevalence and preventive measures of the respiratory illness among Malaysian pilgrims in 2013 Hajj season. J Travel Med. 2016;23(2):tav019. Published 2016 Feb 8. doi:10.1093/jtm/tav019
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Malaysian Family Physician
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EDITORIAL

Living in the digital era: The impact of digital technologies on human health

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Deputy Chief Editor of MFP

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Since the COVID-19 pandemic, there has been an increase in the use of digital health in education, information sharing and public health surveillance.[1] This shift is likely attributed to the widespread availability of digital technologies and devices, such as computers, multimedia technologies, smartphones and mobile applications. In this issue, we published three local articles that provide insights into the extent, benefit and risk of digital device use in young people and children.[2–4]

In terms of benefits, the use of multimedia technologies, such as animations and videos, has transformed how health information is shared with patients. In an interventional study, Siti Aisah et al. reported that the use of animated educational videos significantly increased the knowledge of anaemia prevention among adolescents compared with the control.[2] However, stakeholders must acknowledge the consequences of digital device use, which include misinformation and impacts on health, particularly mental health. In the study conducted by Said et al. among university students, nearly half of the study population was at a high risk of smartphone addiction.[3] On another spectrum, Nathan et al. reported a high prevalence of digital device use among children attending government pre-schools; the majority of these children did not own a smartphone but were using the devices under close supervision.[4] More than two thirds of caregivers reported that the risk of inappropriate content exposure was the reason for close supervision in digital device use among these children.[4]

While the use of digital devices may help patients understand their illnesses better, excessive and uncontrolled use may negatively impact the overall well-being of a person, particularly young people.[5] Better public education and awareness may be necessary to prevent digital device overuse, which could be detrimental to human health.

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References

1. Golinelli D, Boetto E, Carullo G, Nuzzolese AG, Landini MP, Fantini MP. Adoption of Digital Technologies in Health Care During the COVID-19 Pandemic: Systematic Review of Early Scientific Literature. *J Med Internet Res*. 2020;22(11):e22280. Published 2020 Nov 6. doi:10.2196/22280
2. Aisah S, Ismail S, Margawati A. Animated educational video using health belief model on the knowledge of anemia prevention among female adolescents: An intervention study. Malays Fam Physician. 2022;17(3):97-104.
3. Said AH, Mohd FN, Yusof MZ, et al. Prevalence of smartphone addiction and its associated factors among pre-clinical medical and dental students in a public university Malaysia. *Malays Fam Physician*. 2022;17(3):64-73.
4. Nathan T, Leelavathi M, Muhammd NA. Prevalence and description of digital device use among preschool children: A cross-sectional study in Kota Setar District, Kedah. *Malays Fam Physician*. 2022;17(3):114-120.
5. Fischer-Grote L, Kothgassner OD, Felnhofer A. The impact of problematic smartphone use on children's and adolescents' quality of life: A systematic review. *Acta Paediatr*. 2021;110(5):1417-1424. doi:10.1111/apa.15714

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COMMENTARY

Rightful place of qualitative research in family medicine and healthcare

Seng Fah Tong, Chai-Eng Tan

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Abstract

Evidence-based medicine is the foundation of current medical practice. Suitable evidence is needed to support the holistic approach in clinical practice. Quantitative research produces some evidence needed for disease treatment based on probabilities or averages. However, the practice of evidence-based medicine should be personalised to individual patients without relying solely on an average perspective. Beliefs, values and expectations are unique for each individual and may differ significantly from the average. Therefore, understanding individual differences requires evidence from qualitative research. This is particularly important in family medicine practice, which focuses on holistic care for the person, family and community. Findings from properly conducted qualitative research can offer in-depth and comprehensive accounts on healthcare issues from patient and practice perspectives. Qualitative research also provides explanatory power and analytical transferability, which can be applied into daily family medicine practice. In conclusion, evidence from qualitative research should be rightfully equally acknowledged in family medicine and healthcare.

Introduction

Evidence-based medicine is the foundation of current medical practice. Despite advancement in research to generate new evidence, disease management in clinical practice remains challenging, especially for chronic diseases. The majority of evidence arises from quantitative research, which has provided information on optimal treatment of diseases. In particular, quantitative research has provided knowledge regarding treatment targets for many diseases and their treatment options. However, optimal control of diseases remains difficult in some patients. Multidisciplinary care is essential in disease management; yet, establishing an efficient and effective team remains challenging. Although the necessary measures are known, knowledge of how to effectively implement them is limited.

Such challenges have common issues, whereby human and social factors are major determinants of their success. Understanding human behaviour and social environment then becomes important for interventions to be impactful. Therefore, research evidence that can help in understanding human behaviour and social environment better is necessary to support clinical practice. Quantitative research has limitations in this aspect because human behaviour and social interactions are difficult to measure. Qualitative research is more suited to address this need.

Professions that relate closely with human behaviour acknowledge the role of qualitative research.[1] The rightful role of evidence from qualitative research in family medicine and healthcare must be recognised. In this article, we will briefly describe the nature of family medicine practice, discuss how family medicine intersects with qualitative research and position the usefulness of qualitative evidence in family medicine and healthcare in general.

Definition of family medicine and the needed evidence to support its practice

In contrast to other specialties that focus on specific physiological systems, family medicine is not easily defined. While this article does not intend to argue for a particular definition, family medicine can be seen as a specialty that focuses on people.[2] This means that family medicine focuses on the patient as a whole person and as an individual, as opposed to public health, which focuses on the community. Medical decisions in family medicine are made after taking into account the bio-psycho-social and spiritual well-being of patients. Shared decision-making between physicians and patients is an integral part of this process. Active participation of patients in the form of

adjusting their behaviours and daily routines is needed to accommodate the treatment plan agreed on, especially in managing chronic illnesses. This is consistent with the concept of evidence-based practice proposed originally by Sackett et al.[3,4] Patients' ideas, beliefs, perceptions and expectations must also be evaluated in relation to their social well-being and relationship before a particular treatment plan is made.[4] Managing patients' psychological and social well-being is equally important as treating diseases.

Individuals construct their own meanings of diseases and illnesses and their expectations to treatment. Often, these meanings are built from their life and lived experiences as well as the surrounding social structure and dynamics, which vary among patients. For example, one patient may view diabetes as a common illness that is inherited from parents, whereas another patient may view it as a serious consequence of his/her own lifestyle. Hence, these two patients may react to the need to start medications or institute a lifestyle change differently. There are numerous sociocultural influences on patients' behavioural and social adjustments, such as family and community values, beliefs and cultural norms. Understanding and acknowledging these can facilitate communication with empathy, to assess patients' concerns more accurately and to make better decisions in personalising their treatment plans.

An effective and efficient family medicine practice cannot function in isolation. Family medicine clinics often include a team of different healthcare professions, such as nurses, pharmacists, dietitians and rehabilitation therapists. The effectiveness of family medicine practice also depends on the teamwork and interprofessional collaborations between these healthcare professionals. Teamwork and healthcare processes can potentially influence the success of patient management.

Given this perspective of family medicine, two types of evidence are necessary. The first type provides the probability of treatment effectiveness (what commonly works for a disorder) or how impactful an issue is (the magnitude of an issue). This type of evidence can help in deciding what will probably work for a disorder and what should be prioritised in healthcare management.[5] The second type provides an understanding of a patient as a holistic individual.[5]

The first type of evidence uses the quantitative approach to provide a probability perspective. It answers the following questions: What is the usual probability of a treatment that will work for a typical patient? For example, what is the usual odds of metformin in reducing the mortality rate of a typical adult Asian patient with type 2 diabetes? What is the usual knowledge level about diabetes and its association with diabetes control? Statistics generated in the quantitative approach are centred around a point estimate from a sampled population, such as a mean or a median. This point estimate does not reflect any particular individual but provides a representation of the 'average' population. Further, during patient treatment, there is no 'average' because only a single individual is being managed. It either works or fails for that particular individual. With evidence from quantitative data, the probability of effectiveness of the treatment based on the knowledge of the 'average' can be estimated. However, the actual benefits obtained depend on the individual context.

This leads to the role of the second type of evidence, which can help in understanding a patient as a complete person. The qualitative approach is needed to understand the possible spectrum and type of logic that may fit each patient. An approach that allows measurable and unmeasurable variables to be examined together is needed to examine and understand the complexity of family medicine practice. These pieces of evidence are often interconnected and should not be examined in isolation. This can potentially be accomplished with the qualitative approach.

Qualitative research relevant to family medicine practice

Qualitative research has many definitions depending on the perspective. In the selection of a methodology based on research questions, qualitative research can be defined as a scientific investigative methodology suited for research questions aimed at understanding phenomena related primarily to human and social environments. Qualitative research may utilise any type of empirical data with its interpretive methods. It does not evaluate the magnitude of a phenomenon, strength of an association or effect size, in contrast to quantitative research.
It focuses on understanding evidence from empirical data by answering the 'what', 'how' and 'why'.

Qualitative research is well positioned in

medicine and health research because of the fundamental intersection of medicine and health with humanity and social sciences. It is an optimal approach for exploring the layers of human complexity in the practice of family medicine and healthcare. Research questions related to understanding medical humanities may be arbitrarily divided into three categories: i) exploring the spectrum of a phenomenon, ii) exploring patient-constructed meaning and iii) explaining actions, health behaviours or occurrence of a phenomenon. These research questions are best answered using a specific qualitative research design. The general qualitative approach does not fit all types of research questions.

Exploring the spectrum of a phenomenon

A phenomenon refers to an incidence of interest. The intention of being exploratory is justified when the spectrum is not well known in the literature. Such exploration focuses on the 'what', which may include the following: 1) behaviours of interest (e.g. eating patterns of patients with diabetes), 2) factors contributing to a phenomenon (e.g. factors associated with adherence to clinic attendance) or 3) views and perceptions towards a primary care service programme (e.g. perceptions towards a virtual clinic for a chronic disease). The qualitative approach answers the 'what' question by generating comprehensive themes. The findings should be comprehensive by covering all possibilities of behavioural patterns, factors and views.

To further illustrate the use of qualitative research in exploring the spectrum of a phenomenon, we will provide some examples. Wong et al. explored the factors that influence the help-seeking behaviour of caregivers to patients with first-episode psychosis.[6] From their qualitative inquiry, they presented a list of themes with corresponding subthemes. The themes represented the spectrum of internal factors for knowledge and stigma related to schizophrenia. The analysis also revealed a spectrum of four types of help-seeking behaviour based on the two factors identified. Caregivers seek help either early or very late depending on the interplay between the knowledge of schizophrenia and the associated stigma. Pickles et al. investigated doctors' approaches to prostate-specific antigen (PSA) testing in the primary healthcare setting.[7] They identified a spectrum of behaviour, which ranged from doctors being highly likely to offer PSA testing, doctors weighing the advantages and disadvantages before offering PSA testing and doctors offering it only upon patients' request to doctors being reluctant to order PSA testing. The findings can help identify patients or physicians within the spectra presented. No one is considered an outlier.

The exploratory nature of the qualitative approach enables the investigation of spectra that may be unknown or unexpected. This approach does not require pre-determined concepts or their corresponding indicators, which may limit the extent of exploration. The methodology also allows flexibility and creative use of data collection methods. Exploratory qualitative research often uses unstructured or semi-structured interviews, focus group discussions and observations. With the use of a good systematic qualitative methodology to achieve saturation (Box 1), the findings are often comprehensive, providing all possible 'differentials' or potential insights on the investigated phenomenon.

Saturation is the decision made by researchers when further data gathering will neither provide additional understanding nor alter the study findings.[8] There are three types of saturation:

1) data saturation*
2) thematic or analytical saturation
3) theoretical saturation

* *Data saturation is the weakest type of saturation.*

Box 1. Saturation.

A qualitative approach does not aim to make a single general statement regarding the findings because the findings focus on the spectrum. For example, the statement 'We found that the intervention was well accepted by patients' has a quantitative connotation. It implies the summed perception of patients in the study. In another example, the statement 'We found that the knowledge of patients about Pap smear is generally poor' would only be credible if it was based on data gathered using probabilistic sampling from the intended population. Therefore, researchers should be mindful of their choice of words when concluding their findings in qualitative research.

Saturation determines whether the findings of exploratory qualitative research are adequately comprehensive. Often, readers of qualitative research articles can also judge whether the

findings have covered all possible spectra. If readers find that 'there is nothing more to add', then saturation is likely to have been achieved. When the uncovered spectrum is all encompassing, it justifies the full exploratory intention of the qualitative approach.

Exploring patient-constructed meaning

The meaning constructed by patients is closely related to their health behaviour. Patient-constructed meaning can refer to their personal beliefs, values and attitudes towards an illness and its treatment. Beliefs are ideas that are perceived as the truth, whereas values are things or ideas that one holds as important. Attitudes are the thoughts of how one would respond to a particular situation. These three concepts are interrelated. Beliefs and values commonly precede attitude. If beliefs and values are shared within a community or social group, they become cultural beliefs and values.

Beliefs, values and general attitudes may not be accurate in predicting a specific behaviour but exert their influence on a wide range of behaviours.9 Therefore, it is important to uncover these three concepts because they can help in understanding patients' ideas, concerns and expectations when discussing treatment strategies. An exploratory design is needed to uncover all possible beliefs and values given their vast range. Because meanings are abstract, an in-depth and detailed account of patients' feelings or thoughts in their lived experience is required to make sense of the patient-constructed meaning. The qualitative approach is best suited to explore such accounts.

One example of how qualitative research is used to explore patient-constructed meaning is described in the paper by Peterson et al., who investigated the meaning of diabetes among patients.[10] The authors noted that patients used many methods and underwent different phases from being passive to assuming control in their life living with diabetes.[10] The meanings changed throughout the patients' life, and the concept of diabetes transitioned from background to foreground and vice versa every minute of their everyday life.[11] Youngson et al. described the metaphor of patients living with diabetes being akin to charting a course of health and well-being through a choppy sea.[12] The boat represented the patients making their journey through a choppy physical and social environment, with the help of healthcare providers at the boatyard. This metaphor helps readers understand that patients with diabetes would need to take control in balancing their life and condition, without a moment of stopping, until they reach the boatyard.[12] Such in-depth accounts can help in further understanding patients' perspectives.

The above-indicated examples can aid in empathising with patients during consultations, which can promote deeper understanding. An intervention may seem logical and appropriate from physicians' perspectives but could be totally irrelevant from patients' perspectives. This concept is one of the key components in shared decision-making. A good qualitative study aimed at exploring meanings should provide an analysis with sufficient depth, instead of merely describing the findings. Phenomenology is a specific qualitative method that is often adopted for this type of research questions.[13] Although the analysis is thematic, a properly executed phenomenological study should achieve a level of abstraction that provides sufficient explanatory power. In-depth analysis helps increase the transferability of findings beyond the research setting, including clinical practice.

Explaining actions, health behaviours or occurrence of a phenomenon

It is essential to identify what determines or predicts an action, so that interventions can be designed to promote desirable health behaviours. Researchers are attempting to formulate a theory or some parts of it to link the determinants and predictors with an action. A theory consists of interrelated groups of concepts that explain or predict an event or outcome.[14] A theory from a qualitative perspective differs from modelling in statistics, which attempts to construct a model based on statistics to represent a group of a sampled population. As opposed to the population level, health behavioural theories that have explanatory power at the individual level are needed. Determinants of health behaviours are complex with many interconnected variables. For example, a thinking process can lead to behavioural intentions that result in a health behaviour.[15] This type of theory can arise from qualitative research.

At the organisational level of family medicine practice, theories that can help explain and improve practice are essential.[16,17] The effectiveness of various interventions based on these theories varies in different settings, and some of them may fail.18 Interventions are at a higher risk of failure

if the selected underpinning theory involves only a few concepts without understanding their interaction with other determinants. Interventions based on generic theories that do not fit the context or discipline are also at a higher risk of failure.[18] Thus, the qualitative approach may be needed to explore concepts relevant to local contexts that could influence potential interventions. This type of research approach focuses on 'why' or 'how' events happen in the local context.

Cheong et al. explored the factors associated with intention to undertake cardiovascular health checks.[19] Using the grounded theory approach, they identified a core category (or core concept) – the deciding theme that explained an individual's subsequent action. The intention to undergo health checks is the sum of the perceived relevance and readiness to face the outcomes of such checks.[19] During clinic consultations, the importance of health checks must be conveyed to patients, and the readiness to accept the subsequent management plans following the results of these health checks must be addressed.[19] In their study on general practitioners' behaviour on PSA testing, Pickles et al. were able to relate the explanations for different types of decision-making to the general practitioners' past experiences, medicolegal obligations, guidelines and evidence for PSA testing. The interplay between these factors determined which of the four decision-making approaches will be adopted.[7] From this finding, the authors proposed that future interventions should be more sensitive to general practitioners' experiences, as merely informing the evidence concerning PSA testing may be insufficient to change their behaviour. These two studies provide examples of qualitative findings presented in a story-telling format with conceptual models.

The role of qualitative research is similar at the organisational level. McVea et al. explained how the 'Put Prevention into Practice' programme was successful in some clinics but not in other clinics.[20] They found that preventive focused organisation and readiness to change were two key components of the success of the health prevention programme in clinics.[20] This example highlights how qualitative research can generate a theory that will be useful in family medicine practice.

For a theory to be useful in clinical practice, the developed concepts need to be logically connected and comprehensive, covering all significant determinants to the extent possible. A theory needs to be stable and transferable to situations beyond the research context. This requires theoretical saturation, not merely thematic saturation. In theoretical saturation, further data do not add new concepts in the construction of a theory. Thus, the resulting theory would be stable and relevant beyond the research setting and applicable to clinical practice.

Several qualitative approaches may be used to achieve these objectives. The grounded theory approach, which uses systematic steps towards theoretical saturation, is the usual choice for constructing an explanatory theory.[21] The case study approach may be suitable if the phenomenon of interest is investigated in relation to its bounded socio-geographical context.[22] In qualitative case studies, in-depth description and cross-case examination are required during analysis to provide a theoretical explanation to the phenomenon in context. Another option is to use an exploratory descriptive thematic design. However, this usually produces a list of themes without connection between the themes. Therefore, this design may lack the explanatory power of how the concepts evolve to produce an outcome.

Conclusion

Qualitative research offers various means to explore and understand a phenomenon in greater depth as well as to generate a theoretical explanation for such a phenomenon. A rigorously conducted qualitative study with an in-depth analysis can provide explanatory representativeness and analytical transferability beyond the research context.[23] Qualitative researchers should thus aim to go beyond describing data and to obtain new knowledge through in-depth interpretation and analysis. Only then can qualitative research generate relevant knowledge that is valuable for family medicine clinicians, improving empathy and understanding towards patients and guiding clinical decision-making and design of individual- and practice-level interventions. Theories generated from qualitative research can potentially form valuable frameworks for future research. In conclusion, qualitative research has an important role in primary care: It offers much needed evidence for problem-solving in primary care and complements evidence from quantitative research.

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Author contributions

Tong SF conceptualised the main idea and the entire paper. Tan CE conceptualised the paper and refined relevant concepts. Both authors wrote and approved the final draft of the paper.

Conflicts of interest

None

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How does this paper make a difference to general practice?

- This paper aims to correct the common misconception that qualitative research provides only exploratory evidence that must be reconfirmed using quantitative research.
- Qualitative research offers personalised perspectives of evidence required for good family medicine practice, wherein patients are recognised as individuals who are also influenced by their social surroundings.
- Qualitative research aims to provide a comprehensive and in-depth account of 'what', 'why' and 'how' events are happening using empirical data.
- The findings can help in personalising patient approach by understanding patient perspectives during medical decision-making.

References

1. Morse JM. How Different is Qualitative Health Research From Qualitative Research? Do We Have a Subdiscipline? *Qual Health Res*. 2010;20(11):1459-1464. doi:10.1177/1049732310379116

2. Starfield B. Primary Care and Equity in Health: The Importance to Effectiveness and Equity of Responsiveness to Peoples' Needs. *Humanity Soc*. 2009;33(1-2):56-73. doi:10.1177/016059760903300105

3. Sackett DL, Rosenberg WMC, Gray JAM, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *BMJ*. 1996;312(7023):71-72. doi:10.1136/bmj.312.7023.71

4. Haynes RB. Physicians' and patients' choices in evidence based practice. *BMJ*. 2002;324(7350):1350-1350. doi:10.1136/bmj.324.7350.1350

5. Tong SF, Low WY. Making Sense of Mixed Method Design in Health Research: Reconciliation of the Findings in a Study of the Doctors' Decision-Making Process in Engaging Male Patients in Health Checks. *Malays J Qual Res*. 2015;3(1):18-26.

6. Wong DTL, Tong SF, Daud TIM, Aziz SA, Midin M. Factors Influencing Professional Help-Seeking Behavior During First Episode Psychosis in Schizophrenia: An Exploratory Study on Caregivers' Perspective. *Front Psychiatry*. 2020;10:962-962. doi:10.3389/fpsyt.2019.00962

7. Pickles K, Carter SM, Rychetnik L. Doctors' approaches to PSA testing and overdiagnosis in primary healthcare: a qualitative study. *BMJ Open*. 2015;5(3):e006367-e006367. doi:10.1136/bmjopen-2014-006367

8. Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant*. 2018;52(4):1893-1907. doi:10.1007/s11135-017-0574-8

9. Ajzen I. Values, Attitudes, and Behavior. In: Methods, Theories, and Empirical Applications in the Social Sciences. VS Verlag für Sozialwissenschaften; 2012:33-38. doi:10.1007/978-3-531-18898-0_5

10. Paterson BL, Thorne S, Dewis M. Adapting to and Managing Diabetes. *Image J Nurs Sch*. 1998;30(1):57-62. doi:10.1111/j.1547-5069.1998.tb01237.x

11. Hartrick GA. The Meaning of Diabetes. *J Holist Nurs*. 1998;16(1):76-87. doi:10.1177/089801019801600110

12. Youngson A, Cole F, Wilby H, Cox D. The lived experience of diabetes: Conceptualisation using a metaphor. *Br J Occup Ther*. 2015;78(1):24-32. doi:10.1177/0308022614561240

13. Carel H. Phenomenology and its application in medicine. *Theor Med Bioeth*. 2011;32(1):33-46. doi:10.1007/s11017-010-9161-x

14. Glanz K, Rimer BK, Viswanath K. Theory, research, and practice in health behavior. In: Health Behavior: Theory, Research, and Practice. *John Wiley & Sons*; 2015:23-41.

15. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process*. 1991;50(2):179-211. doi:10.1016/0749-5978(91)90020-T

16. Nilsen P. Making sense of implementation theories, models and frameworks. *Implementation Sci*. 2015;10(1):53. doi:10.1186/s13012-015-0242-0

17. Dadich A, Doloswala N. What can organisational theory offer knowledge translation in healthcare? A thematic and lexical analysis. *BMC Health Serv Res*. 2018;18(1):351. doi:10.1186/s12913-018-3121-y

18. Rimer BK, Brewer NT. Introduction to health behavior theories that focus on individuals. In: Health Behavior: Theory, Research, and Practice. *John Wiley & Sons*; 2015.

19. Cheong AT, Khoo EM, Tong SF, Liew SM. To Check or Not to Check? A Qualitative Study on How the Public Decides on Health Checks for Cardiovascular Disease Prevention. *PLoS One*. 2016;11(7):e0159438. doi:10.1371/journal.pone.0159438

20. McVea K, Crabtree BF, Medder JD, Susman JL, Lukas L, McIlvain HE, et al. An ounce of prevention? Evaluation of the "Put Prevention into Practice" program. *J Fam Pract*. 1996;43(4):361-369.

21. Chun Tie Y, Birks M, Francis K. Grounded theory research: A design framework for novice researchers. *SAGE Open Med*. 2019;7:205031211882292. doi:10.1177/2050312118822927

22. Crowe S, Cresswell K, Robertson A, Huby G, Avery A, Sheikh A. The case study approach. *BMC Med Res Methodol*. 2011;11(1):100. doi:10.1186/1471-2288-11-100

23. Polit DF, Beck CT. Generalization in quantitative and qualitative research: Myths and strategies. *Int J Nurs Stud*. 2010;47(11):1451-1458. doi:10.1016/j.ijnurstu.2010.06.004

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REVIEW

Overview of common oral lesions

Esha Zahid, Osama Bhatti, Muhammad Abdullah Zahid, Michael Stubbs

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Abstract

This article summarises common oral lesions that clinicians may face in everyday practice by categorising them by clinical presentation: ulcerated lesions, white or mixed white–red lesions, lumps and bumps, and pigmented lesions. The pathologies covered include recurrent aphthous stomatitis, herpes simplex virus, oral squamous cell carcinoma, geographic tongue, oral candidosis, oral lichen planus, pre-malignant disorders, pyogenic granuloma, mucocele and squamous cell papilloma, oral melanoma, hairy tongue and amalgam tattoo. The objective of this review is to improve clinician knowledge and confidence in assessing and managing common oral lesions presenting in the primary care setting.

Introduction

Clinicians encounter various oral lesions in everyday practice. Oral lesions can arise from a range of different aetiologies: infective, idiopathic, inflammatory, reactive and neoplastic changes. A clinician must obtain a thorough clinical history and have adequate knowledge of the signs and symptoms, such as the location of the oral mucosal lesion and its size, colour and morphology to make a proper diagnosis.

This article aims to review common oral lesions that practitioners are faced with in everyday practice and provide an overview of the following conditions: recurrent aphthous stomatitis, herpes simplex virus, oral squamous cell carcinoma, geographic tongue, oral candidosis, oral lichen planus, pre-malignant disorders, pyogenic granuloma, mucocele and squamous cell papilloma, oral melanoma, hairy tongue and amalgam tattoo. The oral acording to their typical clinical presentations, such as ulcerated lesions, white or mixed white–red lesions, lumps and bumps, and pigmented lesions.

Ulcerated Lesions

Recurrent Aphthous Stomatitis (RAS)

RAS is the most common ulcerative disease and is present in approximately 20% of the general population. However, the prevalence varies from 5% to 50% depending on the population group, and in some cases, personal and work-related stress.[1] In children, the incidence of RAS is heavily influenced by the presence of RAS in parents.[1] Children with parents positive for RAS have a 90% chance of developing the condition, compared to 20% in children whose parents do not have RAS. RAS appears to peak in the second decade of life and becomes less frequent in the later years of life.[1]

Risk Factors

The exact aetiology of RAS is unknown, but several factors have been suggested as possible causes.[1]

Local, microbial, nutritional and other factors

Trauma is a causative agent for RAS.[1] RAS patients often have ulcerations at trauma sites due to toothbrushing, dental treatment or biting of the oral mucosa.[2] Dysregulated salivary composition, xerostomia and stresses have also been linked with an increase in RAS.[1]

It is a common misconception to confuse RAS with microbial infections, but several studies have established that HSV, Helicobacter pylori and EBV do not cause RAS.[1]

Low levels of iron, zinc, folate, and vitamins B1, B2, B6 and B12 have been found twice as commonly in RAS patients, and up to 20% of individuals with RAS may have a nutritional deficiency.[2]

Other factors including high levels of stress and hypersensitivity to certain foods such as chocolate and peanuts have been implicated in some patients with RAS.[2] However, with regards to tobacco, the incidence of RAS was lower in smokers compared to non-smokers. This may be because tobacco tends to increase

keratinisation of the oral mucosa, hence rendering the mucosa less susceptible to oral ulceration.[2]

Underlying medical disorders

Systemic disorders associated with RAS are nutritional deficiencies including anaemia, Behcet's syndrome, HIV, cyclic neutropenia and MAGIC syndrome, to name a few. RAS-like ulceration is a clinical feature of Behcet's syndrome and may involve major and herpetiform ulcers.[1,2]

Individuals with HIV may also have RAS, which is seen in approximately 5%–15% of HIV-positive patients.[2] RAS occurs more frequently in immunocompromised patients than others.[2]

Cyclic neutropenia involves a decrease in circulating neutrophils. The distinguishing features of this disease include RAS, mastoiditis, otitis and febrile episodes in infancy.[2]

Clinical Features

The three main presentations of RAS are described in **Table 1.**[3]

Table 1. Clinical features of minor, major and herpetiform RAS. Adapted from Montgomery-Cranny J, Wallace A, Rogers H, Hughes S, Hegarty A, Zaitoun H. Management of recurrent aphthous stomatitis in children. *Oral Medicine Dental Update*. 2015;42(6):564–572.

	MINOR RAS	MAJOR RAS	HERPETIFORM RAS
Morphology	Round or oval lesions, erythematous halo, grey–white pseudomembrane[3] (*see Figure 1*)	Round or oval lesions, erythematous halo, grey–white pseudomembrane[3] (*see Figure 2*)	Small, deep multiple ulcers, coalesce into one, irregular margins[3]
Distribution	Buccal and labial mucosa, lips, tongue, floor of mouth[3]	Lips, soft palate, pharynx, gingiva[3]	Buccal and labial mucosa, tongue, floor of mouth, gingiva[3]
Number of ulcers	1–5	1–10	10–100
Size	<10 mm	>10 mm	2–3 mm
Gender predilection	Equal	Equal	Female
Incidence	Patients aged 5–19 80% with RAS[3]	10% with RAS[3]	Less than 10% with RAS[3]
Healing period	10–14 days, no scarring[3]	>6 weeks, high risk of scarring[3]	<4 weeks, scarring uncommon[3]
Treatment	Topical corticosteroids; tetracycline mouth rinse	Topical, systemic, intralesional corticosteroids; immunosuppressants	Topical, systemic corticosteroids; tetracycline mouth rinse

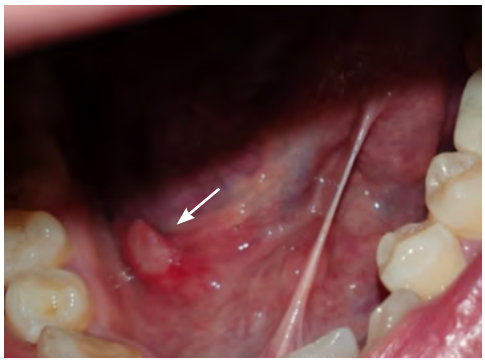

Figure 1. Minor recurrent aphthous ulcer on right floor of mouth

Figure 2. Major recurrent aphthous ulcer on the palate

Treatment

Drug therapy is usually considered for individuals who present with severe pain and difficulty eating or who experience multiple episodes of RAS each month.[2] Protective emollients such as Zilactin or Orabase, and topical agents and anaesthetics such as lidocaine or benzocaine, can be used to palliate the pain from minor ulcers.[1,2] Tetracycline mouth rinses and NSAIDs can reduce the pain and healing time.1 Topical corticosteroid therapy is effective in most cases, but systemic corticosteroids such as prednisone may be required in severe cases of major RAS.[1,2] Referral to

an oral medicine specialist may be required in severe cases of RAS.

Herpes Simplex Virus Infections (HSV)

Herpes simplex virus types 1 and 2 are highly prevalent worldwide, with both types 1 and 2 able to infect multiple sites of the body, including the oral cavity. Data from the United States showed that 40% of those under 20 years of age had positive antibodies against HSV-1, and after the age of 70, that number rose to 65%.[5]

Clinical Features

HSV infections manifest as primary herpetic stomatitis and secondary (recurrent) herpes labialis. Primary infections often occur during childhood, when children may contract the virus asymptomatically or present with a viral prodrome of fever, headache and cervical lymphadenopathy, followed by an eruption of vesicular lesions within the gingiva (primary herpetic gingivostomatitis). These vesicular lesions may appear on the gingiva, borders of the lips or perioral skin region as solitary lesions or clusters (**Figures 3** and **4**). The vesicles are prone to rupture and may also appear crusted or as sores. Primary episodes often self-resolve within 10 to 14 days, after which the virus lies dormant in the trigeminal nerve ganglion6. Secondary herpes labialis is recurrent herpes that presents as a localised crop of vesicles at the vermillion border, as seen in **Figure 5**. Oral HSV shedding into saliva occurs in an estimated 10% of humans. Certain triggers, such as UV light trauma, stress, fatigue or menstruation, may reactivate the virus at later stages, leading to shorter episodic outbreaks.[7]

Figure 3. Primary herpetic stomatitis – lesions on upper and lower lip

Figure 4. Primary herpetic stomatitis – lesion on tongue

Figure 5. Herpes labialis of the lower left lip (crusted lesion)

Treatment

Herpetic mouth lesions are diagnosed clinically but can be confirmed by taking a polymerase chain reaction swab. Because episodes self-resolve, most mild cases can be treated supportively with adequate fluid intake and analgesic antipyretics such as paracetamol. Systemic antivirals such as valaciclovir or famciclovir are useful in neonates, pregnant women and immunocompromised patients, especially when used early in the disease state.[8]

Recurrent episodic outbreaks from reactivation of the dormant virus result in milder presentations called 'cold sores'. Patients are most infectious within the first 24 hours of lesions appearing, and although most are mild and will self-resolve, larger lesions can be treated with topical acyclovir cream or famciclovir.[8] For patients who experience severe recurrences or are immunocompromised with chronic lesions, a role exists for daily prophylactic antivirals.[8]

Oral Squamous Cell Carcinoma

Oral squamous cell carcinoma is the most common oral malignancy, accounting for more than 90% of oral cancers.[9] Oral squamous cell carcinoma tends to affect adults older than 40 years of age and roughly twice as many males as females.[10] Although oral

squamous cell carcinoma can occur anywhere in the oral cavity, it is most often found on the lateral borders of the tongue, followed by the gingiva and alveolar mucosa, the floor of the mouth and the ventral surface of the tongue. In southeastern Asian countries where areca nut– and tobacco-chewing are common, oral squamous cell carcinoma is commonly found on the buccal mucosa.[9]

Risk Factors

Risk factors for oral squamous cell carcinoma include alcohol use, tobacco use, betel quid– and areca nut–chewing, and HPV infection.[9] Tobacco can release pro-carcinogens that can lead to cancer development with a dose–risk relationship.[11] Alcohol is another risk factor for the development of oral cancer and produces cytotoxic agents when metabolised, in addition to nutritional deficiencies, immune deficiencies and local effects on mucosal linings.[11]

Additional risk factors for the development of oral squamous cell carcinoma include solar radiation, immunosuppression (e.g., transplant patients, HIV/ AIDS) and HPV infection, particularly HPV 16 and 18.[12] Solar radiation most commonly involves damage to the lower lip because it receives more direct sun exposure.[9]

Clinical Features

Early-stage oral squamous cell carcinoma is often painless and asymptomatic, resulting in a delay in diagnosis. More than half of oral carcinoma cases are advanced at the time of diagnosis.[9]

Oral squamous cell carcinomas can vary in presentation, from non-healing ulcers in the oral cavity, lumps or swellings to dental symptoms such as ill-fitting prostheses[10] (**Figures 6** and **7**). Additional features may include erythroplakia, leukoplakia, pain or numbness, ulcers with fissures or raised exophytic margins, and non-healing extraction sockets.[12] Two common malignant features to observe are induration (increased tissue density) and fixation (lack of tissue mobility).[13] Any suspicious lesion in the oral cavity that does not resolve after 3 weeks should be investigated further and referred promptly to a specialist.[10]

Figure 6. Squamous cell carcinoma of the right pterygomandibular region

Figure 7. Squamous cell carcinoma of the left ventral surface of the tongue

Treatment

The management of oral squamous cell carcinoma mainly involves surgical excision, with the approach directed by tumour characteristics such as site, location, size, depth and bone involvement.[12] Metastatic cases of oral squamous cell carcinoma involve cervical lymph nodes 80% of the time, and as such, lymph node resection plays an important role in management.[12,14] Radiotherapy and/or chemotherapy may be used in locally advanced squamous cell carcinoma cases.[14] Despite advances in medical treatment options, the 5-year survival rate for oral cancer remains around 50%, so emphasis on early detection and management is vital in improving patient outcomes.[15]

White Or Mixed White–Red Lesions

Oral Candidosis

Oral candidosis is the overpopulation of commensal yeast, most commonly Candida albicans in the mouth. This is often termed an opportunistic infection because changes in the oral microflora enable the proliferation of the Candida organism.[16]

Risk Factors

Common predisposing factors include recent broad-spectrum antibiotic use, dentures, inhaled corticosteroids without rinsing the mouth afterwards, smoking,

diabetes and immunosuppression (e.g. AIDS, haematological malignancies, chemotherapy).[16] Dry mouth, called xerostomia, is also a significant cause of oral candidosis.

Clinical Features and Treatment

Oral candidosis may be further divided into four categories: pseudomembranous, erythematous, hyperplastic and denture-induced stomatitis.[17] **Table 1** outlines the clinical features and treatment regimens for oral candidosis.

The diagnosis of oral candidosis is usually made on the clinical appearance, but an oral swab or smear in many cases is helpful to confirm the diagnosis. First-line treatment consists of topical antifungal agents such as nystatin liquid, amphotericin lozenges or miconazole gel. Refractory cases should be further investigated for an underlying cause. This may also include the use of fluconazole or ketoconazole.[8]

Table 2. Types, features and treatment of oral candidosis

Type	Features	Treatment
Pseudomembranous	Most common type; presents with creamy white coating on mucosa that can be wiped away, revealing underlying erythema[17] (**Figures 8** and **9**)	Topical antifungal therapy[8]
Erythematous (atrophic)	Common with prolonged steroid or antibiotic use; presents as erythematous areas that are sensitive, painful (burning) and smooth (due to depapillation)[17] (**Figure 10**)	Topical antifungal therapy[8]
Hyperplastic	Often chronic; white patches or plaques that cannot be removed[17] (**Figure 11**)	May resemble leukoplakia or oral cancer; consider referral to specialist for biopsy[8]
Denture-induced stomatitis	Common in up to 60% of denture wearers; presents with erythematous areas at denture-bearing areas and may be associated with angular cheilitis[16,17] (**Figure 12**)	Dental review to assess fit of dentures and denture hygiene, followed by topical antifungal therapy to mouth and dentures[16,17]

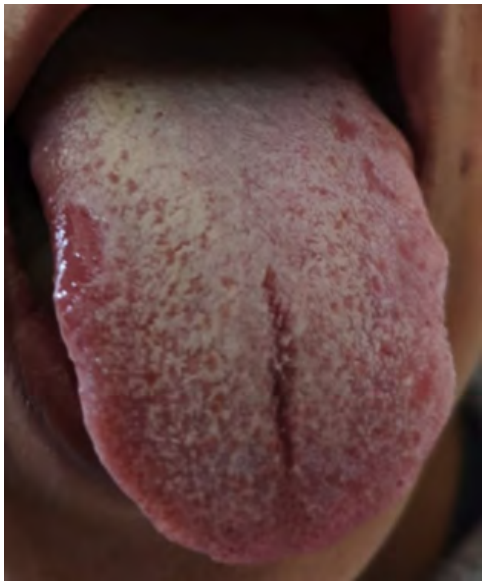

Figure 8. Pseudomembranous candidosis of the tongue

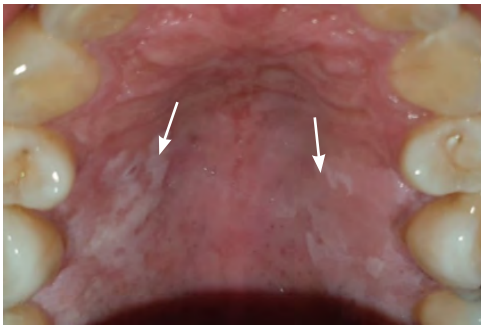

Figure 9. Pseudomembranous candidosis of the hard palate (confirmed by oral swab)

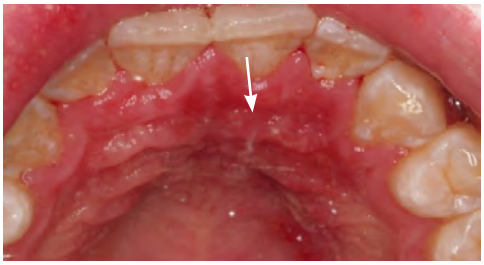

Figure 10. Erythematous candidosis of the hard palate

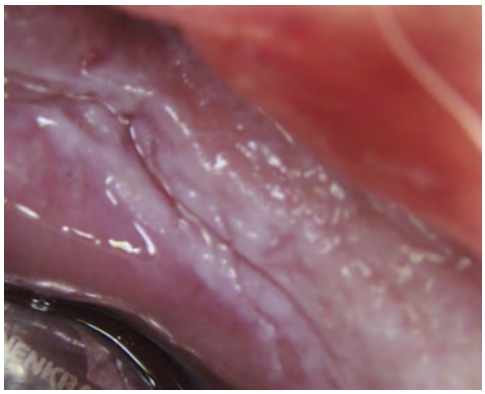

Figure 11. Hyperplastic candidosis associated within the edentulous ridge 47–48-retromolar region in a diabetic with poor denture hygiene

Figure 12. Denture-induced stomatitis

Oral Lichen Planus (OLP)

OLP is a chronic inflammatory disease that affects the oral mucosa.[18] It is a subtype of lichen planus and is associated with cell-mediated immunological dysfunction.[18] OLP has a prevalence of 1–2%, usually affecting adults with a male-to-female ratio of 1:2.[19,20]

Although the exact aetiology of OLP is unknown, it is thought to result from an immune-mediated mechanism involving both CD4+ helper (Th 1) and CD8+ cytotoxic T-cells, causing epithelial damage.[7,20]

Clinical Features

The most common sites for OLP are the gingiva, tongue and buccal mucosa, followed by the vermillion border of the lip and the labial mucosa; lesions on the floor of the mouth and the palate are rare.[20,21] The incidence of lesions occurring on the buccal mucosa is 73%–95.5%, and bilateral involvement can be seen in approximately 82% of patients.[20]

OLP can be classified into six types, which are described in **Table 3**.

Table 3. Types, features and incidence of OLP

Type	Features	Incidence	Treatment
Reticular	Presents as small, white keratotic papules connected by a white, lacy network known as Wickham's striae;[33,36] usually asymptomatic but can cause taste alteration and burning sensation if on the tongue[21] (**Figures 13** and **14**)	64.8%[20]	Generally, treatment is not required[20,21]
Plaque-like	White, smooth keratotic lesions, sometimes with striations[20]	5.7%[20]	If asymptomatic, no treatment required; if symptomatic, topical corticosteroids can be used[20,21]
Papular	Small keratotic lesions of approximately 1 mm in diameter[20]	2.3%[20]	Topical corticosteroids e.g. dexamethasone, triamcinolone;[20,21] systemic corticosteroids e.g. prednisolone if topical therapy ineffective[21]
Atrophic/ erythematous	Regions of muscle atrophy with thinned epithelium in conjunction with previous reticular lesions[20,21]	4.3%[20]	Same as above
Erosive	Red or erythematous areas with central ulceration of varying degrees and bordered by fine white striae; characterised by lesions, ulcers and sometimes bullae[20,21] (**Figure 15**)	22.9%[20]	Same as above
Bullous	Severe erosions resulting in rupture of epithelium and bullae formation[20]	Rare[20]	Same as above

Approximately two thirds of individuals affected by OLP experience symptoms. Most symptoms are associated with atrophic and erosive (ulcerative) forms of OLP. These symptoms include mucosal roughness, burning sensation, irritation, xerostomia, bleeding and dysgeusia.[20,21] If OLP

is localised to the gingiva, it can have clinical features of desquamative gingivitis (**Figures 16** and **17**).[21]

OLP has the potential for malignant change into squamous cell carcinoma. It has been classified as a potentially malignant disorder by the World Health Organization. OLP requires regular monitoring for any malignant changes. The reported frequency of malignant change ranges from 0% to 5.8%.[20]

Diagnosis can be made from both clinical findings and biopsy. The authors of this paper recommend a biopsy, both to confirm the diagnosis and to exclude the presence of any dysplastic change.[20]

Figure 13 and **14.** Reticular form of oral lichen planus on buccal mucosa

Figure 15. Erosive oral lichen planus

Figure 16 and **17.** Gingival oral lichen planus areas of desquamation or loss of the epithelial surface appearing intensely red – desquamative gingivitis

Treatment

Since the aetiology of OLP is unknown, no cure exists for this disease. The goal of treatment is to relieve the symptoms and reduce inflammation to allow for healing.[20,21] Symptomatic lesions such as erosive or erythematous OLP require treatment because they are painful.[20,21] The first line of treatment includes topical corticosteroids such as dexamethasone and triamcinolone.[20,21]

Systemic corticosteroids such as prednisolone are another treatment option, but they are reserved for acute exacerbations of OLP, where topical therapy has been ineffective or where mucosal sites are also affected.[21]

Geographic Tongue

Geographic tongue is a benign condition with an incidence of 2%–3%. It presents as

smooth red areas of depapillation across the dorsum and lateral borders of the tongue.[22] Geographic tongue is a recurrent condition, and the lesions migrate to different areas of the tongue from time to time.[23]

Clinical Features

Clinical features include an erythematous area surrounded by white margins depicting regeneration of papilla and keratin (**Figures 18** and **19**). The aetiology of geographic tongue is unknown.[22] It is usually a painless condition, but some individuals may experience a burning sensation and sensitivity to acidic and spicy foods.[23]

Figures 18 and **19.** Geographic tongue on dorsal and lateral surfaces of the tongue

Treatment

A biopsy is usually not required but can be taken in certain cases to rule out malignant conditions. The lesions of geographic tongue generally resolve spontaneously, and no treatment is needed. Reassuring the patient that lesions are benign and self-limiting is necessary. Any burning sensation can be alleviated through the use of topical steroids and topical anaesthetics.[23]

Pre-Malignant Disorders

Oral potentially malignant disorders are defined as potentially pre-malignant lesions or disorders found in the oral cavity. These disorders include leukoplakia, erythroplakia, oral submucous fibrosis, actinic cheilitis and OLP.[24] Early identification and treatment of these lesions is recommended to prevent the development of oral squamous cell carcinoma. Oral leukoplakia refers to white plaques of the oral mucosa with unknown cause. Leukoplakia may increase the risk of malignancy and should be differentiated from other benign conditions such as candidiasis, hairy leukoplakia, lupus erythematous and morsication (**Figure 20**).[25] Smokers are six times more likely to develop leukoplakia, and it carries a 1% annual risk of malignant transformation.[25] Leukoplakia has two main types – homogenous and non-homogenous. The homogenous type is uniformly white in appearance and is flat and thick, whereas the non-homogenous type appears as a combined red and white lesion, sometimes also called erythroleukoplakia or speckled leukoplakia. It can appear speckled or nodular within any site of the oral cavity.[25] Due to the very high risk of malignant transformation, these lesions may require surgical excision. Erythroplakia refers to red patches within the oral mucosa that do not clinically appear as any other identifiable condition (**Figure 21**).[25]

Oral submucous fibrosis is a chronic condition of the oral cavity and results in inflammation and fibrosis of the submucosal layer. Patients often present with difficulty opening the jaw, intolerance to spicy food, or a burning sensation with clinical features of mucosal stiffening and fibrosis[25] (**Figure 22**). Oral submucous fibrosis has an estimated 10-year malignancy transformation risk of 7.6%.[26]

Actinic cheilitis is a condition affecting the lip, caused by exposure to solar UV radiation resulting in histopathological changes such as elastosis, chronic inflammatory infiltrate, vasodilation and hyperkeratosis. It can progress to squamous cell carcinoma.[27] Clinically, actinic cheilitis presents with lip dryness, atrophy, scaly lesions, ulcerations and loss of vermilion border (**Figure 23**). The incidence of actinic cheilitis is around 31%.[28] These multifocal changes most often occur on the lower lip of typically fair-skinned individuals above the age of 40 who have a history of significant sun exposure.[27]

A biopsy is required to correctly establish a definitive diagnosis and assess the degree of dysplasia as well as to differentiate potentially premalignant disorders from other inflammatory and atrophic lesions.

Figure 20. Leukoplakia (biopsied with diagnosis of oral lichen planus and secondary oral candidosis)

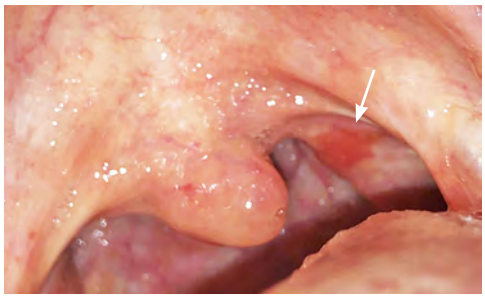

Figure 21. Erythroplakia

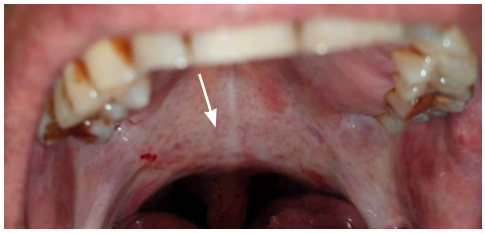

Figure 22. Submucosal fibrosis in a patient who used betel leaf frequently (the pallor of the soft palate is an extensive fibrous change within the submucosa)

Figure 23. Dry and fissured lips (called cheilitis) secondary to oral candidosis with solar elastosis (actinic cheilitis)

Lumps And Bumps

Mucocele

Mucoceles are cavities filled with mucus and are benign soft-tissue masses that are usually asymptomatic.[29] They are mucus-containing cystic lesions of the minor salivary glands and can appear as single or multiple, round, smooth, raised, smooth fluctuant nodules (**Figure 24**).[29] Mucoceles are classified as a mucous extravasation cyst (MEC) or mucous retention cyst (MRC) depending on the histological features as outlined in **Table 4**. Ranula is a type of mucocele found on the floor of the mouth.[29] Mucoceles are most prevalent between the ages of 10 and 19 years. Oral mucoceles do not cause significant issues, but individuals may experience discomfort and problems with speech, swallowing and mastication depending on the size of the lesion and the location.[29] Table 4 describes the features and treatment of mucoceles.

Table 4. Clinical features and treatment of mucoceles

	MEC	MRC	Ranula
Age Group	Children and young adults[29]	Older adults[29]	-
Clinical and Histological Features	No epithelial lining. Macrophages, eosinophils and plasma cells are present.[30] Granulation tissue is present.[30] Dome-shaped, fluctuant nodule with bluish translucency due to spilled mucin. Older lesions are firmer.[29]	True cyst due to presence of epithelial lining. Mucin and inflammatory debris are present.[30] Similar appearance to MEC but pain present and mucus or pus may be expressed.[29]	Blue dome-shaped fluctuant swelling that can elevate the tongue and is present lateral to the midline.[29] Larger than other mucoceles, sometimes reaching several centimetres in size.[29]
Causes	Rupture of minor salivary gland duct and mucin spilling into surrounding soft tissue.[29] Mechanical trauma such as cheek or lip biting.[29]	Due to mucous retention in the duct or acini due to a sialolith or calculi obstructing the duct. The narrow ductal opening is blocked, causing swelling and irritation.[29] Irritation can be due to toothpastes, hydrogen peroxide mouth rinses and anti-plaque solutions.[29]	Arises from leaking of saliva from sublingual gland, Wharton's duct or ducts of Rivini.[29]

Site	Buccal and labial mucosa with a size less than 1.5 cm[29]	Floor of the mouth, upper lip, hard palate, maxillary sinus[29]	Floor of the mouth[29]
Treatment	Marsupialisation, dissection, carbon dioxide lasers or complete excision including total removal of feeder gland to minimise recurrence[29]		

Figure 24. Mucocele on lower lip

Squamous Cell Papilloma (SCP)

SCP is a benign and asymptomatic exophytic mass presenting in the oral cavity.[31] It is caused by HPV types 6 and 11. Risk factors include smoking, dietary deficiencies, hormonal changes and other infections.[31,32] The two types of SCP are isolated-solitary and multiple-recurring. Isolated-solitary are generally found in adults, whereas multiple-recurring are usually found in children.[31] HPV can transmit via skin-to-skin, oral or sexual contact with an infectious person, as well as the possibility of vertical transmission from mother to child.[31]

Clinical Features

SCP is a localised proliferation appearing cauliflower-like and arising from the underlying soft tissue. It appears as a single lesion and grows to reach a maximum of 1 cm.[31,32] The most common sites include the palate (37.84%), tongue (29.73%), lips and gingiva. It most commonly affects patients between the ages of 30 and 50 years, although it can also be found in paediatric patients (**Figure 25**).[31,32]

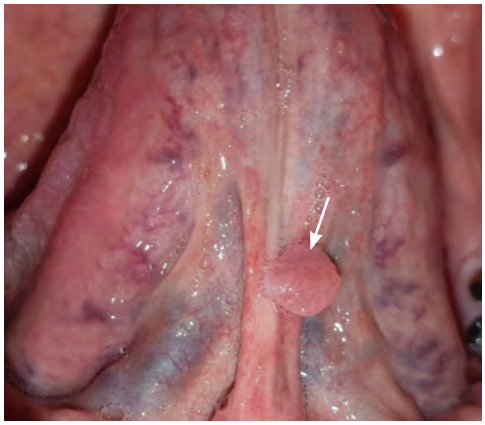

Figure 25. Squamous papilloma of the lingual frenum

Treatment

Treatment of SCP includes surgical excision of the entire lesion, including some surrounding tissue. Other treatment modalities include laser such as CO2 and ER,Cr:YSGG, electrocautery and cryosurgery.[31,32] Recurrence is uncommon, except in patients with HIV.[31]

Pyogenic Granuloma

Pyogenic granuloma is a non-neoplastic rapidly growing vascular lesion that most commonly occurs on the skin or mucous membranes. The aetiology is unclear, but it is believed to result from inflammatory hyperplasia secondary to trauma, chronic irritation, medications or hormone factors such as pregnancy.[33]

Clinical Features

Oral pyogenic granuloma presents as a localised red papule that is smooth or lobulated, on a pedunculated or sessile base. The size of lesions can vary from a few millimetres, and a characteristic history of rapid growth is a common clinical feature. They are also haemorrhagic and can bleed easily from minor trauma, and some may ulcerate.[33] The majority of lesions occur in the gingiva, particularly the maxillary gingiva, but they may also affect the lips, mucosa and tongue (**Figure 26**).[34]

Figure 26. Pyogenic granuloma

Treatment

Excision of pyogenic granulomas, especially during pregnancy, carries a high recurrence rate.[33] Management of pyogenic granuloma may range from clinical observation for small, asymptomatic lesions to surgical excision.[33]

Pigmented Lesions

Oral Melanoma

Primary oral malignant melanomas can be considered rare, with estimates suggesting that less than 1% of melanomas occur on mucosal surfaces.[35] The incidence of oral melanomas increases with age. The aetiology of oral melanomas is unknown, but some risk factors include pre-existing pigmented naevi, infection, trauma from ill-fitting prostheses and tobacco consumption.[36]

Clinical Features

Most oral melanomas appear as black, brown, white, grey, purple or red lesions, but a third may appear amelanocytic (**Figure 27**). Additional features may include ulceration, central nodules and satellite lesions.[36] Oral mucosal melanomas occur most commonly on the hard palate (40%) or gingival surfaces (28%).[37] Most (85%) are invasive at the time of diagnosis, with a poor 5-year survival rate of around 15%.[37] Diagnosis is confirmed through a biopsy.[36]

Figure 27. Oral melanoma

Treatment

Treatment options include surgery to excise the tumour as well as radiotherapy, chemotherapy and immunotherapy.[36]

Amalgam Tattoo

Amalgam tattoos are pigmented lesions present in the oral cavity, usually resulting from the displacement of amalgam particles in soft tissues during common dental restorative procedures. This presents as grey–blue or black pigmentation on the oral mucosa. It is usually round and uniformly pigmented and can be present on the buccal mucosa, lips, tongue, floor of the mouth, palate and gingiva (**Figure 28**).[38]

Figure 28. Amalgam tattoo biopsied of left buccal mucosa

Treatment

No treatment is required, but excision using laser may be considered if an amalgam tattoo is present in aesthetic regions of the oral cavity.[38]

Hairy Tongue

Hairy tongue is a benign and painless condition resulting in the filiform papilla of the tongue being greatly elongated.[39] It affects both genders but is more prevalent in males. The incidence is approximately 0.5% of the population.[39]

Clinical Features

It is caused by defective desquamation and hypertrophy of the cells in the central column of the filiform papillae, leading to the prevalence of chromogenic bacteria. It can present with significant discolouration: white, yellow, green, brown or black (**Figure 29**). Aetiological factors include poor oral hygiene, antibiotic and psychotropic agents, xerostomia, mouthwashes, and smoking and alcohol use.[39,40] Discolouration can occur due to tobacco, coffee, tea and food.[39]

Figure 29. Hairy tongue on dorsal surface of tongue

Treatment

Management of hairy tongue includes minimising aetiological factors such as smoking and coffee. Regular tongue brushing is also recommended, using a tongue scraper or toothbrush. Hairy tongue can be managed effectively with appropriate oral hygiene and patient education. In rare cases, surgical removal of papillae may be required.[40]

Conclusion

The oral cavity is often an under-examined area in general practice. Increased knowledge about the common presentations of oral lesions can improve practitioner confidence in conducting oral examinations and managing any identified pathology.

Importantly, general practitioners should keep in mind the red flags in oral pathology that may indicate malignancy. A good rule of thumb is to refer any lesion not resolving after 3 weeks for specialist review. Additional red flags include non-healing ulcers, ill-fitting prostheses, erythroplakia, leukoplakia, ulceration with fissures, and lesions with features of induration and fixation.

Particular attention in oral examination should be provided to patients who present with identifiable risk factors, such as smoking, betel nut or areca nut consumption, solar radiation, HPV infection and immunocompromised state.

How does this paper make a difference to general practice?

- This is an educational paper, designed to improve the clinical knowledge of general practitioners in oral health.
- This paper categorises common oral lesions by presentation and provides clinical photographs to assist general practitioners in recognising and diagnosing many commonly encountered oral lesions.
- This paper also discusses risk factors and management of common oral lesions and highlights red flags for clinicians to watch out for.

References

1. Akintoye SO, Greenberg MS. Recurrent aphthous stomatitis. *Dent Clin North Am*. 2014;58(2):281-297. doi:10.1016/j.cden.2013.12.002
2. Tarakji B, Gazal G, Al-Maweri S, Azzeghaiby SN, Alaizari N. Guideline for the diagnosis and treatment of recurrent aphthous stomatitis for dental practitioners. *J In Oral Health*. 2015 05;7(5):74–80.
3. Edgar N, Saleh D, Miller R. Recurrent aphthous stomatitis: a review. *J Clin Aesthet Dermatol*. 2017;10(3):26–36.
4. Montgomery-Cranny JA, Wallace A, Rogers HJ, Hughes SC, Hegarty AM, Zaitoun H. Management of Recurrent Aphthous Stomatitis in Children. *Dent Update*. 2015;42(6):564-572. doi:10.12968/denu.2015.42.6.564
5. Xu F, Schillinger JA, Sternberg MR, et al. Seroprevalence and coinfection with herpes simplex virus type 1 and type 2 in the United States, 1988-1994. *J Infect Dis*. 2002;185(8):1019-1024. doi:10.1086/340041
6. Woo SB, Challacombe SJ. Management of recurrent oral herpes simplex infections. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007;103 Suppl:S12.e1-S12.e18. doi:10.1016/j.tripleo.2006.11.004
7. Gonsalves WC, Chi AC, Neville BW. Common oral lesions: Part I. Superficial mucosal lesions. *Am Fam Physician*. 2007;75(4):501-507.
8. eTG complete [digital]. Melbourne: Therapeutic Guidelines Limited; 2019 Jun. https://www.tg.org.au
9. Johnson NW, Jayasekara P, Amarasinghe AA. Squamous cell carcinoma and precursor lesions of the oral cavity: epidemiology and aetiology. *Periodontol 2000*. 2011;57(1):19-37. doi:10.1111/j.1600-0757.2011.00401.x
10. Wong T, Wiesenfeld D. Oral Cancer. *Aust Dent J*. 2018;63 Suppl 1:S91-S99. doi:10.1111/adj.12594
11. Walker DM, Boey G, McDonald LA. The pathology of oral cancer. *Pathology*. 2003;35(5):376-383. doi:10.1080/00310290310001602558
12. Scully C, Bagan J. Oral squamous cell carcinoma overview. *Oral Oncol*. 2009;45(4-5):301-308. doi:10.1016/j.oraloncology.2009.01.004
13. Farah CS, McCullough MJ. Oral cancer awareness for the general practitioner: new approaches to patient care. *Aust Dent J*. 2008;53(1):2-99. doi:10.1111/j.1834-7819.2007.00002.x

14. Pires FR, Ramos AB, Oliveira JB, Tavares AS, Luz PS, Santos TC. Oral squamous cell carcinoma: clinicopathological features from 346 cases from a single oral pathology service during an 8-year period. *J Appl Oral Sci*. 2013;21(5):460-467. doi:10.1590/1679-775720130317

15. Mariño R, Haresaku S, McGrath R, et al. Oral cancer screening practices of oral health professionals in Australia. *BMC Oral Health*. 2017;17(1):151. Published 2017 Dec 15. doi:10.1186/s12903-017-0439-5

16. Webb BC, Thomas CJ, Willcox MD, Harty DW, Knox KW. Candida-associated denture stomatitis. Aetiology and management: a review. Part 1. Factors influencing distribution of Candida species in the oral cavity. *Aust Dent J*. 1998;43(1):45-50. doi:10.1111/j.1834-7819.1998.tb00152.x

17. Pankhurst CL. Candidiasis (oropharyngeal). *BMJ Clin Evid*. 2013;2013:1304. Published 2013 Nov 8.

18. Thongprasom K, Carrozzo M, Furness S, Lodi G. Interventions for treating oral lichen planus. *Cochrane Database Syst Rev*. 2011;(7):CD001168. Published 2011 Jul 6. doi:10.1002/14651858.CD001168.pub2

19. Mozaffari H, Mirbahari S, Sadeghi M. Histopathological findings in oral lichen planus: a three-year report from western Iran. *J Res Med Dent Sci*. 2018;6(1):274–278.

20. Budimir V, Richter I, Andabak-Rogulj A, Vučićević-Boras V, Budimir J, Brailo V. Oral lichen planus - retrospective study of 563 Croatian patients. *Med Oral Patol Oral Cir Bucal*. 2014;19(3):e255-e260. Published 2014 May 1. doi:10.4317/medoral.18940

21. Olson MA, Rogers RS 3rd, Bruce AJ. Oral lichen planus. *Clin Dermatol*. 2016;34(4):495-504. doi:10.1016/j.clindermatol.2016.02.023

22. Bakshi SS, Bhattacharjee S. Geographic Tongue. *J Allergy Clin Immunol Pract*. 2017;5(1):176. doi:10.1016/j.jaip.2016.06.017

23. Shah N, Kariya P, Dave B, Thomas P. Geographic tongue: a case report with review of literature. *Adv Hum Biol*. 2016;6(3):142.

24. Mello FW, Miguel AFP, Dutra KL, et al. Prevalence of oral potentially malignant disorders: A systematic review and meta-analysis. *J Oral Pathol Med*. 2018;47(7):633-640. doi:10.1111/jop.12726

25. van der Waal I. Potentially malignant disorders of the oral and oropharyngeal mucosa; terminology, classification and present concepts of management. *Oral Oncol*. 2009;45(4-5):317-323. doi:10.1016/j.oraloncology.2008.05.016

26. Cox SC, Walker DM. Oral submucous fibrosis. A review. *Aust Dent J*. 1996;41(5):294-299. doi:10.1111/j.1834-7819.1996.tb03136.x

27. Cavalcante AS, Anbinder AL, Carvalho YR. Actinic cheilitis: clinical and histological features. *J Oral Maxillofac Surg*. 2008;66(3):498-503. doi:10.1016/j.joms.2006.09.016

28. Rodríguez-Blanco I, Flórez Á, Paredes-Suárez C, et al. Actinic Cheilitis Prevalence and Risk Factors: A Cross-sectional, Multicentre Study in a Population Aged 45 Years and Over in North-west Spain. *Acta Derm Venereol*. 2018;98(10):970-974. doi:10.2340/00015555-3014

29. More CB, Bhavsar K, Varma S, Tailor M. Oral mucocele: A clinical and histopathological study. J Oral Maxillofac Pathol. 2014;18(Suppl 1):S72-S77. doi:10.4103/0973-029X.141370

30. Tandon A, Sircar K, Chowdhry A, Bablani D. Salivary duct cyst on lower lip: A rare entity and literature review. *J Oral Maxillofac Pathol*. 2014;18(Suppl 1):S151-S156. doi:10.4103/0973-029X.141375

31 Toledano-Serrabona J, López-Ramírez M, Sánchez-Torres A, España-Tost A, Gay-Escoda C. Recurrence rate of oral squamous cell papilloma after excision with surgical scalpel or laser therapy: A retrospective cohort study. *Med Oral Patol Oral Cir Bucal*. 2019;24(4):e433-e437. Published 2019 Jul 1. doi:10.4317/medoral.22943

32. Babaji P, Singh V, Chaurasia VR, Masamatti VS, Sharma AM. Squamous papilloma of the hard palate. *Indian J Dent*. 2014;5(4):211-213. doi:10.4103/0975-962X.144731

33. Jafarzadeh H, Sanatkhani M, Mohtasham N. Oral pyogenic granuloma: a review. *J Oral Sci*. 2006;48(4):167-175. doi:10.2334/josnusd.48.167

34. Saravana G. Oral pyogenic granuloma: a review of 137 cases. *Br J Oral Maxillofac Surg*. 2009;47(4):318–319.

35. Chang AE, Karnell LH, Menck HR. The National Cancer Data Base report on cutaneous and noncutaneous melanoma: a summary of 84,836 cases from the past decade. The American College of Surgeons Commission on Cancer and the American Cancer Society. *Cancer*. 1998;83(8):1664-1678. doi:10.1002/(sici)1097-0142(19981015)83:8<1664::aid-cncr23>3.0.co;2-g

36. Warszawik-Hendzel O, Słowińska M, Olszewska M, Rudnicka L. Melanoma of the oral cavity: pathogenesis, dermoscopy, clinical features, staging and management. *J Dermatol Case Rep*. 2014;8(3):60-66. Published 2014 Sep 30. doi:10.3315/jdcr.2014.1175

37. Hicks MJ, Flaitz CM. Oral mucosal melanoma: epidemiology and pathobiology. *Oral Oncol*. 2000;36(2):152-169. doi:10.1016/s1368-8375(99)00085-8

38. Kamal F, Essaoudi M, Khalfi L, Elkhatib K. Extensive amalgam tattoo (amalgam pigmentation) on the palatal mucosa: a short case report. *J Oral Med Oral Surg*. 2019;25(1):7.

39. Shetty S, Shetty R. Hairy tongue (linguavillosa nigra): a case report. *Int J Dent Clin*. 2011;3(3):75–76.

40. Shimizu T, Tokuda Y. Hairy tongue. *BMJ Case Rep*. 2012;2012:bcr0220125755. Published 2012 Oct 6. doi:10.1136/bcr-02-2012-5755

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REVIEW

Effects of patient education on the quality of life of patients with type 2 diabetes mellitus: A scoping review

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Mustapa A, Justine M, Manaf, H. Effects of patient education on the quality of life of patients with type 2 diabetes mellitus: A scoping review. *Malays Fam Physician.* 2022;17(3):22–32. https://doi.org/10.51866/rv.208

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Abstract

Introduction: Patient education is an integral component of diabetes mellitus care. The emergence of different methods and characteristics of patient education has led to varying outcomes of quality of life (QoL). Herein, we systematically searched for published studies reporting patient education and its methods and characteristics for improving the QoL of patients with type 2 diabetes mellitus (T2DM).

Methods: In this scoping review, eligible studies from six databases (PubMed, Scopus, Cochrane Library, Springer Link, Science Direct and Google Scholar) were identified. The keywords used in the search strategies were as follows: health education, health promotion, patient education, diabetes care, QoL, diabetes mellitus and type 2 diabetes mellitus. Two reviewers independently screened all references and full-text articles retrieved to identify articles eligible for inclusion.

Results: A total of 203 articles were identified in the initial search. Of them, 166 were excluded after screening the titles and abstracts. Further full-text screening led to the subsequent removal of 22 articles, leaving 15 articles eligible for data extraction.

Conclusion: There is a broad array of methods of patient education for improving the QoL of patients with T2DM. Self-management education with supplementary supervision and monitoring effectively improves QoL. Future studies must emphasise the application of holistic education covering psychological distress, diet plan, and physical health.

Introduction

Currently, the worldwide prevalence of diabetes mellitus (DM) is increasing tremendously regardless of age and disease type. About 463 million people, representing 9.3% of the global adult population aged between 20 and 79 years in 2019, have DM.[1,2] This figure is predicted to increase extensively to about 578 million (10.2%) in 2030 and 700.2 million (10.9%) in 2045.[1,2] This alarming prevalence of DM substantially impacts medical costs and has emerged as a global health burden.

DM is a disproportionately expensive disease, with an estimated annual global expenditure of USD 760 billion for diabetes care in 2019.[3] The yearly expenditure is projected to increase to approximately USD 825 billion by 2030 and USD 845 billion by 2045, which is primarily driven by the increasing prevalence of type 2 diabetes mellitus (T2DM).[3,4] T2DM accounts for 90 to 95% of all cases of DM.[1] Therefore, the present review focused on T2DM, as it is more common than type 1 DM.

Patients with DM generally experience a poor quality of life (QoL) owing to DM-related complications such as foot ulceration, amputation, and retinopathy.[5,6] Thorough and explicit patient education on T2DM can avert and delay the progression of the disease. Evolving epidemiological studies have also elucidated the effectiveness of patient education on lifestyle modification, well-balanced diet, weight loss, smoking cessation and regular exercise in controlling glucose homoeostasis and improving QoL.[7–10] Patient education is also an integral component of DM care.[10]

Patient education on T2DM is a supportive and self-motivating process that involves imparting knowledge, abilities and skills in DM self-care, increasing self-efficacy and motivation, changing lifestyle and behaviour, improving compliance to therapeutic regimens, improving awareness of DM-related complications and enhancing emotional resilience, ultimately improving QoL.[10–12] Current educational practices have shifted from the didactic style concentrating on

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the attainment of knowledge to interventions involving patient participation.[13]

The outcomes of patient educational techniques are influenced by their mode, method and delivery, which eventually impact QoL.[13,14] Failure of educational techniques for T2DM decreases the perceived susceptibility to the complications of DM.[15,16] Moreover, the emergence of different methods and characteristics of patient education has led to varying outcomes of QoL. In this review, we systematically searched for published studies reporting patient education and its methods and characteristics for improving the QoL of patients with T2DM.

Methods

The review protocol has been registered within the Open Science Framework (https://osf.io/3gk6v). This scoping review was conducted using the methodological framework proposed by Arksey and O'Malley.[17] The article identification and screening processes were synthesised using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR).[18] Electronic-based searches were performed in six databases (PubMed, Scopus, Cochrane Library, Springer Link, Science Direct and Google Scholar) to identify existing studies that described the methods and characteristics of patient education for improving the QoL of patients with T2DM.

The comprehensive search of articles (except for systematic and narrative reviews) published from 2010 to 2022 was conducted between 2 and 6 February 2021. Studies were excluded when they were not reported in the English language. The keywords used in the search strategies were as follows: health education, health promotion, patient education, diabetes care, quality of life, diabetes mellitus and type 2 diabetes mellitus. The Boolean terms 'AND', 'OR' and 'AND NOT' were used to separate the keywords.

Thereafter, two reviewers independently screened all references and full-text articles retrieved to identify articles eligible for inclusion. Discrepancies between the reviewers were resolved via consensus. Finally, two reviewers independently extracted data from the selected articles and input them in tabulation form in a structured Excel sheet. The following data were extracted: name of author(s), year of publication, country, method, characteristics of the intervention (period, mode, delivery, content, contact hour and provider), outcome measures of QoL and their significance and adverse events throughout the intervention. Two other reviewers further checked the Excel sheet to identify any errors in data extraction. The data were summarised on the basis of the method of the included study, characteristics of patient education, outcome measures of QoL, adverse events and adherence to patient education.

Results

A PRISMA-ScR flow diagram showing the stages of article screening and selection is shown in **Figure 1**. A total of 203 articles were identified from the databases and other sources, including Google Scholar. Of them, 166 were excluded after screening the titles and abstracts. Further full-text screening led to the subsequent removal of 22 articles, leaving 15 articles eligible for data extraction.[19–32]

Study description

Table 1 shows the characteristics of the included studies. In total, 2,909 patients with T2DM were allocated into an intervention group and a control group. The sample sizes ranged from 10 to 298 and from 10 to 210 in the intervention and control groups, respectively, except for the studies by Baraz et al.,[11] Mahmoud et al.[31] and Wong et al.[24] that did not utilise a control group. Two studies included patients with T2DM on insulin and/or oral hypoglycaemic therapy.[20,31] Meanwhile, Estuningsih et al.[27] grouped their hospitalised participants according to nutritional education before the intervention.

Five studies designated both intervention and control groups to receive usual DM care.[19–22,27] In the study by Estuningsih et al.,[27] all participants received nutritional consultation before the intervention. In the study by Pon et al.,[21] all participants had access to an online care platform (e-Vita) to support their self-management skills. In the study by Sherifali et al.,[22] all participants received usual DM education along with community resources and an accelerometer.

Four studies used Diabetes Self-Management Education and Support (DSME/S),[19,20,29,30] while three studies used distinct group-based patient-centred and/or self-management education programmes such as Next Education (NEED),[26] the Chronic Disease Self-Management Program (CDSMP),[28] and the Patient Empowerment Programme (PEP).[24]

Intervention characteristics

The intervention duration ranged from 4 weeks to 4 years, except in the study by Pon et al.[21] For the intervention group, three studies did not report the mode of educational programme as either individual or group.[11,25,27] Three studies used individual-based educational programmes[19,20,22]; nine, group-based educational programmes[19,21,23,24,26,29–32]; one, a classroom-based educational programme[28]; and twelve, face-to-face educational programmes.[19,21,23–32] The other studies used educational technology,[11] text messages via a smartphone application[20] and phone calls[22] for the delivery of the educational programmes.

Regarding intervention content, 10 studies focused on self-management or self-care skills.[11,19–22,24,25,28–30] Christoffersen et al.[26] tailored their educational programme based on the participants' needs, focusing on psychosocial issues and behavioural changes and aiming to achieve a balanced life. Meanwhile, Estuningsih et al.[27] applied intensive monitoring using a self-regulated learning approach with four sessions of educational meeting that comprised basic information about DM and a diet programme, obstacles encountered during the diet programme and implementation of the diet programme and assessed the effectiveness of the intervention. Mahmoud et al.[31] conducted a psychoeducational programme using various interactive educational methods, including counselling, demonstration, group discussion and vignette.

Mostafa et al.[32] utilised an educational programme in the Arabic language, including discussion and feedback using lectures (knowledge) and videos (practical) that consisted of definitions, causes, types, signs and symptoms, treatments, complications and nursing managements of DM. Trento et al.[23] assigned group care in three phases: (1) introduction, (2) main content regarding role-playing with real-life simulations expressing patients' opinions and life experiences with DM and (3) summary. Two studies enhanced the content regarding self-efficacy in their educational programmes.[19,24]

The contact hour for the intervention ranged from 55 minutes to 3.5 hours per session, which was held either weekly or monthly or at 3-to-4-month intervals, except in the study by Boels et al.[20] in which each participant received one text message per day two to six times per week. For the educational providers, all included studies employed highly trained healthcare professionals such as dietitians, nurses, physicians, DM specialists and endocrinology specialists, except for the studies by Estuningsih et al.[27] and Jahromi et al.[29] in which educators and coordinators conducted the educational programmes without specifically mentioning whether they had been trained.

Outcome measures

The most commonly used outcome measurement tools for QoL were the World Health Organization Quality of Life Scale,[19,27,29,32] Diabetes-Dependent Quality of Life Questionnaire,[20,22] Diabetes Quality of Life/Mod Scale[23] and EuroQoL Five-Dimensional Scale (EQ-5D-3L/5L).[20,21,25,26] Other studies used the Iranian Short-Form Health Survey,[11] Self-Reported Health-Related Quality of Life Scale,[28] Diabetes Quality of Life Brief Clinical Inventory,[30] Short-Form 12 and 36 Health Surveys Version[2,20,24] Short-Form Six-Dimensional Scale[24] and RAND 36-Item Health Survey 1.0.31 Estuningsih et al.[27] further measured QoL objectively based on the blood glucose level, cholesterol level, blood pressure and body mass index.

Adverse events and compliance

Two studies reported no serious adverse events or withdrawals during the intervention.[19,20] Azami et al.[19] further reported that none of their participants were hospitalised or died due to hypoglycaemic events. Meanwhile, a study reported that 60 participants visited the emergency department or were hospitalised during the >1-year monitoring period but found no significant difference between the intervention and control groups.[22] Additionally, six studies reported moderate-to-good compliance, satisfaction and response of the participants to the interventions.[19,22,24,25,30,31] In contrast, Boels et al.[20] observed poor compliance towards the use of written diaries in recording the glucose level. Pon et al.[21] further noted a low participation rate among their patients with T2DM.

QoL

Eight studies found significant differences in the QoL in the intervention group depending on the domains measured.[22,24,25,27,29–32] Conversely, seven studies found either a non-significant slight or great improvement in the QoL in the intervention group.[11,19–21,23,26,28]

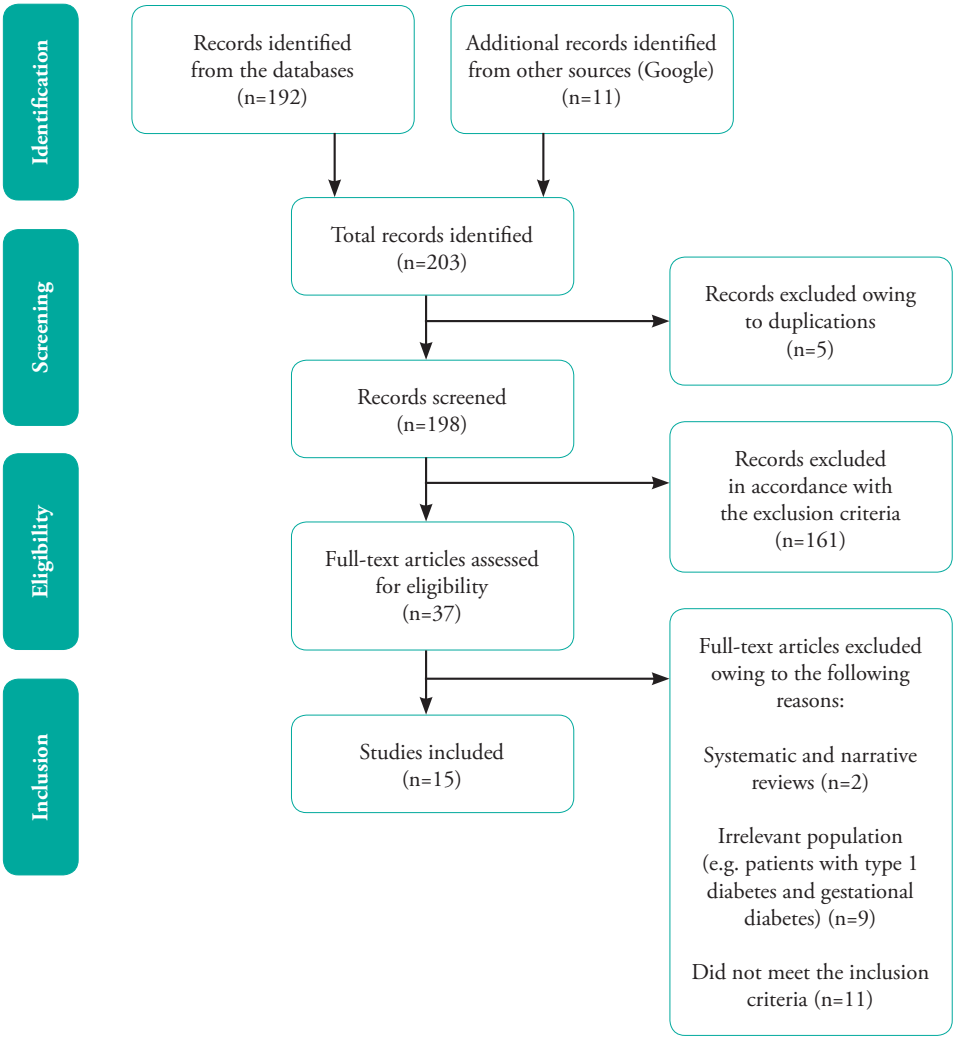

Figure 1. PRISMA-ScR flowchart of the scoping review.

Table 1. Characteristics of the included studies.

Author	Country	Patient	Method	Intervention						Outcome measure of QoL	Significance of the outcome measure of QoL
				Period	Mode	Delivery	Content	Contact hour	Provider		
Azami et al.[19]	Iran	IG: 71 CG: 71	- Usual DM care (e.g. self-care management, lifestyle modification and medication adherence) - Intervention for 20 to 30 minutes per session at 3-month intervals - Pamphlets **IG:** Plus DSME - Booklets - Movie clips and group discussions - Weekly follow-up phone call (2 months after the group discussion)	12 weeks	Group	F2F	Booklet: Diet, PA, medication, blood glucose level monitoring, foot care and healthy living with DM Movie clips: Information about T2DM, prevention of complications, PA, daily foot care, healthy eating and healthy living with DM Group discussion: Building knowledge, SE and skills regarding self-goal setting, action planning, problem-solving, sharing and peer support	Movie clips: 10 minutes weekly on the 1st month Group discussion: 2 hours weekly on the 1st month	DSME: Multidisciplinary team Group discussion: DM specialist nurse	WHOQOL-BREF Baseline 3 months 6 months	Effect of time × group: ↑↓ Between-group and time: ↔ Non-significant trend towards greater improvements in QoL
Baraz et al.[11]	Iran	30	Self-care educational programme	12 weeks	Not stated	Educational technology	Self-care educational programme: Advice on diet, medicine, skills, glycaemic control, PA and nutrition	55 minutes for 2 sessions	Endocrinology specialists	Iranian Short-Form Health Survey Baseline 3 months	General health: ↑↓ Physical function: ↑↓ Physical role: ↑↓ Emotional role: ↔ Social performance: ↑↓ Physical pain: ↑↓ Vital strength and energy: ↔ General health perception: ↔ Overall QoL: ↔

Table 1. Continued

Author	Country	Patient	Method	Intervention						Outcome measure of QoL	Significance of the outcome measure of QoL
				Period	Mode	Delivery	Content	Contact hour	Provider		
Boels et al.[20]	Netherlands	Patients with T2DM on insulin therapy IG: 115 CG: 115	Usual care IG: Plus DSME/S CG: Plus a smartphone application after completing follow-up	24 weeks	Individual	Text messages via a smartphone application	DSME/S: Hypoglycaemia, dietary habits, PA and glucose control	One text message per day 2 to 6 times per week	Text messages critically reviewed by a dietician, physiotherapist, practice nurse and two patients with T2DM on insulin therapy	DDQoL EQ-5D-5L SF-36 Baseline 6 months 9 months	DDQoL: ↔ EQ-5D-5L: ↔ SF-36: ↔ Minimal improvements in QoL
Chen et al.[25]	China	IG: 213 CG: 210	**IG:** Education-based intervention - Lectures - Periodical follow-up interviews - Annual physical examination - Special medical services **CG:** Routine services	1 year	Not stated	F2F	Lecture: Prevention and self-management strategies, nutrition, PA, health-seeking behaviour and psychological counselling	2 hours every 2 months	Physicians, nurses, public health physicians and DM specialists from county-level hospitals, township health centres and village clinics	EQ-5D-3L index: EQ-5D-3L dimension EQ VAS Baseline 1 year	EQ-5D-3L index: ↑↓ EQ-5D-3L dimension: Mobility: ↑↓ Self-care: ↔ Usual activities: ↑↓ Pain/discomfort: ↔ Anxiety/depression: ↑↓ EQ VAS: ↔
Christoffersen et al	Denmark	IG: 234 CG: 76	**IG:** Tailored education using NEED based on participant needs **CG:** Group-based educational programmes other than NEED, including methods to facilitate interaction, person-centredness and social learning	1 year	Group	F2F	Focus on psychosocial issues and behavioural changes	2 to 4 sessions	Specially trained healthcare professionals	EQ-5D-5L Baseline 3 months 1 year	EQ-5D-5L: ↔
Estuningsih et al.[27]	Surabaya	Grouped according to nutritional education Hospitalised patients IG: 10 CG: 10	Standard medical care and nutritional consultation **IG:** Plus intensive monitoring using a self-regulated learning-based nutritional education **CG:** Plus regular education	4 weeks	Not stated	F2F during inpatient care and continued at home post-discharge	1st week: Information on DM (definition, diagnosis and treatment) and diet 2nd week: Obstacles encountered during the diet programme and formulation of the diet programme 3rd week: Implementation of the plan and assessment of its effectiveness 4th week: Assessment of the plan's effectiveness	Weekly	Educator	Subjective: WHOQO L-BREF Objective: Blood glucose level, cholesterol level, BP and BMI Baseline 1 month	Subjective QoL: ↑↓ Objective QoL: ↑↓ QoL: ↑↓
Forjuoh et al.[28]	United States	IG: 101 CG: 95	**IG:** Chronic Disease Self-Management Program in clinical environments and community-based settings **CG:** Usual clinical DM care with Texas Diabetes Council patient education materials	6 weeks	Classroom-based	F2F	Enhanced decision-making, action planning and effective communication	6 sessions	Master trainers/ lay leaders	HRQOL Baseline 6 months 12 months	HRQOL: ↔
Jahromi et al.[29]	Iran	Elderly women IG: 45 CG: 45	**IG:** DSME - Division into three sub-groups (n=15 each group) and enrolment to eight group interaction sessions for each sub-group CG: Not stated	8 weeks	Group	F2F	Nutrition, stress management, PA, sleep and rest, safety, glycaemic control and self-care	Weekly	Coordinator	WHOQO L-BREF SF-26 Baseline 2 months 3 months	WHOQO L-BREF SF-26: ↑↓

Table 1. Continued

Author	Country	Patient	Method	Intervention						Outcome measure of QoL	Significance of the outcome measure of QoL
				Period	Mode	Delivery	Content	Contact hour	Provider		
Jaipakdee et al.[30]	Thailand	IG: 203 CG: 200	**IG:** DSMS with a CAI **CG:** Usual health care - Physical examination - Monitoring of blood glucose levels - Individual health education - Consultation from a registered nurse and/or other healthcare providers	6 months	Group	F2F	DSMS: (I) Educational section about the disease process through a CAI (video) - Knowledge of and food for DM - PA - Foot care - Medication - Complications and stress management - Self-monitoring of clinical indicators - Goals of DM control (II) Condition management and lifestyle changes - Construction of a problem and its definition - Collaborative goal setting and problem-solving - Contracting for change - Continuing support	3 hours monthly	Trained nurses and healthcare staff	Diabetes Quality of Life Brief Clinical Inventory Baseline 3 months 6 months	Diabetes Quality of Life Brief Clinical Inventory: ↑↓
Mahmoud et al.[31]	Saudi Arabia	Patients with T2DM on oral hypoglycaemic and/or insulin therapy 99	Psychoeducational programme based on a variety of interactive educational methods, including counselling, demonstration, group discussion and vignette	4 weeks	Group	F2F	DM overview and its complications, self-care, medications and their side effects, lifestyle modification, clarification of myths and misconceptions and coping skills for living with DM	3 hours weekly	Psychoeducator and nurse	RAND-36 Baseline 5 months	Physical functioning: ↔ Role limitations d/t physical health: ↔ Role limitations d/t emotional problems: ↑↓ Energy/ fatigue: ↑↓ Emotional well-being: ↑↓ Social functioning: ↔ Pain: ↔ General health: ↑↓
Mostafa et al.[32]	Egypt	IG: 30 CG: 30	**IG:** - Three sessions of an educational programme including discussion and feedback using lectures (knowledge) and videos (practical) - A copy of the educational programme for use at home **CG:** Routine oral instructions	8 weeks	Group	F2F	1st session: Definition, causes and types of DM 2nd session: Signs and symptoms and treatment of DM 3rd session: Complications and nursing management of DM	Each session: 1 hour thrice weekly	Nurse	WHOQO L-WHO Baseline 2 months	WHOQO L-WHO: ↑↓
Pon et al.[21]	Netherlands	IG: 95 CG: 98	Access to an online care platform (e-Vita) to support self-management skills Usual care involving 2 to 4 visits per year with a practice nurse and at least 1 annual check-up with a general practitioner **IG:** Plus group-based PRISMA **CG:** Plus PRISMA after 6 months	Baseline	Group	F2F	1st session: Individual stories, T2DM, effects of insulin and medication for blood glucose, blood glucose level monitoring and nutrition 2nd session: Complications and personal risk factors, including nutrition, PA and individual DM action plan	3.5 hours for 2 sessions	Practice nurse and a dietician specialising in DM care	EQ-5D-3L: EQ-5D EQ VAS Baseline 6 months 12 months	EQ-5D-3L: ↔ (except EQ VAS on the 6th month)

Table 1. Continued

Author	Country	Patient	Method	Intervention						Outcome measure of QoL	Significance of the outcome measure of QoL
				Period	Mode	Delivery	Content	Contact hour	Provider		
Sherifali et al.[22]	Canada	IG: 188 CG: 177	Usual DM education (individual or group) provided by nurses and/or dietitians every 3 to 6 months, along with community resources and an accelerometer **IG:** Plus DM health coaching	1 year	Individual	Phone call	Case management and monitoring, DSME/S, behavioural modification, goal setting and reinforcement and general psychosocial support	Weekly phone calls in the 1st 6 months and monthly phone calls in the last 6 months	Registered nurse/ certified DM educator	ADDQoL Baseline 6 months 12 months	ADDQoL: ↑↓
Trento et al.[23]	Italy	IG: 25 CG: 25	**IG:** - Assignment into group care divided into 3 groups of 8 to 9 patients each - Group-based educational sessions followed by individual consultations after each session **CG:** Traditional individual consultations	4 years	Group	F2F	Three phases: a) Introduction b) Main content – role-playing with real-life simulations expressing patients' opinions and life experiences with DM c) Summary and scheduling of next appointments	1-hour for 7 sessions held every 3 to 4 months and repeated twice over 4 years	Physician	DQOL/Mod Baseline 4 years	DQOL/Mod total: ↔ DQOL/Mod satisfaction: ↑↓ DQOL/Mod impact: ↔ DQOL/Mod complications: ↔
Wong et al.[24]	Hong Kong	298	PEP The PEP consisted of generic components (group-based meetings) and disease-specific knowledge and skill components (lecture-based learning sessions)	6 months	Group	F2F	Generic SE enhancement and lifestyle modification Components: Self-management and behavioural modification, healthy diet, PA, problem-solving, self-monitoring, stress management, psychosocial support and networking and communication	2 hours for 4 to 5 sessions	Well-trained healthcare professionals, mainly social workers and dietitians	SF-12 and SF-6D Baseline 1 year	**SF-12:** Physical functioning: ↔ Physical role: ↔ Bodily pain: ↑↓ General health: ↔ Vitality: ↔ Social functioning: ↔ Emotional role: ↑↓ Mental health: ↔ Physical composite summary: ↔ Mental composite summary: ↔ **SF-6D:** ↑↓
							Disease-specific knowledge and skills Components: Self-care management, medications for DM control and contingency management for hypo- and hyperglycaemia	2.5 hours for 2 sessions	Experienced nurses		

Arrows indicate significant (↑↓) or non-significant (↔) differences between the interventions and controls unless otherwise stated.

ADDQoL: Audit of Diabetes-Dependent Quality of Life 19; BMI: body mass index; BP: blood pressure; CAI: computer-assisted instruction; CG: control group; DDQoL: Diabetes-Dependent Quality of Life; DM: diabetes mellitus; DQOL/Mod: Diabetes Quality of Life/Mod; DSME/S: Diabetes Self-Management Education and Support; DSMS: Diabetes Self-Management Support; DTTP: Diabetes Treatment and Teaching Programme; EQ-5D-3L: EuroQoL Five-Dimensional Scale; F2F: face-to-face; HRQOL: Health related quality of life; IG: intervention group; NEED: Next Education; PA: physical activity; PEP: Patient Empowerment Programme; PRISMA: Proactive Interdisciplinary Self-Management; RAND-36: RAND 36-Item Health Survey 1.0; SE: self-efficacy; SF-12: Short-Form 12 Health Survey Version 2; SF-36: Short-Form 36 Health Survey; SF-6D: Short-Form Six-Dimensional Scale; WHOQOL-BREF/ WHOQOL-WHO: World Health Organization Quality of Life Scale

Discussion

Patient education plays a vital role in effectively controlling the various distressing clinical conditions related to T2DM.[11] This scoping review included 15 studies that described the methods and characteristics of patient education for improving the QoL of patients with T2DM, although QoL was not the primary outcome of the study. The educational method, mode, delivery, content and provider as well as the follow-up interval and participant characteristics differed among the reviewed studies. Therefore, we could not provide a formal recommendation on the optimal educational method.

Cunningham et al.[33] reported significant QoL improvements with the implementation of Diabetes Self-Management Education (DSME). However, we found that one study conveyed a non-significant trend towards

greater improvements in QoL using DSME.[19] Comparatively, two studies that used DSME/S and Diabetes Self-Management Education Support (DSMS) demonstrated non-significant and significant improvements in QoL, respectively.[20,30] It is difficult to quantify the effects of DSME or DSME/S on QoL owing to the vast array of the mode, delivery, content and provider of interventions. Nevertheless, a particular method may yield significant improvements in QoL.

The greater improvements in QoL in the study by Azami et al.[19] were suggested to be attributed to the distribution of booklets, usage of movie clips, group-based educational sessions and supervision via weekly phone calls in the intervention group. In comparison, Boels et al.[20] showed only a slight improvement in QoL, as they used DSME only. Meanwhile, Jaipakdee et al.[30] indicated significant improvements in QoL owing to the combination of an educational DM section through the usage of a video and learning approach for disease management and lifestyle change. Hence, DSME and DSMS with supplementary educational resources, including booklets, videos or notes, are effective in improving QoL.

For the other methods of self-management education, non-significant improvements in QoL were reported after CDSMP owing to the implementation of education on decision-making, action planning and effective communication instead of self-management for DM care.[28] Similarly, the Proactive Interdisciplinary Self-Management (PRISMA) programme encompassed holistic education on blood glucose level monitoring, medication, nutrition and physical activity, which yielded non-significant improvements in QoL.[21] This result is probably attributed to the implementation of the educational programme during the study baseline only. Additionally, the lack of interest and persuasion to enrol in the PRISMA programme might have contributed to the insufficient improvements in QoL.[21]

Baraz et al.[11] found that the self-care educational programme using Orem's Self-Care Model positively impacted the overall average QoL of patients, although the increase was not significant in the psychological domain. Thus, they hypothesised that the absence of education on psychological problems leads to non-significant improvements in QoL.[11] The psychoeducational programme in the study by Mahmoud et al.[31] showed significant improvements in the emotional domain but non-significant improvements in the physical domain owing to the absence of education on physical health. The PEP in the study by Wong et al.[24] also yielded non-significant improvements in QoL in the aspect of physical health owing to the absence of education on this domain. Meanwhile, emotional health-related QoL significantly improved, since self-efficacy and psychosocial support were covered in the educational programme.[24] Therefore, future studies must emphasise the application of education on psychological distress after the diagnosis of DM in combination with education on physical health.

To fulfil patients' needs, Christoffersen et al.[26] tailored their educational programme based on NEED. This intervention consisted of physical, practical, social and psychosocial aspects of living with DM to achieve a balanced life. This group-based patient-centred educational programme yielded non-significant improvements in QoL.[26] The health educational lectures in the study by Chen et al.[25] also improved QoL. However, the variety of baseline data and participant composition contributed to both significant and non-significant improvements in QoL.[25]

Intensive monitoring using a self-regulated learning approach and an interactive group session, including discussion and feedback, significantly and effectively improved QoL.[27,29,32] Although the individual- and group-based educational programmes equally enhanced QoL, the group-based educational programme was more cost-effective, yielded better treatment satisfaction and provided greater support for lifestyle changes.[34]

Face-to-face training was more effective in delivering patient education than educational technology and text messages. Although Sherifali et al.[22] applied phone coaching, they conducted weekly and monthly phone calls, which may have aided as a supplementary foundation of motivation and adherence. Moreover, a weekly contact hour was more effective in improving QoL,[22,27,29,31,32] further strengthening the application of continuous monitoring and supervision during interventions.

Herein, no significant adverse events were observed during the interventions, suggesting that the procedures were well tolerated. However, a few studies reported that the

levels of education and income contributed to the dropouts.[19,32] Therefore, well-matched pairing of sociodemographic data, particularly education, motivation, finance and residence (rural/urban), between intervention and control groups is warranted in future studies to reduce the dropout rate during the study period.

This review has two limitations. First, the outcome measures of QoL in the included studies were heterogeneous, which may limit the standardisation of QoL measurement post-intervention. Second, we did not formally evaluate the methodological quality and risk of bias of the included studies, as the general purpose of a scoping review is to provide a more comprehensive overview of available evidence.

Conclusion

There is a broad array of methods of education for improving the QoL of patients with T2DM. Self-management education with supplementary methods, including the use of booklets, videos or notes and supervision and monitoring, can effectively improve QoL. Future studies must emphasise the application of holistic education covering psychological distress after the diagnosis of DM, diet plan and physical health. Group-based education and face-to-face training can also significantly improve QoL.

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Author contributions

Conceptualization: Mustapa A. Methodology: Mustapa A, Manaf H. Formal analysis: Mustapa A, Manaf H. Project administration: Mustapa A, Justine M, Manaf H. Visualization: Mustapa A. Writing - original draft: Mustapa A. Writing - review and editing: Mustapa A, Justine M, Manaf H. Approval of final manuscript: all authors.

Review protocol registration

The review protocol has been registered within the Open Science Framework (https://osf.io/3gk6v).

Conflicts of interest

The authors declare no conflicts of interest.

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How does this paper make a difference in general practice?

- This review summarises the methods and characteristics of patient education for improving the quality of life (QoL) of patients with type 2 diabetes mellitus. Although the optimal method of patient education cannot be drawn owing to the broad array of modes, deliveries, contents, and providers of self-management interventions, each of them can improve QoL.
- Self-management education with supplementary methods, including the use of booklets, videos or notes and supervision and monitoring; holistic education covering physical, psychological, and nutritional aspects; and group-based education and face-to-face training can effectively improve QoL.

References

1. International Diabetes Federation. IDF Diabetes Atlas 9th ed. In: *International Diabetes Federation*, 2019.
2. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract*. 2019;157:107843. doi:10.1016/j.diabres.2019.107843
3. Williams R, Karuranga S, Malanda B, et al. Global and regional estimates and projections of diabetes-related health expenditure: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract*. 2020;162:108072. doi:10.1016/j.diabres.2020.108072

4. Rowley WR, Bezold C, Arikan Y, Byrne E, Krohe S. Diabetes 2030: Insights from Yesterday, Today, and Future Trends. *Popul Health Manag*. 2017;20(1):6-12. doi:10.1089/pop.2015.0181

5. Spasic A, Radovanovic RV, Dordevic AC, Stefanovic N, Cvetkovic T. Quality of life in type 2 diabetic patients. *Acta Fac*. Med. 2014;31(3):193-200. doi:10.2478/afmnai-2014-0024

6. Lotfy M, Adeghate J, Kalasz H, Singh J, Adeghate E. Chronic Complications of Diabetes Mellitus: A Mini Review. *Curr Diabetes Rev*. 2017;13(1):3-10. doi:10.2174/1573399812666151016101622

7. American Diabetes Association Professional Practice Committee. 3. Prevention or Delay of Type 2 Diabetes and Associated Comorbidities: Standards of Medical Care in Diabetes—2022. Diabetes Care. 2021;45(Supplement_1):S39-S45. doi:10.2337/dc22-S003

8. Chaudhary N, Tyagi N. Diabetes mellitus: An Overview. Int. j. res. dev. pharm. *life sci*. 2018;7(4):3030-3033. doi:10.21276/ijrdpl.2278-0238.2018.7(4).3030-3033

9. Madkoor M, Shammakhi I, Halawi H. A review on new guidelines updates in diabetes management 2020. *IJMDC*. 2020;4(December 2019):840-843. doi:10.24911/ijmdc.51-1577723575

10. Swiatoniowska N, Sarzynska K, Szymanska-Chabowska A, Jankowska-Polanska B. The role of education in type 2 diabetes treatment. *Diabetes Res Clin Pract*. 2019;151:237-246. doi:10.1016/j.diabres.2019.04.004

11. Baraz S, Zarea K, Shahbazian HB. Impact of the self-care education program on quality of life in patients with type II diabetes. *Diabetes Metab Syndr*. 2017;11 Suppl 2:S1065-S1068. doi:10.1016/j.dsx.2017.07.043

12. Powers MA, Bardsley J, Cypress M, et al. Diabetes Self-management Education and Support in Type 2 Diabetes: A Joint Position Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *Diabetes Care*. 2015;38(7):1372-1382. doi:10.2337/dc15-0730

13. Adam L, O'Connor C, Garcia AC. Evaluating the Impact of Diabetes Self-Management Education Methods on Knowledge, Attitudes and Behaviours of Adult Patients With Type 2 Diabetes Mellitus. *Can J Diabetes*. 2018;42(5):470-477.e2. doi:10.1016/j.jcjd.2017.11.003

14. Debono M, Cachia E. The impact of diabetes on psychological well being and quality of life. The role of patient education. *Psychol Health Med*. 2007;12(5):545-555. doi:10.1080/13548500701235740

15. Mohamed Nor N, Mohd Shukri NA, Mohd Yassin NQ, Sidek S, Azahri N. Barriers and enablers to make lifestyle changes among type 2 diabetes patients: *A review. Sains Malaysiana*. 2019;48(7):1491-1502. doi: doi.org/10.17576/jsm-2019-4807-18.

16. Vaccaro JA, Gaillard T, Caceres S, Hollifield M, Huffman FG. Nursing & Primary Care Barriers to Participating in Diabetes Care Behaviors in Hard to Reach Older Hispanics. Nur Prim. Care. 2020;4(5):1-8.

17. Arksey H, O'Malley L. Scoping studies: Towards a methodological framework. *Int. J. Soc. Res*. 2005;8(1):19-32. doi:10.1080/1364557032000119616

18. Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med*. 2018;169(7):467-473. doi:10.7326/M18-0850

19. Azami G, Soh KL, Sazlina SG, et al. Effect of a Nurse-Led Diabetes Self-Management Education Program on Glycosylated Hemoglobin among Adults with Type 2 Diabetes. *J Diabetes Res*. 2018;2018:4930157. Published 2018 Jul 8. doi:10.1155/2018/4930157

20. Boels AM, Vos RC, Dijkhorst-Oei LT, Rutten GEHM. Effectiveness of diabetes self-management education and support via a smartphone application in insulin-treated patients with type 2 diabetes: results of a randomized controlled trial (TRIGGER study). *BMJ Open Diabetes Res Care*. 2019;7(1):e000981. Published 2019 Dec 30. doi:10.1136/bmjdrc-2019-000981

21. du Pon E, Kleefstra N, Cleveringa F, van Dooren A, Heerdink ER, van Dulmen S. Effects of the Proactive interdisciplinary self-management (PRISMA) program on self-reported and clinical outcomes in type 2 diabetes: a pragmatic randomized controlled trial. *BMC Endocr Disord*. 2019;19(1):139. Published 2019 Dec 11. doi:10.1186/s12902-019-0466-0

22. Sherifali D, Brozic A, Agema P, et al. Effect of Diabetes Health Coaching on Glycemic Control and Quality of Life in Adults Living With Type 2 Diabetes: A Community-Based, Randomized, Controlled Trial. *Can J Diabetes*. 2021;45(7):594-600. doi:10.1016/j.jcjd.2020.11.012

23. Trento M, Fornengo P, Amione C, et al. Self-management education may improve blood pressure in people with type 2 diabetes. A randomized controlled clinical trial. *Nutr Metab Cardiovasc Dis*. 2020;30(11):1973-1979. doi:10.1016/j.numecd.2020.06.023

24. Wong CK, Wong WC, Wan EY, Wong WH, Chan FW, Lam CL. Increased number of structured diabetes education attendance was not associated with the improvement in patient-reported health-related quality of life: results from Patient Empowerment Programme (PEP). *Health Qual Life Outcomes*. 2015;13:126. Published 2015 Aug 12. doi:10.1186/s12955-015-0324-3

25. Chen S, Burström B, Sparring V, Qian D, Burström K. Differential Impact of an Education-Based Intervention for Patients with Type 2 Diabetes Mellitus in Rural China. *Int J Environ Res Public Health*. 2019;16(15):2676. Published 2019 Jul 26. doi:10.3390/ijerph16152676

26. Christoffersen LA, Hansen AK, Pals RA, Willaing I, Siersma V, Olesen K. Effect of a participatory patient education programme (NExt EDucation) in group-based patient education among Danes with type 2 diabetes. *Chronic Illn*. 2020;16(3):226-236. doi:10.1177/1742395318799843

27. Estuningsih Y, Rochmah TN, Andriani M, Mahmudiono T. Effect of Self-Regulated Learning for Improving Dietary Management and Quality of Life in Patients with Type-2 Diabetes Mellitus at Dr . Ramelan Naval Hospital, Surabaya, Indonesia. *Public Health*. 2019;14(2):51-57. doi:10.21109/kesmas.v14i2.2257

28. Forjuoh SN, Ory MG, Jiang L, Vuong AM, Bolin JN. Impact of chronic disease self-management programs on type 2 diabetes management in primary care. *World J Diabetes*. 2014;5(3):407-414. doi:10.4239/wjd.v5.i3.407

29. Kargar Jahromi M, Ramezanli S, Taheri L. Effectiveness of diabetes self-management education on quality of life in diabetic elderly females. *Glob J Health Sci*. 2014;7(1):10-15. Published 2014 Jul 29. doi:10.5539/gjhs.v7n1p10

30. Jaipakdee J, Jiamjarasrangsi W, Lohsoonthorn V, Lertmaharit S. Effectiveness of a self-management support program for Thais with type 2 diabetes: Evaluation according to the RE-AIM framework. *Nurs Health Sci*. 2015;17(3):362-369. doi:10.1111/nhs.12198

31. Mahmoud SS, Mahdy MHE, Mahfouz MS, et al. Effects of a Psychoeducational Program on Hemoglobin A1c Level and Health-Related Quality of Life in Patients with Type 2 Diabetes Mellitus, Jazan, Saudi Arabia. *Biomed Res Int*. 2018;2018:6915467. Published 2018 May 14. doi:10.1155/2018/6915467

32. Mostafa NM, Ahmed GH, Anwar W. Effect of educational nursing program on quality of life for patients with type II diabetes mellitus at Assiut University Hospital. *Nurse Educ*. Pract. 2018;8(11):61-67. doi:10.5430/jnep.v8n11p61

33. Cunningham AT, Crittendon DR, White N, Mills GD, Diaz V, LaNoue MD. The effect of diabetes self-management education on HbA1c and quality of life in African-Americans: a systematic review and meta-analysis. *BMC Health Serv Res*. 2018;18(1):367. Published 2018 May 16. doi:10.1186/s12913-018-3186-7

34. Tang TS, Funnell MM, Anderson RM. Group education strategies for diabetes self-management. *Diabetes Spectr*. 2006;19(2):99-105. doi:10.2337/diaspect.19.2.99

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ORIGINAL ARTICLE

Assessing knowledge, acts of discrimination, stigmatizing attitudes and its associated factors towards people living with HIV (PLHIV) among Family Medicine trainees in Malaysia

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Abstract

Introduction: Human immunodeficiency virus (HIV)-related stigmatisation and discrimination adversely affect health outcomes in terms of timely diagnosis, treatment and care. Despite global efforts, they remain common among healthcare workers worldwide. In Malaysia, family medicine specialists are entrusted with the care of HIV patients at the primary care level. This study aimed to assess HIV-related knowledge, acts of discrimination, stigmatising attitudes and their associated factors among family medicine trainees in Malaysia.

Methodology: This cross-sectional study was conducted among 397 family medicine trainees in Malaysia using a validated, self-administered questionnaire that assessed the participants' sociodemographic information, HIV/AIDS knowledge, stigmatising attitudes (attitudes of blame, attitudes towards imposed measures, comfort in dealing with HIV patients) and acts of discrimination.

Results: The most common stigmatisation was "attitudes of blame" (mean [SD] score: 3.0 (0.74); range score:1–5), and the most frequent discriminatory act was breaching patient confidentiality (54.9%). Around 82.1% had good knowledge of HIV/AIDS. Married participants and participants who had 7 years or less in service were more stigmatising in "attitudes of imposed measures" towards people living with HIV (p=0.006).

Conclusion: Family medicine trainees exhibited stigmatisation and discrimination towards HIV patients despite having good HIV knowledge. Hence, appropriate and concerted health education should be given to all family medicine trainees to eliminate stigmatisation and discrimination.

Introduction

HIV/AIDS is a major health burden worldwide. Globally, an estimated 38 million people are living with this virus, of whom 5.8 million are living in the Asia Pacific region.[1] Malaysia has 87,041 people living with HIV (PLHIV).[2] Malaysia has one of the lowest HIV prevalences in the Asia Pacific region, at 0.4% in a population of 32.385 million.

Despite being a global pandemic for over 30 years, HIV/AIDS-related stigmatisation still exists among health care workers (HCWs) in many regions worldwide.[3-5] Stigmatisation is defined as negative attitudes and beliefs about PLHIV, and discrimination is behaviour that results from these beliefs.[5] Surveys conducted by The People Living with HIV (PLHIV) Stigma Index among PLHIV in 19 countries between 2011 and 2016 revealed that denial of healthcare service, provision of substandard care, coerced procedures (including HIV testing), imposed conditions in exchange for treatment, and breach of confidentiality remained common judgmental acts committed towards HIV patients.[4] A survey conducted in Malaysia in 2012 showed the presence of similar HIV-related stigmatisation and discrimination among HCWs.[6] Common judgmental acts among HCWs in Belize included attitudes of blame and breaching of confidentiality.[7] A study in Thailand found HCWs agreeing with coerced sterilisation among HIV-positive women, unwillingness

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to provide care and giving substandard care to PLHIV.[8]

HIV-related stigma and discrimination are known to adversely affect health behaviour in PLHIV and exist as challenging barriers to timely HIV testing, treatment and care. A meta-analysis of 64 studies in 2016 found significant associations between HIV-related stigma and higher rates of depression, lower social support, lower medical adherence, and less usage of health and social services.[9] A few systematic reviews have confirmed that HIV-related stigma was associated with late presentation for HIV care and compromised medical adherence.[10,11] Late testing, delayed initiation of treatment and medication non-adherence inevitably impede viral load suppression among HIV patients, leading to poor health outcomes and hampering efforts in reducing HIV transmission.

Given that stigmatisation and discrimination stand as barriers to HIV testing and treatment, studying their associated factors is fundamental. These judgemental attitudes were often due to factors such as the association of HIV infection with perceived moral and religious misconduct (sexual promiscuity, homosexuality, drug use, etc.), poor HIV knowledge, fear of transmission and lack of experience in treating HIV patients.[12,13,14,15] Andrewin et al. (2008) reported that having formal HIV/AIDS training and being aware of HIV policy were significantly associated with less stigmatisation in Belize.[7] HCWs in Asia, including Malaysia, and Africa have been reported to have good knowledge of HIV, but they may need improved knowledge on its modes of transmission.[16,17,18,19]

A local study by Chew et al. (2013) revealed that HIV-related stigmatisation among medical students was associated with less clinical exposure to HIV patients and poor HIV knowledge.[20] Tee et al. (2019) revealed the presence of discriminatory intent among physicians in Malaysia, which was associated with more negative feelings towards PLHIV.[21] In Malaysia, family physicians are entrusted with the provision of care for PLHIV at the primary care level. Interestingly, to date, no study has assessed the knowledge, stigmatisation and discriminatory acts towards HIV/AIDS patients among family physicians in Malaysia.

Hence, this study aimed to determine the knowledge and awareness of HIV, acts of discrimination, stigmatising attitudes towards PLHIV and their associated factors (including sociodemographic factors, clinical experience, training in HIV/AIDS and primary care, and religiosity) among family medicine trainees in Malaysia. Information obtained from this study could provide a baseline understanding of HIV-related stigmatisation and discrimination among family medicine trainees. Such invaluable information could help in designing concerted health education targeting to reduce stigmatisation and discrimination, thereby improving HIV preventive care, timely diagnosis and treatment.

Methods

Study design

This was a cross-sectional study conducted among Advanced Training of Family Medicine (ATFM) trainees and Graduate Certificate in Family Medicine (GCFM) trainees who attended the GCFM and ATFM workshops in March 2019 and May 2019, respectively. Both programmes are part of the parallel pathway to the family medicine specialisation in Malaysia. GCFM is the initial 2-year training of the parallel pathway, followed by the further 2-year ATFM training. Completion of ATFM is a prerequisite for family medicine trainees to sit for the conjoint Membership of the Academy of Family Physicians of Malaysia (MAFP) and Fellowship of Royal Australian College of General Practitioners (FRACGP) examinations. The award of the conjoint examination is equivalent to the family medicine specialist qualification in Malaysia.

Sample size

This study used universal sampling. A total of 454 family medicine trainees who attended the GCFM and ATFM workshops on 23rd March 2019 and 25th May 2019, respectively, were invited to participate.

Study instrument

This study used a self-administered questionnaire that consisted of four sections (I–IV). Section I assessed the participant's sociodemographic details such as age, gender, religiosity, marital status, years of working in the medical profession, ATFM/GCFM trainee intake, whether the participant provided care to HIV/AIDS patients,

whether the participant had any formal HIV/AIDS training, the number of HIV/AIDS cases encountered in the past 6 months and awareness of HIV test policy.

Section II assessed the participants' knowledge of HIV/AIDS through six items with 'true', 'false' or 'don't know' answers. A score of 1 was given for a correct answer and 0 for incorrect or 'don't know' answers. The total score ranged between 0 and 6. A score of 4 or above was considered good knowledge, whereas a score of 3 or below was considered poor knowledge.

Section III evaluated stigmatising attitudes towards HIV/AIDS patients, comprising three domains: (1) attitudes towards imposed measures (four items); (2) attitudes of blame/judgement (three items); and (3) Comfortableness in dealing with HIV/AIDS patients (two items). These items had 5-point Likert scale responses, ranging from strongly disagree (score of 1) to strongly agree (score of 5). Reverse coding was applied to both items under "comfortableness in dealing with HIV/AIDS patients". A score of 1 was regarded as least stigmatising while 5 was considered most stigmatising. These items were summed and averaged to obtain the stigmatising scores for each subscale.

Section IV evaluated the acts of discrimination through five questions. The responses were recorded according to a 5-point Likert-type scale, which ranged from 1 (never) to 5 (all of the time). A score of 1 was regarded as least discriminatory and 5 as most discriminatory. Reverse coding was applied to items 1 and 5. A higher total score indicated a higher frequency of discriminatory acts.

This questionnaire was validated for use among doctors and nurses in Belize by Andrewin and Chien.[7] Reliability testing was done to determine the consistency. For section III, Cronbach's α for the three domains:(1) Attitudes toward imposed measures, (2) Attitudes of blame / judgment and (3) Comfortableness in dealing with HIV/AIDS patients were 0.71, 0.60 and 0.83, respectively. However, the answer for one of the questions under section II was modified from "true" to "false" based on expert panel input and literature review. The question was: "After needle stick injury with a needle from an HIV-infected patient, immediately gently expressing blood from the puncture site reduces the risk of contracting HIV infection." Permission to use this questionnaire was obtained.

Ethical approval

Approval to conduct the study was obtained from the Medical Research and Ethics Committee (MREC) of the Ministry of Health Malaysia (NMRR-18-3351-44916). The participants were required to sign an informed consent before participating in the study. Their anonymity was maintained throughout the research process.

Data analysis

Data were analysed using IBM SPSS version 25. In the descriptive analysis, the data were presented as mean and standard deviation (SD). Categorical variables were described as frequency (n) and percentage (%). The associations between independent variables and stigmatising attitudes towards PLHIV were examined using simple logistic regression. The independent variables with a p-value of <0.25 from the bivariate analysis were selected for multiple logistic regression analysis to determine their independent association with the dependent variables. The significance level was set at $p<0.05$.

Results

Out of 454 attendees of the ATFM and GCFM workshops, 417 family medicine trainees consented and participated in this study. The response rate for this study was 91.9%. However, 20 participants were excluded from the analysis because of incomplete questionnaires. Therefore, only data obtained from 397 participants were analysed.

Table 1. Sociodemographic characteristics of the participants (n=397)

Variables	n (%)	Mean (SD)
Age (years), mean (SD)		33.4 (4.0)
Gender		
Male	100 (25.2)	
Female	297 (74.8)	
Nationality		
Malaysian	395 (99.5)	
Other	2 (0.5)	
Marital status		
Single	121 (30.5)	
Married	276 (69.5)	
Clinical experience		
Number of years in service, mean (SD)		7.4 (3.17)
Need to manage HIV patients		
Yes	231 (58.2)	
No	166 (41.8)	
Number of HIV cases encountered in the past 6 months		
≤10	384 (96.7)	
>10	13 (3.3)	
Awareness of HIV testing policy		
Yes	299 (75.3)	
No/don't know	98 (24.7)	
Training		
Formal HIV/AIDS training		
Yes	106 (26.7)	
No	291 (73.3)	
Family medicine/primary care training		
ATFM programme	70 (17.6)	
GCFM programme [a]	327 (82.4)	
Religiosity		
Somewhat/very	369 (92.9)	
No	28 (7.1)	

*All continuous data were normally distributed.

[a] ATFM = Advanced Training in Family Medicine programme.

GCFM = Graduate Certificate in Family Medicine programme.

Participant characteristics

Table 1 shows the sociodemographic information, clinical experience, training and religiosity of the participants.

Sociodemographic data

The mean (SD) age of the participants was 33.4 (4.0) years. More than two thirds of the respondents were female (74.8%) and married (69.5%).

Clinical experience

More than half (58.2%) of participants were directly involved in managing HIV/AIDS patients. Most (96%) had encountered 10 or fewer HIV cases in the past 6 months, and around 75.3% were aware of the HIV testing policy in Malaysia.

Training in HIV/AIDS and primary care

Approximately one quarter of the participants had received formal training in managing HIV/AIDS patients. Most were GCFM programme trainees.

Religiosity

The majority of participants indicated being religious, and only 7.1% denied being religious.

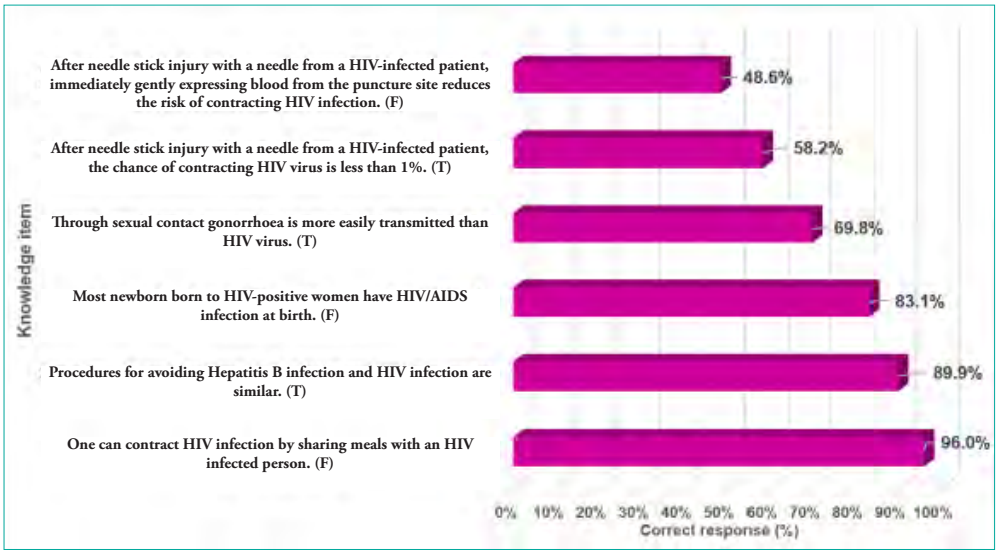

Figure 1. Family physician trainees' knowledge of HIV

Knowledge of HIV /AIDS

Figure 1 shows that the mean score (SD) for knowledge of HIV/AIDS was 4.46 (1.08), which was above the midpoint of 3.0 from the total score range (0–6). Around 82.1% of the participants had good knowledge of HIV/AIDS. The majority answered the following three items correctly: "Most newborns born to HIV-positive women have HIV/AIDS infection at birth", "Procedures for avoiding Hepatitis B and HIV infection are similar" and "One can contract HIV infection by sharing meals with an HIV-infected person".

Table 2. Stigmatising attitudes and acts of discrimination towards HIV/ AIDS patients among family physician trainees

Stigmatising attitudes subscales and items	No. of respondents (%)					
	Strongly disagree[a]	Disagree	No opinion	Agree	Strongly agree	Mean (SD)
Attitudes of blame/judgement						**3.00 (0.74)**
I feel more sympathetic towards people who get AIDS from blood transfusions than those who get it from intravenous drug abuse.	16 (4.0)	57 (14.4)	66 (16.6)	161 (40.6)	97 (24.4)	3.67 (1.11)
I feel that if a child contracts the HIV/AIDS virus from their mother through mother-to-child or vertical transmission, the mother is to be blamed for the child's disease.	54 (13.6)	187 (47.1)	88 (22.2)	49 (12.3)	19 (4.8)	2.48 (1.03)
I have little sympathy for people who get AIDS from sexual promiscuity.	33 (8.3)	131 (33.0)	115 (29.0)	97 (24.4)	21 (5.3)	2.85 (1.05)
Attitudes toward imposed measures						**2.57 (0.74)**
All patients admitted to the hospital should be HIV-tested.	50 (12.6)	211 (53.1)	34 (8.6)	80 (20.2)	22 (5.5)	2.53 (1.11)
Relatives/sexual partners of patients with HIV/ AIDS should be notified of the patient's status even without his/her consent.	78 (19.7)	149 (37.5)	24 (6.0)	91 (22.9)	55 (13.9)	2.74 (1.37)
Patients with HIV/AIDS should be cared for and treated in their own hospitals and facilities, away from other patients who do not have HIV/AIDS.	92 (23.2)	239 (60.2)	22 (5.5)	39 (9.8)	5 (1.3)	2.06 (0.89)
A health professional with HIV/AIDS should not be working in any area of health care that requires patient contact.	51 (12.8)	134 (33.8)	39 (9.8)	123 (31.0)	50 (12.6)	2.97 (1.29)
Comfortableness dealing with HIV/AIDS patients						**2.10 (0.75)**
I am comfortable providing health services to clients who are HIV-positive.[b]	2 (0.5)	20 (5.0)	29 (7.3)	242 (61.0)	104 (26.2)	1.93 (0.76)
I am comfortable putting a drip in someone who is showing signs of AIDS.[b]	6 (1.5)	49 (12.3)	55 (13.9)	224 (56.4)	63 (15.9)	2.27 (0.93)

Acts of discrimination items	Never[a]	A little of the time	Some of the time	Most of the time	All the time	Mean (SD)
I give the same amount of attention to all my patients regardless of their HIV status.[b]	1 (0.3)	6 (1.5)	34 (8.6)	142 (35.8)	214 (53.9)	1.58 (0.73)
Do you ever disclose a patient's HIV status to a colleague who is not directly involved in the management of that case?	179 (45.1)	102 (25.7)	89 (22.4)	21 (5.3)	6 (1.5)	1.92 (1.01)
Because I suspect a patient to be HIV-positive, I let another health care worker deal with that patient.	348 (87.7)	31 (7.8)	14 (3.5)	3 (0.8)	1 (0.3)	1.18 (0.54)
Do you ever disclose a patient's HIV status to a friend?	324 (81.6)	46 (11.6)	23 (5.8)	3 (0.8)	1 (0.3)	1.26 (0.62)
I get consent from the patient before testing his/her blood for HIV.[b]	6 (1.5)	4 (1.0)	9 (2.3)	66 (16.6)	312 (78.6)	1.30 (0.71)

[a] The score for responses was:
"Strongly disagree" = 1, "Disagree" = 2, "No opinion" = 3, "Agree" = 4, "Strongly agree" = 5
"Never" = 1, "A little of the time" = 2, "Some of the time" = 3, "Most of the time" = 4, "All the time" = 5

[b] Reverse coding was applied to these questions.

SD = standard deviation

Stigmatising attitudes and acts of discrimination

Table 2 shows the subscale "attitudes of blame/judgement" had the highest stigmatising score (mean [SD] score: 3.00 [0.74]), while the least stigmatising subscale was "comfortableness in dealing with HIV/AIDS patients" (mean [SD] score: 2.10 [0.75]). Item 1 under the subscale "attitudes of blame/judgement" had the highest stigmatising score: 65% of the participants felt more sympathetic towards people who had contracted AIDS from blood transfusions than those who had contracted it from intravenous drug use (mean [SD] score: 3.67 [1.11]).

The commonest committed act of discrimination was disclosing an HIV patient's status to a colleague not directly involved in the management of that case (Item 2); 54.9% of participants admitted that they had breached a patient's confidentiality. Only 12.3% of participants let another HCW deal with a patient who was suspected to have HIV (**Table 2**).

Table 3. Simple logistic regression – factors associated with stigmatising attitudes towards HIV/AIDS patients among family medicine trainees (stigmatising=1, non-stigmatising=0)

Variables	Attitudes towards imposed measures			Attitudes of blame/judgement			Comfortableness in dealing with HIV/AIDS patients		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Gender									
Male	1.16	0.61–2.20	0.662	0.83	0.52–1.31	0.414	0.61	0.36–1.04	0.068
Female	1.00			1.00			1.00		
Nationality									
Malaysian	5.58	0.35–90.48	0.226	1.53	0.10–24.67	0.764	671667388	0.00–0.00	0.999
Other	1.00			1.00			1.00		
Religiosity									
Somewhat/very	0.64	0.19–2.20	0.482	0.10	0.45–2.17	0.977	0.86	0.38–1.97	0.724
No	1.00			1.00			1.00		
Marital status									
Single	**0.53**	**0.30–0.93**	**0.027**	0.82	0.53–1.26	0.355	0.73	0.45–1.18	0.200
Married	**1.00**			1.00			1.00		
Batch									
ATFM	0.75	0.38–1.48	0.414	0.79	0.47–1.33	0.372	1.33	0.77–2.31	0.305
GCFM	1.00			1.00			1.00		
Need to manage HIV patients									
Yes	0.82	0.47–1.43	0.480	0.93	0.62–1.40	0.732	1.26	0.81–1.96	0.314
No	1.00			1.00			1.00		
Formal HIV/AIDS training									
Yes	1.59	0.81–3.11	0.180	1.24	0.78–1.96	0.364	0.83	0.50–1.36	0.459
No	1.00			1.00			1.00		

Awareness of HIV testing policy									
Yes	0.63	0.31–1.26	0.193	0.96	0.60–1.53	0.857	0.67	0.41–1.09	0.104
No/don't know	1.00			1.00			1.00		
Age									
≤33 years	1.16	0.67–2.01	0.597	0.80	0.53–1.20	0.278	1.087	0.70–1.69	0.709
>33 years	1.00			1.00			1.00		
Number of years in service									
≤7 years	**1.77**	**1.02–3.08**	**0.042**	1.08	0.72–1.62	0.708	0.98	0.64–1.51	0.928
>7 years	**1.00**			1.00			1.00		
Number of HIV cases (past 6 months)									
≤10	0.45	0.06–3.53	0.447	1.82	0.6–5.52	0.290	2.32	0.51–10.64	0.278
>10	1.00			1.00			1.00		
HIV knowledge									
≥67	0.88	0.43–1.84	0.741	0.64	0.37–1.1	0.105	1.16	0.65–2.06	0.615
<67	1.00			1.00			1.00		

* Significance: p<0.05

Table 4. Multiple logistic regression – factors associated with stigmatising attitudes towards HIV/AIDS patients among family medicine trainees (stigmatising=1, non-stigmatising=0)

	Attitudes towards imposed measures			Comfortableness in dealing with HIV/AIDS patients		
	OR	95% CI	p-value	OR	95% CI	p-value
Marital status						
Single	**0.44**	**0.24–0.79**	**0.006**	0.77	0.47–1.25	0.288
Married						
Gender						
Male				0.61	0.35–1.04	0.070
Female						
Formal HIV/AIDS training						
Yes	1.91	0.95–3.84	0.069			
No						
Awareness of HIV testing policy						
Yes	0.51	0.25–1.06	0.070	0.64	0.40–1.05	0.076
No/don't know						
Number of years in service						
≤7 years	**2.73**	**1.27–4.08**	**0.006**			
>7 years						

* Significance: p<0.05

Factors associated with HIV/AIDS stigmatising attitudes

Bivariate analysis showed that marital status and number of years in service were significantly associated with attitudes towards imposed measures. Single participants were less stigmatising towards PLHIV in terms of attitudes towards imposed measures (OR 0.53; 95% CI 0.30–0.93, p=0.027) compared to married participants. Participants who had 7 years or less in service had more stigmatising attitudes towards imposed measures (OR 1.77; 95% CI 1.02–3.08, p=0.042) compared to those with more than 7 years in service (**Table 3**).

In multivariate analysis, both marital status and number of years in service remained significantly associated with attitudes towards imposed measures (p=0.006; **Table 4**).

Discussion

HIV knowledge among family medicine trainees

In this study, 82.1% of family physician trainees had good HIV-related knowledge. This was likely attributable to more clinical exposure to HIV patients among our participants.[20] However, a study by Andrewin et al. (2008) in Belize showed that 57% of 230 doctors and nurses had good HIV knowledge.[7] It also showed that 97% of their participants correctly answered the question on casual contact, which was similar to our study, where 96% answered correctly. Another study performed in Vientiane, Laos, by Vorasane et al. (2017) found that only 56% of doctors and 60.5% of nurses had good HIV knowledge.[15] However, a direct comparison could not be made with this study because a different tool was used to assess participants' knowledge.

HIV-related stigmatisation among family medicine trainees

This study revealed the presence of stigmatisation of HIV patients among family medicine trainees in Malaysia, of which "attitudes of blame" was the commonest. Participants' moral beliefs and negative feelings towards PLHIV could have caused these judgemental thoughts.[14] It has been well-established that HCWs are more stigmatising towards HIV patients from marginalised groups such as intravenous drug users, commercial sex workers, and homosexuals.[11,12] This finding is consistent with a study done in Belize.[7] As such, it is fundamental to address issues pertaining to stereotyping HIV patients among HCWs.

As for "attitudes towards imposed measures", 43.6% of the participants agreed that a health professional with HIV/AIDS should not be working in any department that required patient contact. Possible reasons are HIV transmission–related fears and misconceptions.[22] This finding is consistent with a study done by Reis et al. (2005) in Nigeria, where 40% of the HCWs had a similar belief.[23] Our results also revealed HIV testing and confidentiality issues: 25.7% agreed with mandatory HIV testing for all hospitalised patients, and 36.8% agreed that relatives and sexual partners of patients should be notified even without the patient's consent. These coercive measures are driven by HIV transmission misconceptions, attitudes of blame and symbolic stigma.[14] Likewise, in Belize, 50.1% of HCWs agreed with mandatory HIV testing on admission to hospital, and 44.4% agreed with disclosing HIV patients' status to relatives or sexual partners without the patient's consent.[7] Another study done by Gledović et al. (2015) in Montenegro showed that 64.7% of HCWs agreed with mandatory HIV testing for all hospitalised patients, and 90% believed that all HIV patients were obliged to disclose their status to an HCW.[24] A lack of knowledge was believed to have reinforced fear, causing these stigmatising behaviours.[24]

Over 80% of the participants were comfortable dealing with HIV/AIDS patients, consistent with the study done by Andrewin et al. (2008) in Belize.[7] Such confidence in managing HIV patients was usually attributed to related to clinical experience.[14]

Acts of discrimination towards HIV patients among family medicine trainees

The majority of participants discriminated against HIV patients infrequently, consistent with the study done in Belize.[7] This was due to participants' experience in managing HIV patients, good HIV knowledge and being more advanced in training.[14,15,25] However, a study in India showed that the majority of the HCWs had discriminatory intent when providing care in clinical situations with fluid exposure. This was largely caused by transmission-related fears and misconceptions, attitudes of blame and negative feelings towards PLHIV.[14,24] Similarly, a recent Malaysian study revealed that HCWs in hospitals and primary care clinics had neutral to negative attitudes and fair to poor practices towards PLHIV, possibly attributed to fear of contracting HIV.[19]

Factors associated with HIV/AIDS stigmatising attitudes

This study demonstrated that married participants were more stigmatising in attitudes towards imposed measures towards HIV/AIDS patients, which is in keeping with the findings of a study done by Harapan et al. (2013) in Indonesia.[25] It was postulated that married HCWs were more attentive towards their own families, resulting in more judgemental attitudes.[25] Our study also revealed that HCWs with more than 7 years in service were less stigmatising in attitudes towards imposed measures, consistent with the findings of Dong et al.[26] This was because HCWs developed more experience and familiarity with HIV/AIDS through more clinical encounters over time, thereby becoming more willing to provide better care, as found in studies done in Malaysia, India and Vientiane.[14,15,16]

This study has a few limitations. Firstly, it was a cross-sectional study, so causal relationships could not be established. Secondly, social desirability bias and recall bias were possible because a self-administered questionnaire was used, which might influence the accuracy of the findings. Finally, our study only recruited family medicine trainees from the parallel pathway for this specialisation, excluding trainees enrolled in the government-based master's programme and other categories of HCWs. This could limit the generalisation of the study findings.

Nonetheless, this was the first study done in Malaysia to determine knowledge and assess acts of discrimination and stigmatising attitudes and their associated factors among family medicine trainees. Thus, this study provided a baseline measurement of HIV knowledge, stigmatisation and discrimination towards HIV patients among these trainees in Malaysia for future studies. Furthermore, as family medicine trainees, the participants will provide care to HIV patients at the primary care level in the future, and the results of this study may be used as guidance for further educational interventions for them. Finally, this study used a validated questionnaire to ensure reliability.

Conclusion

Family medicine trainees exhibited stigmatisation and discrimination towards HIV patients. "Attitudes of blame" was the most common stigmatising behaviour, whereas acts of discrimination happened infrequently. Breaching confidentiality was the most common discriminatory act. The majority of the participants had good HIV knowledge. Higher levels of stigmatising attitudes were associated with being married and having fewer years in service. Hence, appropriate and concerted health education should be given to all family medicine trainees to eliminate stigmatisation and discrimination. Future studies should assess HIV-related judgemental behaviour among family medicine trainees from the master's programme and other categories of HCWs to obtain a more comprehensive understanding of HIV-related stigmatisation and discrimination.

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Conflict of interest

The authors declare that there is no conflict of interest.

How does this paper make a difference in general practice?

- Provides preliminary information on HIV-related knowledge, stigmatisation and discrimination among doctors specialising in general practice.
- Identifies variables to be addressed for improving HIV management in general practice.
- Reveals the presence of stigmatising attitudes and acts of discrimination among family care practitioners in Malaysia.
- Reflects the importance of ethical principles and reinforces that maintaining patients' confidentiality and obtaining informed consent for HIV testing are crucial in general practice.
- Suggests initiatives to improve general practitioners' competency in managing HIV patients, e.g. offering formal HIV training that addresses stigmatisation and discrimination issues among general practitioners.

References

1. UNAIDS Data 2020. UNAIDS. Accessed July 15, 2020. https://www.unaids.org/sites/default/files/media_asset/2020_aids-data-book_en.pdf
2. Ministry of Health (MOH), Malaysia. Country Progress Report on HIV/AIDS 2019, Malaysia.
3. Nöstlinger C, Rojas Castro D, Platteau T, Dias S, Le Gall J. HIV-Related discrimination in European health care settings. AIDS Patient Care STDS. 2014;28(3):155-161. doi:10.1089/apc.2013.0247

4. Overcoming HIV-Related Stigma and Discrimination in Healthcare Settings and Beyond. UNAIDS. Accessed Aug 25, 2020. https://www.unaids.org/sites/default/files/media_asset/confronting-discrimination_en.pdf

5. Facts about HIV stigma. Centers for Disease Control and Prevention. Updated June 1, 2021. Accessed Jan 3, 2022. https://www.cdc.gov/hiv/basics/hiv-stigma/index.html

6. Positive Malaysian Treatment Access & Advocacy Group (MTAAG+). PLHIV Stigma Index, Malaysia, 2012.

7. Andrewin A, Chien LY. Stigmatization of patients with HIV/AIDS among doctors and nurses in Belize. *AIDS Patient Care STDS*. 2008;22(11):897-906. doi:10.1089/apc.2007.0219

8. Ministry of Public Health, Thailand. Report of a Pilot: Developing Tools and Methods to Measure HIV-related Stigma and Discrimination in Health Care Settings in Thailand. 2014.

9. Rueda S, Mitra S, Chen S, et al. Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. *BMJ Open*. 2016;6(7):e011453. Published 2016 Jul 13. doi:10.1136/bmjopen-2016-011453

10. Gesesew HA, Tesfay Gebremedhin A, Demissie TD, Kerie MW, Sudhakar M, Mwanri L. Significant association between perceived HIV related stigma and late presentation for HIV/AIDS care in low and middle-income countries: A systematic review and meta-analysis. *PLoS One*. 2017;12(3):e0173928. Published 2017 Mar 30. doi:10.1371/journal.pone.0173928

11. Katz IT, Ryu AE, Onuegbu AG, et al. Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. *J Int AIDS Soc*. 2013;16(3 Suppl 2):18640. Published 2013 Nov 13. doi:10.7448/IAS.16.3.18640

12. King EJ, Maman S, Bowling JM, Moracco KE, Dudina V. The influence of stigma and discrimination on female sex workers' access to HIV services in St. Petersburg, Russia. *AIDS Behav*. 2013;17(8):2597-2603. doi:10.1007/s10461-013-0447-7

13. Cianelli R, Ferrer L, Norr KF, et al. Stigma Related to HIV among Community Health Workers in Chile. *Stigma Res Action*. 2011;1(1):3-10. doi:10.5463/sra.v1i1.11

14. Ekstrand ML, Ramakrishna J, Bharat S, Heylen E. Prevalence and drivers of HIV stigma among health providers in urban India: implications for interventions. *J Int AIDS Soc.* 2013;16(3 Suppl 2):18717. Published 2013 Nov 13. doi:10.7448/IAS.16.3.18717

15. Vorasane S, Jimba M, Kikuchi K, et al. An investigation of stigmatizing attitudes towards people living with HIV/AIDS by doctors and nurses in Vientiane, Lao PDR. *BMC Health Serv Res*. 2017;17(1):125. Published 2017 Feb 10. doi:10.1186/s12913-017-2068-8

16. Chan YC, Binti Mawardi M, Ismail Daud AH. Stigmatizing attitudes toward people living with HIV/AIDS (PLWHA) among primary health care providers in Kinta District, Perak. *Malays Fam Physician*. 2021;16(1):31-38. Published 2021 Feb 15. doi:10.51866/oa0001

17. Aisien AO, Shobowale MO. Health care workers' knowledge on HIV and AIDS: universal precautions and attitude towards PLWHA in Benin-City, Nigeria. *Niger J Clin Pract*. 2005;8(2):74-82.

18. Kermode M, Holmes W, Langkham B, Thomas MS, Gifford S. HIV-related knowledge, attitudes and risk perception amongst nurses, doctors and other healthcare workers in rural India. Indian *J Med Res.* 2005;122(3):258-264.

19. Yadzir ZHM, Ramly M, Suleiman A. HIV-Related Knowledge, Attitude and Practice among Healthcare Workers (HCW) in Governmental Healthcare Facilities in Malaysia. *Prim Health* Care, 2021, 11(3), 372. doi: 10.35248/2167-1079.21.11.372

20. Chew BH, Cheong AT. Assessing HIV/AIDS Knowledge and Stigmatizing Attitudes among Medical Students in Universiti Putra Malaysia. *Med J Malaysia*. 2013;68(1):24-29.

21. Tee YC, Earnshaw VA, Altice FL, Jin H, Kamarulzaman A, Wickersham JA. Evaluating Physicians' Intention to Discriminate Against Patients Living with HIV in Malaysia. *AIDS Behav*. 2019;23(4):1039-1047. doi:10.1007/s10461-018-2362-4

22. Sadoh AE, Sadoh WE, Fawole AO, Oladimeji A, Sotiloye O. Attitude of health care workers to patients and colleagues infected with human immunodeficiency virus. *Sahara J*. 2009;6(1):17-23. doi:10.1080/17290376.2009.9724925

23. Reis C, Heisler M, Amowitz LL, et al. Discriminatory attitudes and practices by health workers toward patients with HIV/AIDS in Nigeria. *PLoS Med*. 2005;2(8):e246. doi:10.1371/journal.pmed.0020246

24. Gledović Z, Rakočević B, Mugoša B, Grgurević A. HIV-related knowledge, attitudes and practice among health care workers in Montenegro. *Coll Antropol*. 2015;39(1):81-85.

25. Harapan H, Feramuhawan S, Kurniawan H, et al. HIV-related stigma and discrimination: a study of health care workers in Banda Aceh, Indonesia. *Med J Indones*. 2013;22(1):22–29.

26. Dong X, Yang J, Peng L, et al. HIV-related stigma and discrimination amongst healthcare providers in Guangzhou, China. *BMC Public Health*. 2018;18(1):738. Published 2018 Jun 15. doi:10.1186/s12889-018-5654-8

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ORIGINAL ARTICLE

The prevalence of gestational diabetes, associated factors and feto-maternal outcome among antenatal women attending health clinics in Terengganu

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is a known risk factor for diabetes mellitus (DM). The rising prevalence of GDM in the Asian population (11.7%) may explain the increasing incidence of DM in women. This study examined the prevalence of GDM, its associated factors and the foeto-maternal outcomes of women with GDM in Terengganu.

Methods: A cross-sectional study was conducted between April and September 2019 using secondary data from antenatal records in 40 health clinics in Terengganu for 2018. All pregnant women aged 25 years and above with or without risk factors for GDM were included in the study. Those with pre-existing type 1 or 2 DM were excluded. A total of 270 respondents were included. The prevalence of GDM and its associated factors were determined using descriptive statistics followed by multiple logistic regression.

Results: The prevalence of GDM in Terengganu was 27.3% (n=72). Logistic regression analysis found that BMI at booking (adjusted OR=4.51, 95% CI 2.13–9.55, p<0.001), history of GDM (adjusted OR=5.31, 95% CI 2.17–12.99, p<0.001) and family history of DM (adjusted OR=4.24, 95% CI 2.23–8.05, p<0.001) were the significant associated risk factors. Of women with GDM, 17.7% (n=11) had postpartum pre-diabetes based on modified oral glucose tolerance at 6 weeks postpartum. Univariate analysis using chi-square tests showed a significant association of neonatal jaundice and hypoglycaemia with GDM.

Conclusion: Because the prevalence of GDM in Terengganu is high, surveillance of GDM in high-risk pregnancies and effective glycaemic management should be emphasised to prevent adverse foeto-maternal outcomes.

Introduction

Gestational diabetes mellitus (GDM) is a state of glucose intolerance of varying degrees with onset or first recognition during pregnancy.[1] It has been associated with short-term and long-term adverse outcomes for both mothers and newborns.[2] The National Health Morbidity Survey (NHMS) 2015 showed a prevalence of diabetes mellitus (DM) among adult women in Malaysia of 18.3%.[3] One risk factor for developing DM is gestational diabetes mellitus (GDM). Asia has an increasing prevalence of GDM, which varies widely depending on the population studied and the diagnostic test employed.[4] According to a meta-analysis, the pooled prevalence of GDM was 11.5% in Asia and 10.1% in Southeast Asia.[5,6] However, a local study in Selangor in 2003 reported a higher prevalence of GDM (18.3%),[7] and this was even higher in another local study 11 years later (27.9%).[8] Other studies have found the prevalence ranges from 2.4% to 21.0%.[9,10]

Based on current guidelines, the diagnosis of GDM is based on a fasting plasma glucose (FPG) value of more or equal to 5.1 mmol/L and/or a 2-hour post-prandial (2HPP) value of more or equal to 7.8 mmol/L.[11] In Terengganu, this guideline was applied to the whole state in 2019. Since this study was conducted in 2018, the diagnosis of GDM was based on the previous guideline, which was an FPG of 5.6 mmol/L and a 2HPP of 7.8 mmol/L.[12] The most commonly reported

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risk factors for GDM were older age, pre-pregnancy obesity, high parity, family history of diabetes (especially in first-degree relatives), previous history of GDM, and previous obstetric outcomes such as a macrosomic infant, congenital malformation and recurrent abortions. Maternal overweight or obesity and family history of GDM were recognised as established risk factors for GDM.[7,13] Women with GDM were also at increased risk of caesarean section, gestational hypertension, preeclampsia and type 2 DM.[14,15] The newborns of mothers with GDM have been associated with macrosomia or larger than normal gestational age, neonatal hypoglycaemia and type 2 DM later in life.[5,16,17]

Given the rapid socioeconomic and nutrition transition and the increasing prevalence of GDM in Asia,[18] it is important to recognise the risk factors among the local population so that screening systems and pre-pregnancy management can be strengthened. Additionally, the prevalence of GDM and foeto-maternal outcomes in Terengganu have never been reported. Hence, the results of this study will be the reference and basis for future studies of mothers with GDM, especially in exploring modifiable risk factors and the association of GDM with foeto-maternal outcomes to reduce its morbidity and mortality.

Methods

This cross-sectional study was conducted between April and September 2019. It involved antenatal women who attended health clinics and delivered in Terengganu state in 2018. Based on the current guideline, women with risk factors for GDM were screened using a modified oral glucose tolerance test (MOGTT) at booking or as early as possible. If the initial result was normal, a second MOGTT was done between 24 and 28 weeks' gestation. The inclusion criteria were antenatal women aged 25 years and above with or without risk factors for GDM as recommended by the local guideline. Those with pre-existing type 1 or 2 DM were excluded. The sample size was calculated using OpenEpi software. The sample size was calculated based on the parameters of population size: 1,000,000; anticipated frequency: 18.3%[7]; absolute precision: 0.05; design effect: 1. The calculated sample size was 226. After considering 20% drop-out, 283 was taken as the sample size for this study.

Of the total of 40 health clinics located in eight districts in Terengganu, all were involved in this study. The total sample size was then allocated proportionately to eight districts in Terengganu based on the percentage of total deliveries in each district. For each clinic, samples were selected using stratified random sampling generated by an online random number generator. Antenatal record books of selected cases were retrieved from respective health clinics. The retrieved information was for the dependent variable (GDM) and the independent variables, including sociodemographic data (age, education level, occupation, family history of DM), obstetric factors (gravida, trimester at booking, BMI at booking, weight gain of more than 2 kg/week, recurrent urinary tract infection), past obstetric history (previous macrosomia, history of GDM, history of abortions, intrauterine death), investigations (HbA1c result, postnatal MOGTT results) and foeto-maternal outcomes (delivery method, neonatal jaundice, hypoglycaemia, foetal macrosomia, respiratory distress syndrome [RDS], preterm delivery). A proforma was applied to record all of this data.

The data were analysed using IBM SPSS ver. 20.0 (IBM Corp., Armonk, NY, USA). Descriptive analysis was performed, in which categorical variables were presented as frequencies (percentages). The prevalence of GDM was described as frequencies (percentages). Simple and multiple logistic regression analyses were used to determine factors associated with GDM among pregnant women. Simple logistic regression was used for screening in the selection of variables, whereby all variables with a p-value of less than 0.25 and clinically significant variables were then included in multiple logistic regression. Forward and backward logistic regression methods were used, where the selection of variables was based on Wald's test. This process of deleting, refitting and verifying continued until all the important variables appeared included in the model and those excluded were clinically or statistically unimportant. At this step, the preliminary main effect model was obtained. All possible two-way interactions were checked. The independent variables were fitted into multiple logistic regression, and variance inflation factors were obtained to check for multicollinearity. Multicollinearity was present if the VIF values were greater than 5. The findings were presented with the crude and adjusted odds ratio (OR),

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95% confidence interval (CI), and p-value. The level of significance was set at 0.05 in a two-tailed fashion. Univariate analysis using chi-square tests (Fisher's exact test when applicable) was used to find the associations between GDM and the foeto-maternal outcomes.

This study was approved by National Medical Research Register (NMRR) committee (NMRR-19-1527-46454[IIR]).

Results

i) Sociodemographic and clinical characteristics of GDM among antenatal women

Of the reviewed antenatal records, 264 (93.2%) were completed in proforma and hence included in the analysis. The characteristics of pregnant women in this study are presented in Table 1. The majority of respondents were Malay (n=261, 98.9%), were aged under 35 years (n=193, 73.0%) and had a secondary education (n=164, 62.0%). Most were multiparous (n=158, 59.8%) and had early bookings in the first trimester (n=213, 80.7%).

ii) Prevalence of GDM

The prevalence of GDM in this study was 27.3% (n=72). The prevalence of GDM was higher in those with a family history of DM (n=36, 48.6%) and a history of GDM (n=19, 65.5%). The other associated factors are described in Table 1. Of the women with GDM, 95.8% (n=69) had good baseline glycaemic control, with an HbA1c less than or equal to 6.5%. All were advised about diet control (n=72, 100%), almost all received dietary counselling by the dietitian (n=69, 95.8%) and only 22.2% were started on insulin therapy.

Table 1. Sociodemographic and clinical characteristics of GDM patients (n=264).

Variables	n (%)	No GDM (n=192)	GDM (n=72)
Sociodemographic characteristics:			
Age group			
Less than 35 years old	193 (73.1)	149 (77.2)	44 (22.8)
35 years old and above	71 (26.9)	43 (60.6)	28 (39.4)
Ethnic group			
Malay	261 (98.9)	191 (73.2)	70 (26.8)
Chinese	3 (1.1)	1(33.3)	2 (66.7)
Education level			
No formal/primary education	8 (3.0)	6 (75.0)	2 (25.0)
Secondary education	164 (62.1)	123 (75.0)	41 (25.0)
Tertiary education	92 (34.8)	63 (68.5)	29 (31.5)
Occupation			
Working	117 (44.3)	87 (74.4)	30 (25.6)
Home duties	147 (55.7)	105 (71.4)	42 (28.5)
Family history of DM			
No	190 (72.0)	154 (81.1)	36 (18.9)
Yes	74 (28.0)	38 (51.4)	36 (48.6)
Obstetric characteristics:			
Gravida			
Primigravida	58 (22.0)	47 (81.0)	11 (19.0)
Multipara	158 (59.8)	114 (72.2)	44 (27.8)
Grand multipara	48 (18.2)	31 (64.6)	17 (35.4)
Trimester at booking			
First trimester	213 (80.7)	156 (73.2)	57 (26.8)
Second/third trimester	51 (19.3)	36 (70.6)	15 (29.4)
BMI at booking			
Normal	99 (37.5)	88 (88.9)	11 (11.1)
Overweight/obese	165 (62.5)	104 (63.0)	61 (37.0)
Weight gain >2 kg/week			
No	237 (89.8)	174 (73.4)	63 (26.6)
Yes	27 (10.2)	18 (66.7)	9 (33.3)
Urinary tract infection/candidiasis			
No	252 (95.8)	185 (73.4)	67 (26.6)
Yes	11 (4.2)	7 (63.6)	4 (36.4)

Past obstetric history:			
Previous macrosomic baby			
No	253 (95.8)	185 (73.1)	68 (26.9)
Yes	11 (4.2)	7 (63.6)	4 (36.4)
History of GDM			
No	235 (89.0)	182 (77.4)	53 (22.6)
Yes	29 (11.0)	10 (34.5)	19 (65.5)
History of abortion			
No	256 (97.0)	188 (73.4)	68 (26.6)
Yes	8 (3.0)	4 (50.0)	4 (50.0)
History of intrauterine death			
No	262 (99.2)	191 (72.9)	71 (27.1)
Yes	2 (0.8)	1 (50.0)	1 (50.0)
Investigations:			
HbA1c level			
6.5% and below			69 (95.8)
Greater than 6.5%			3 (4.2)
Postnatal MOGTT			
Normal			51 (82.3)
IFG/IGT			11 (17.7)
Diabetes			0
GDM management:			
Diet control			
No			72 (100)
Yes			0
Insulin initiation			
No			16 (22.2)
Yes			56 (77.8)
Dietitian counselling			
No			69 (95.8)
Yes			3 (4.2)

iii) Factors associated with GDM

Simple logistic regression showed a significant association of GDM with age, gravida, BMI at booking, family history of DM, history of GDM and history of abortion (**Table 2**).

Table 2. Simple logistic regression of factors associated with GDM (n=264).

Significant variables	B[a]	Crude OR[b]	95% CI[c]	Wald stat[d] (df)	p-value
Age					
35 years or more	0.79	2.21	1.23–3.95	7.07 (1)	0.008
Less than 35 years		1.00			
Gravida				3.58 (2)	0.167
Grand multipara	0.85	2.34	0.97–5.67	3.57(1)	0.059
Multipara	0.50	1.65	0.79–3.47	1.74(1)	0.187
Primigravida		1.00			
BMI at booking					
Overweight/obese	1.55	4.70	2.33–9.47	18.63 (1)	<0.001
Normal		1.00			
Weight gain >2 kg/week					
Yes	0.32	1.38	0.59–3.23	0.55 (1)	0.457
No		1.00			
Family history of DM					
Yes	1.40	4.05	2.26–7.26	22.16(1)	<0.001
No		1.00			

History of GDM					
Yes	1.88	6.53	2.81–14.88	19.87 (1)	<0.001
No		1.00			
History of abortion					
Yes	1.02	2.77	0.67–11.36	1.99 (1)	0.158
No		1.00			
History of intrauterine death					
Yes	0.99	2.69	0.17–43.59	0.49 (1)	0.486
No		1.00			
Recurrent UTI					
Yes	0.44	1.56	0.44–5.48	0.47 (1)	0.492
No		1.00			

[a] Regression coefficient, [b] Adjusted odds ratio, [c] 95% confidence interval, [d] Wald statistic (degree of freedom)

Multiple logistic regression showed that BMI at booking, family history of DM and history of GDM were significant associated factors of GDM when other confounders were controlled (**Table 3**).

Table 3. The association between GDM and the risk factors of GDM by multiple logistic regression (n=264).

Significant variables	B[a]	Adjusted OR[b]	95% CI[c]	Wald stat[d] (df)	p-value
BMI at booking					
Overweight/obese	1.51	4.51	2.13–9.55	15.44 (1)	<0.001
Normal		1.00			
Family history of DM					
Yes	1.44	4.24	2.23–8.05	19.42 (1)	<0.001
No		1.00			
History of GDM					
Yes	1.67	5.31	2.17–12.99	13.34 (1)	<0.001
No		1.00			

[a] Regression coefficient, [b] Adjusted odds ratio, [c] 95% confidence interval, [d] Wald statistic (degree of freedom)
Constant value : -2.762.
Forward and backward method applied.
No multicollinearity present.
No significant interaction found.
Hosmer–Lemeshow test, p-value 0.550.
Percentage of classification table correctly classified was 72.7%.
Percentage of area under receiver operating characteristics (ROC) curve was 0.759.

In the final model, women who were overweight or obese at booking had 4.51 times greater odds of having GDM than those with a normal BMI (adjusted OR=4.51, 95% CI 2.13–9.55, p<0.001). Similarly, those with a family history of DM had 4.24 times greater odds of having GDM compared to those without a family history of DM (adjusted OR=4.24, 95% CI 2.23–8.05, p<0.001). Antenatal women with a history of GDM had 5.31 times greater odds of having GDM in the current pregnancy than those without a history of GDM (adjusted OR=5.31, 95% CI 2.17–12.99, p<0.001).

iv) Foeto-maternal outcomes

The associations between GDM and foeto-maternal outcomes are summarised in Table 4. For maternal outcomes, no significant association existed between GDM and the method of delivery. For foetal outcomes, a significant association existed between GDM and neonatal jaundice as well as neonatal hypoglycaemia. No significant association with macrosomia, RDS or preterm delivery was observed.

Table 4. The association between GDM and adverse foeto-maternal outcomes (n=72).

Foeto-maternal outcome		GDM status		X^2 statistic (df)	p-value
		No GDM, n(%) (n=192)	GDM, n(%) (n=72)		Fisher's exact test*
Maternal outcome:					
Delivery method					
SVD	No	32 (65.3)	17 (34.7)		
	Yes	160 (74.4)	55 (25.6)	1.67 (1)	0.196
LSCS	No	161 (74.5)	55 (25.5)		
	Yes	31 (64.6)	17 (35.4)	1.96 (1)	0.161
Instrumental delivery	No	191 (72.6)	72 (27.4)		
	Yes	1 (100.0)	0		0.727*
Foetal outcome:					
Neonatal jaundice	No	96 (78.7)	26 (21.3)	4.06 (1)	**0.044**
	Yes	96 (67.6)	46 (32.4)		
Hypoglycaemia	No	191 (73.7)	68 (26.3)		**0.021***
	Yes	1 (20.0)	4 (80.0)		
Macrosomia	No	189 (72.7)	71 (27.3)		0.700*
	Yes	3 (75.0)	1 (25.0)		
RDS	No	187 (72.8)	70 (27.2)		0.613*
	Yes	5 (71.4)	2 (28.6)		
Preterm delivery	No	189 (73.0)	70 (27.0)		0.616*
	Yes	3 (60.0)	2 (40.0)		

SVD – spontaneous vaginal delivery
LSCS – lower segment caesarean section
RDS – respiratory distress syndrome

Discussion

Prevalence of GDM

The prevalence of GDM in clinics in Terengganu was 27.3%, which is comparable with a study in public health clinics in Selangor in 2017 (27.9%).[8] However, the prevalence of GDM was lower in other studies locally[7] and internationally, ranging from 6.6% to 18.3%.[5,13,19] A 2018 meta-analysis by Lee et al.[6] found that the pooled prevalence of GDM was 11.5% (95% CI 10.9–12.1). This is considered more representative of the burden of GDM across Asian populations. This prevalence of GDM in Asia is higher than in European countries (5.4%) but lower than in African countries (14.0%). This might be due to differences in maternal age, BMI disparities and ethnic backgrounds.[6]

Over the years, additional risk factors included in GDM screening have resulted in higher diagnosis rates. Previously, based on World Health Organization 1998 diagnostic criteria, for those with risk factors, screening was done once at 24 to 28 weeks of gestation. From 2008, GDM screening was recommended to be done twice.[8] Later, the NICE 2015 guideline introduced universal screening of women aged more than 25 years without other additional risk factors at 24 to 28 weeks' gestation.[12] Other possible contributors are modifiable risk factors for GDM, such as high carbohydrate intake, sedentary lifestyle and smoking, which vary between regions and countries. This explains the different rates of glucose intolerance among different populations, which then leads to pancreatic B-cell exhaustion in pregnancy.[20] However, these factors were not included in this study.

Associated Factors of GDM

BMI at booking, family history of DM and history of GDM were found to be significant in our study. We found that the odds of GDM increased 4.51 times among overweight or obese women compared to those with a normal BMI (adjusted OR=4.51, 95% CI 2.13–9.55, p<0.001). This finding is consistent with numerous studies that have reported an increased risk of GDM among women who are overweight or obese compared with lean or normal-weight women. Based on a meta-analysis on maternal obesity and the risk of GDM, the unadjusted ORs of GDM were 2.14 times higher among overweight women, 3.56 times higher among obese women and 8.56 higher among severely obese women compared with normal-weight

pregnant women.[4] Priyanka et al. also found a significant association between maternal obesity and GDM.[19] In obese women, the pathophysiology is primarily characterised by the pregnancy-induced insulin resistance being amplified by the already elevated pre-pregnant insulin resistance level. The elevated insulin resistance level is a known factor in the metabolic syndrome. These defects disrupt insulin action in maintaining glucose levels, resulting in maternal hyperglycaemia.[21]

Another significant finding was that those with a family history of DM had 4.24 times greater odds of having GDM compared to those without a family history of DM (adjusted OR=4.24, 95% CI 2.23–8.05, p<0.001). Similarly, a systematic review[6] found that those with a family history of diabetes had 2.77 times higher odds of having GDM. Other studies[8,13,17,19] obtained similar findings. Researchers have identified various genetic variants appearing to impact B-cell function, explaining the theory of genetic predisposition to diabetes.[13] A meta-analysis also found that the odds of GDM were increased by 8.42 times in those with a previous history of GDM compared to those with no history of GDM. A similar association was found by other studies.[8,13,19] These are consistent with our finding that antenatal women with a history of GDM had 5.31 times greater odds of having GDM in the current pregnancy than those without a history of GDM (adjusted OR=5.31, 95% CI 2.17–12.99, p<0.001). Based on our extensive search of available studies in the medical literature, none had contradicting results. Those with a history of GDM were found to have abnormal carbohydrate metabolism and pancreatic β-cell function and insulin insensitivity.[5,8]

Nevertheless, the other risk factors for GDM (poor obstetric history, history of macrosomia, history of abortion, polyhydramnios, urinary tract infection and weight gain of more than 2 kg/week) were statistically not significant in our study. A possible reason is that the majority of women with GDM in our study had good glycemic control, as evidenced by 95.8% (n=69) having an HbA1c less than or equal to 6.0%, resulting in a lesser degree of GDM complications.

Foeto-Maternal Outcomes

GDM has a well-known association with an increased rate of caesarean section. The common direct causes are acute foetal distress, failed induction of labour and macrosomia.[22] The proportion of caesarean section among women with GDM in our study was 35.4% (n=17), which is comparable to the national prevalence of 34.5% to 35.5% (from 2013–2015).[22] However, the proportion of caesarean section among women with GDM was higher in a prospective study in India (79.0%), with the most common indication being arrest of labour.[19] Other studies have shown varying rates of caesarean section for women with GDM, ranging from 18.0% to 28.5%.[8,20] This difference is probably due to the majority having good diabetic care and controlled diabetes and thus less macrosomia and labour arrest that contribute to caesarean section. Other possibilities are the different clinical settings, adequacy of intrapartum foetal monitoring and surveillance. The complications that might happen due to uncontrolled GDM can be minimised by proper glucose control throughout pregnancy, which reduces the caesarean section rate. These factors might be why our study found no significant association between GDM and the delivery method. In this study, 95.8% (n=69) of mothers with GDM underwent nutritional therapy by a dietitian, and 22.2% (n=16) were started on insulin to ensure proper glucose optimisation. The other study used a similar management approach, whereby 42.4% of those with uncontrolled GDM were started on insulin to improve their glycaemic control.[13]

A systematic review of 20 studies found at least a 7-fold increase in the risk of developing type 2 DM, when comparing women with a pregnancy complicated by GDM to women with a normoglycemic pregnancy.[21] Therefore, post-partum diabetic screening is recommended for all women with GDM. In clinical practice, postnatal glycaemic status needs to be confirmed with a repeat MOGTT at 6 weeks postpartum.[12] In our study, of the 86% (n=62) of women with GDM who underwent MOGTT postnatally, 17.7% were diagnosed with pre-diabetes. The prevalence of postpartum pre-diabetes was higher than in a 2014 local study in Selangor (12.1%).[14] This difference in the prevalence of abnormal postnatal MOGTT may be due to the differences in ethnicity involved, as well as the rate of weight gain during pregnancy among women with GDM, which was greater in our study compared to the study in Selangor (33.3% vs 20.7%).[8]

Further, in our study, 48.6% of women with GDM had a family history of DM, and 65.5% had a history of GDM (compared to the study in Selangor: 38.3% had a family history of DM, and only 16.2% had a history of GDM), which contributed significantly to the risk of developing pre-diabetes as well as diabetes postpartum. The prevalence of DM was observed in the systematic review to range from 2.6% to 70% at 6 weeks or even 28 years postpartum. Most studies have reported the cumulative incidence of type 2 DM. Knowing diabetic status in the postpartum period allows early treatment and close follow-up, given the future diabetic risk. Furthermore, comprehensive pre-pregnancy counselling can reduce maternal and foetal morbidity and mortality. Although none of our women were diabetic during postpartum, they must be aware of this risk, and lifestyle modification right after delivery is recommended to minimise the future risk of diabetes.

For foetal outcomes, our study found a significant association between GDM and hypoglycaemia. A retrospective study in Sydney in 2019 showed similar associations; the risk of developing hypoglycaemia increased 1.8-fold in pregnancies complicated with GDM.[23] However, a study in Selangor in 2017 did not find such associations.[8] Neonatal hypoglycaemia is associated with elevated levels of maternal glucose, resulting in foetal hyperinsulinemia, which leads to hypoglycaemia in infants.[24] Therefore, pre-conception care and antenatal optimisation of glycaemic control could yield reductions in adverse neonatal outcomes.[23] Our findings suggest that GDM was associated with neonatal hyperbilirubinemia. This is supported by a 2019 study that found that the risk of neonatal hyperbilirubinemia increased 1.5-fold in pregnancies complicated with GDM.[22] However, Logakodie et al. did not find such an association.[8] National data in 2015 reported that mothers with GDM had higher rates of macrosomic infants and preterm birth, similar to another study.[19,22] However, we did not find these factors to be significantly associated with GDM.

Study Strengths and Limitations

This study was conducted at all clinics in rural and urban areas throughout Terengganu. Hence, it could represent the pregnant population in this state. However, the prevalence of GDM in this study might be lower than the actual prevalence because we used the former diagnostic criteria. The GDM criteria used were an FPG value of more than or equal to 5.6 mmol/L or a 2HPP of more than or equal to 7.8 mmol/L, as in 2018. Hence, the prevalence might be higher if we used the current diagnostic criteria stated in our national guidelines. Another limitation is that this study did not explore the modifiable risk factors for GDM, such as lifestyle practices, or other foeto-maternal outcomes commonly associated with GDM, such as gestational hypertension, preterm prelabour membrane rupture, shoulder dystocia and stillbirth because these data were not available in the reviewed records. Future study is needed to examine these associations so that modifiable risk factors can be identified and tackled before pregnancy to minimise the risk of GDM. The association between maternal glycaemic control and foeto-maternal outcomes is another area to be explored.

Conclusion

The high prevalence of GDM among antenatal women in Terengganu has raised the concern of future increased incidence of DM in not only the women but also their offspring. However, with optimised maternal glycaemic control, adverse foeto-maternal outcomes have been reduced over time. Surveillance of GDM in high-risk antenatal mothers and effective glycaemic control should be emphasised to prevent adverse foeto-maternal outcomes.

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How does this paper make a difference in general practice?

- This study provides baseline data on GDM prevalence and its risk factors in Terengganu. Future study is needed to prospectively see the trend of future development of DM and maternal modifiable risk factors.
- The two significant risk factors found in the study (family history of DM and history of GDM) warrant education and early diet intervention for women with such risks.
- This study found a lower rate of foeto-maternal complications compared to other studies, which indicates good surveillance and proper management of GDM were applied in clinical practice. These must be emphasised to further reduce foeto-maternal morbidity and mortality.

References

1. Metzger BE, Coustan DR. Summary and recommendations of the Fourth International Workshop-Conference on Gestational Diabetes Mellitus. The Organizing Committee. *Diabetes Care.* Aug 1998;21 Suppl 2:B161-7.

2. Farrar D, Simmonds M, Bryant M, et al. Hyperglycaemia and risk of adverse perinatal outcomes: systematic review and meta-analysis. *BMJ*. 2016;354: i4694. doi:10.1136/bmj.i4694

3. Ministry of Health Malaysia. Non-Communicable Diseases, Risk Factors and Other Health Problems. National Health and Morbidity Survey. 2015. Accessed December 10, 2020. https://www.moh.gov.my/moh/resources/nhmsreport2015vol2.pdf

4. Chu SY, Callaghan WM, Kim SY, et al. Maternal obesity and risk of gestational diabetes mellitus. *Diabetes Care*. Aug 2007;30(8):2070-6. doi:10.2337/dc06-2559a

5. Nguyen CL, Pham NM, Binns CW, Duong DV, Lee AH. Prevalence of gestational diabetes mellitus in Eastern and Southeastern Asia: A systematic review and meta-analysis. *J Diabetes Res*. 2018 February 20. doi:10.1155/2018/6536974

6. Lee KW, Ching SM, Ramachandran V, et al. Prevalence and risk factors of gestational diabetes mellitus in Asia: a systematic review and meta-analysis. *BMC Pregnancy and Childbirth*. 2018 December 14;18(1):494. doi:10.1186/s12884-018-2131-4

7. Idris N, Hatikah Ch C, Murizah M, Rushdan M. Universal versus selective screening for detection of gestational diabetes mellitus in a Malaysian population. *Malays Fam Physician*. 2009;4(2-3):83-87.

8. Logakodie S, Azahadi O, Fuziah P, et al. Gestational diabetes mellitus: The prevalence, associated factors and foeto-maternal outcome of women attending antenatal care. *Malays Fam Physician*. 2017;12(2):9-17.

9. Guariguata L, Linnenkamp U, Beagley J, Whiting DR, Cho NH. Global estimates of the prevalence of hyperglycaemia in pregnancy. *Diabetes Res Clin Pract*. Feb 2014;103(2):176-85. doi:10.1016/j.diabres.2013.11.003

10. Yogev Y, Xenakis EM, Langer O. The association between preeclampsia and the severity of gestational diabetes: the impact of glycemic control. *Am J Obstet Gynecol*. Nov 2004;191(5):1655-60. doi:10.1016/j.ajog.2004.03.074

11. Ministry of Health Malaysia. Clinical Practice Guidelines Management of Diabetes in Pregnancy.2017. Accessed December 21, 2020. http://www.acadmed.org.my/index.cfm?&menuid=67

12. National Institute for Health and Care Excellence. Diabetes in pregnancy: management from preconception to the postnatal period. February 25, 2015. Accessed November 2, 2020. https://www.nice.org.uk/guidance/ng3

13. Tutino GE, Tam WH, Yang X, Chan JC, Lao TT, Ma RC. Diabetes and pregnancy: perspectives from Asia. *Diabet Med*. 2014 March;31(3):302-18. doi:10.1111/dme.12396

14. Langer O, Yogev Y, Most O, Xenakis EMJ. Gestational diabetes: The consequences of not treating. *Am J Obstet Gynecol*. 2005 April 1;192(4):989-997. doi:10.1016/j.ajog.2004.11.039

15. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care*. 2002;25(10):1862-1868. doi:10.2337/diacare.25.10.1862

16. Marchetti D, Carrozzino D, Fraticelli F, Fulcheri M, Vitacolonna E. Quality of Life in Women with Gestational Diabetes Mellitus: A Systematic Review. *J Diabetes Res*. 2017;2017:7058082. doi:10.1155/2017/7058082

17. Clausen TD, Mathiesen ER, Hansen T, et al. High prevalence of type 2 diabetes and pre-diabetes in adult offspring of women with gestational diabetes mellitus or type 1 diabetes: the role of intrauterine hyperglycemia. *Diabetes Care*. Feb 2008;31(2):340-6. doi:10.2337/dc07-1596

18. International Diabetes Federation. *IDF Diabetes Atlas*. 7th ed; 2015. Accessed November 24, 2020. https://www.diabetesatlas.org/upload/resources/previous/files/7/IDF%20Diabetes%20Atlas%207th.pdf

19. Kalra P, Kachhwaha CP, Singh HV. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. *Indian J Endocrinol Metab*. Jul 2013;17(4):677-80. doi:10.4103/2230-8210.113760

20. Yong HY, Mohd Shariff Z, Rejali Z, Mohd Yusof BN, Yasmin F, Palaniveloo L. Seremban Cohort Study (SECOST): a prospective study of determinants and pregnancy outcomes of maternal glycaemia in Malaysia. *BMJ Open*. Jan 21 2018;8(1):e018321. doi:10.1136/bmjopen-2017-018321

21. Ministry of Health Malaysia. 4th Report of National Obstetrics Registry (2013-2015). National Obstetric Registry; 2015. Accessed November 24, 2020. http://www.acrm.org.my/nor/

22. Thevarajah A, Simmons D. Risk factors and outcomes for neonatal hypoglycaemia and neonatal hyperbilirubinaemia in pregnancies complicated by gestational diabetes mellitus: a single centre retrospective 3-year review. *Diabet Med*. 2019;36(9):1109-1117. doi:10.1111/dme.13962

23. Kampan N, Azman H, Hafiz I, et al. Outcome of pregnancy among Malaysian women with diabetes mellitus-A single centre experience. *Malaysian J Public Heal Med*. 2013;2(2):1-10.

24. Kampmann U, Madsen LR, Skajaa GO, Iversen DS, Moeller N, Ovesen P. Gestational diabetes: a clinical update. *World J Diabetes*. 2015;6(8):1065.

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ORIGINAL ARTICLE

Determinants of microalbuminuria among type 2 diabetes mellitus patients in Kuala Selangor district: A cross-sectional study

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Abstract

Introduction: Microalbuminuria presents significant health risks for the progression of end-stage renal-failure (ESRF) among type 2 diabetes mellitus (T2DM) patients. This study aims to determine the proportion and associated factors of microalbuminuria among T2DM patients in Kuala Selangor district, Malaysia.

Methods: A retrospective cross-sectional study was conducted from December 2020 to February 2021 using secondary data from the National Diabetic Registry (NDR), Malaysia, and reviewed patients' diabetic records for the year 2020. All T2DM patients aged ≥18 years who were registered with the NDR in 2020 and fulfilled the inclusion and exclusion criteria were included in the study. Descriptive statistics and multiple logistic regression analysis were performed. Data were analysed using SPSS version 26.0. A total of 343 samples were included in this study for the determination of the proportion of microalbuminuria and its associated factors.

Results: Of 343 respondents, 34.4% had microalbuminuria. HbA1c >7.0% (AdjOR 2.19, 95% CI: 1.35, 3.55, p=0.001), HDL <1.04 mmol/L (AdjOR 2.44, 95% CI: 1.323, 4.52, p=0.004), dyslipidaemia (AdjOR 1.90, 95% CI: 1.03, 3.48, p=0.039), and peripheral neuropathy (AdjOR 3.01, 95% CI: 1.02, 8.93, p=0.047) were significantly associated with microalbuminuria.

Conclusion: Microalbuminuria is a modifiable risk factor in preventing the progression of ESRF among T2DM patients. Therefore, identification of factors associated with microalbuminuria among this high-risk group is important to facilitate early screening and prompt treatment to prevent progression of diabetic kidney disease to ESRF.

Introduction

Globally, the increasing prevalence of type 2 diabetes mellitus (T2DM) is becoming a major public health concern. Worldwide, the number of people affected by diabetes increased from 108 million in 1980 to 422 million in 2014.[1] Furthermore, from 1980 to 2014, the global prevalence of diabetes in adults increased by 3.8%. The rising prevalence of diabetes mellitus is more pronounced and rapid in low- and middle- income countries than in high-income countries,[2] including Malaysia. According to the latest National Health Morbidity Survey (2019), the prevalence of diabetes in adults in Malaysia increased from 11.2% in 2011 to 13.4% in 2015, reaching 18.3% in 2019, which is equivalent to approximately 3.9 million adults.[3] Diabetes is a major cause of blindness, ischemic heart disease (IHD), cerebrovascular accident (CVA), lower limb amputation, and renal failure. Globally, diabetes-related premature mortality increased by 5% between 2000 and 2016, with 1.5 million fatalities directly caused by diabetes in 2019.[4] Nearly half of all deaths attributable to hyperglycaemia occur before the age of 70 years. According to the World Health Organisation (WHO), diabetes was the ninth leading cause of death in 2019.

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are becoming more prevalent globally. The global prevalence of CKD ranges between 11% and 13%.[5] In Malaysia, most recent population-based study reported the prevalence of CKD as 15.48% of the total population in 2018 compared to 9.07% in 2013, with 0.08% of patients

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having stage 5 CKD or ESRD.[6,7] Since 2013, the number of Malaysians with ESRD receiving dialysis had more than doubled to 1,059 per million population (pmp) from 415 pmp in 2003.[8] The increase in ESRD has been largely attributed to the rising prevalence of diabetic nephropathy, which accounts for 58% of new dialysis patients.[9]

The increasing number of patients with ESRD places a significant strain on the healthcare system in terms of human, economic, and social costs. Over a 7-year period, the annual ESRD spending of the public sector increased by 94% from MYR 572 million in 2010 to MYR 1.12 billion in 2016. Total ESRD expenditure increased from 2.95% of total health expenditure in the public sector in 2010 to 4.2% in 2016.[10]

Microalbuminuria (MA) is an important marker of progression to ESRD and an independent predictor of cardiovascular disease (CVD) and mortality across all levels of glomerular filtration rate (GFR).[10] Without intervention, 20–40% of T2DM patients with MA progress to overt nephropathy and, 20 years later, approximately 20% develop ESRD.[11] The 2018 Malaysian clinical practice guidelines for the management of CKD in adults recommend screening for MA in T2DM at time of diagnosis followed by yearly screening, with diagnosis of MA requiring two of three abnormal test results. Early diagnosis of MA is important because effective treatments exist to limit the progression of diabetic nephropathy.[12] Globally, the prevalence of MA among T2DM patients is 36.3% in India,[13] 44.6% in Kazakhstan,[14] 33.2% in Saudi Arabia,[15] 14.2% in Sub-Saharan Africa,[16] and 32.1% in Singapore.[17] Meanwhile, in Malaysia, 25.4% of MA was reported among T2DM patients in one tertiary centre in Kelantan.[18] Among the factors associated with MA in T2DM are increasing age,[19] female gender,[15] ethnicity,[20] obesity, poorly controlled blood pressure,[19] neuropathy, and macrovascular complications.[15]

There is limited published literature on the prevalence of MA and its associated factors in Malaysia. To date, there was one published study on MA among T2DM patients in a tertiary centre on the East Coast in which the findings might differ from the population in Kuala Selangor due to different population demography and socio-cultural aspects.[18] In addition, the increasing prevalence of diabetes in Malaysia will give rise to diabetic complications, particularly diabetic nephropathy and ESRF, resulting increasing healthcare costs. This will eventually lead to morbidity and premature mortality. Diabetic nephropathy is usually asymptomatic until the late stage; therefore, early screening and detection of MA is crucial to prevent its progression. This is in line with the United Nations third Sustainable Development Goal on health and wellbeing, target 3.4: to reduce premature mortality from noncommunicable diseases (NCDs) by one-third between 2015 and 2030. This is in addition to the WHO target of reducing premature deaths from NCDs by 25% between 2010 and 2025. Thus, the aim of this study is to determine the proportion and associated factors of MA among T2DM patients. We believe that identifying the determinants of MA among T2DM patients will help providers to identify patients who are at risk of developing MA for effective intervention. This study will also help healthcare providers to continuously improve the services they deliver.

Methods

Study type and design

This study applied a cross-sectional design based on retrospective data review between December 2020 and February 2021 in Klinik Kesihatan Bukit Cherakah and Klinik Kesihatan Sungai Tengi Kanan.

Secondary data were collected from the National Diabetic Registry (NDR) and review of patients' records. The NDR is an online registry set up by the Ministry of Health in 2009 for surveillance purpose of the diabetic population in Malaysia to monitor the quality of care in patients. Kuala Selangor is one of the districts in Selangor state bounded by Sabak Bernam in the north, Hulu Selangor and Gombak in the west, Petaling in the southwest, and Klang in the south. It has a total of nine mukims. Based on the census in 2010, it had an estimated population of 209,590. The majority of the population were Malay (74.9%) followed by Indian (15.4%) and Chinese (9.5%); 65.4% of the population were aged between 15 and 64 years.

Study participants

The reference populations were all active T2DM patients in Kuala Selangor district in 2020, and the study samples were all active T2DM patients registered with the NDR who attended Bukit Cherakah and SgTengi

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Kanan health clinics in 2020 and fulfilled the inclusion and exclusion criteria. In this study, the inclusion criteria were Malaysian citizen, aged ≥18 years, who had performed a urine microalbumin investigation in 2020. The exclusion criteria were T2DM patients who were pregnant or had comorbidities resulting in proteinuria, such as congestive cardiac failure, overt proteinuria, kidney disease other than diabetic, and stage 4 CKD and ESRF as these additional risk factors would be confounding factors during the analysis.

The sample size was calculated for each variable of associated factors for MA using Power and Sample Size calculation to compare two independent proportions. The largest estimated sample for each group was 345 based on a probability of exposure of associated factors among normoalbuminuria from a literature review,[21] a power of 80% (0.8), alpha of 0.05, P_0 : 0.2 P_1 : 0.34, M : 1, the calculated sample size was 314 patients. Allowing for a 10% dropout rate, a final sample size of 345 was used.

Data collection and analysis

Simple random sampling was applied for sample selection from a list generated from the NDR from each of the health clinics based on proportionate sampling calculated based on the annual active patients registered at each clinic. All data fulfilling the inclusion and exclusion criteria were analysed. Data were collected from both the NDR and patients' diabetic books. The retrieved information comprised sociodemographic data (age, sex, race), anthropometric measurements (weight, height, body mass index [BMI]), duration of diabetes, lifestyle (smoking status), laboratory results (HbA1c, low-density lipoprotein [LDL], creatinine), usage of ACEi/ARBs, comorbidities (hypertension, hyperlipidaemia, gout), diabetic complications (microvascular: diabetic retinopathy/premature cataract, CKD, and peripheral neuropathy; macrovascular: CVD, CVA, and PVD), and staff factors.

MA is considered positive when the urinary albumin-to-creatinine ratio (ACR) is 30–300 mg/g creatinine in two of three tests performed within a 3–6-month period on a spot urine sample.[22] However, in this study, the test was performed annually for each patient due to unforeseen circumstances. Measurement of urine creatinine was performed using Siemens Microalbumin Test Strip, and measurement of urine microalbumin was performed using Siemens Microalbumin urine analyser. The data were extracted from the patients' diabetic record books.

The independent variables were categorised according to ethnicity, which was divided into four groups (Malay, Chinese, Indian, and other) and smoking status (smoking, non-smoking, or quit ≥6 months). BMI was calculated by weight in kilograms divided by height in meters squared and was classified into two categories (normoweight and others) based on the 2003 Malaysian Clinical Practice Guidelines on Management of Obesity cut-off point. Laboratory investigation classified HbA1c ≤7.0% or >7.0%,[23] while high-density lipoprotein (HDL) was classified as ≥1.04 mmol/L or <1.04 mmol/L.[24] The comorbidities, usage of ACEi/ARBs, and diabetic complications were categorised as 'yes' or 'no' and were extracted from the diabetic records. Finally, staff factors, including medical lab technicians (MLTs) who performed urine microalbumin tests not according to the protocol (i.e., performed on a patient with positive urine dipstick for proteinuria) were categorised as 'yes' or 'no'.

Statistical analysis

The statistical package for social sciences (SPSS) version 26.0 software was used for data entry and analysis. Descriptive statistics with mean and standard deviation (SD), frequency, and percentages were calculated. Simple and multiple logistic regression analyses were used to determine factors associated with MA. Multiple logistic regression using the forward stepwise method was performed. In this study, the single dichotomous outcome was coded as 0 for non-MA and 1 for MA. Univariable analysis was performed to select the variables into multiple logistic regression analysis, and only variables with p-value < 0.25 or clinical important were selected. Multicollinearity between different predictor variables was checked using a variance inflation factor (VIF). All possible two-way interaction terms between significant variables were checked one at a time. The final model was determined where the adjusted odds ratio was estimated with a 95% confidence interval (CI). A p-value of less than 0.05 was considered statistically significant.

Ethical approval

Ethical approval for this study was obtained from the National Medical Research Register Ministry of Health (NMRR-20-2087-56369).

Results

Proportion of study population

The total sample retrieved from the registry following the inclusion and exclusion criteria was 343, with 2 (0.16%) participants excluded due to having CKD stage 4.

There were 118 (34.4%) T2DM patients with MA in this study.

Table 1. Proportion of T2DM patients with microalbuminuria (n=343).

Variable	n (%)	95% CI
Microalbuminuria		
No	225 (65.6)	0.65, 0.68
Yes	118 (34.4)	0.33, 0.35

Type 2 diabetes mellitus respondents' characteristics

The respondents' characteristics are presented in **Table 2**. The mean age was 61.0 (9.8), the majority of the respondents were female (74.1%), of Malay ethnicity (97.4%), and non-smokers (95.3%). Most of the respondents were obese (74.1%) and had hypertension (93.0%) and dyslipidaemia (77.8%). Only 3.5% of the study population had IHD and gout respectively; 0.9% had CVA and none had PVD. In term of microvascular diabetic complications, 4.4% of the participants had retinopathy and neuropathy respectively. Almost half (44.6%) of the participants had stage 2 diabetic CKD and 81.3 % were on ACEi/ARBs. Regarding laboratory parameters, most of the respondents had HDL ≥1.04 mmol/L (84.0%) and HbA1c ≤7.0% (66.8%). Only 37.6% of the patients with MA had urine microalbumin investigations performed by MLTs not according to protocol.

Table 2. Characteristics of type 2 diabetes mellitus patient in PKD Kuala Selangor (n=343).

Variable	Total Mean (SD), n (%)	Outcome (n, %)	
		Normal (n=225)	Microalbuminuria (n=118)
Age (years)	61.0 (9.8)	61.1 (8.9)	60.7 (11.0)
Gender			
Female	254 (74.1)	168 (74.7)	86 (72.9)
Male	89 (25.9)	57 (25.3)	32 (27.1)
Ethnicity			
Malay	334 (97.4)	222 (98.7)	112 (94.9)
Chinese	9 (2.6)	3 (1.3)	6 (5.1)
Klinik kesihatan			
Bukit Cherakah	139 (40.5)	85 (37.8)	54 (45.8)
Sg Tengi Kanan	204 (59.5)	140 (62.2)	64 (54.2)
Duration of diabetes (years)	7.87 (5.3)	7.93 (5.7)	7.77 (4.5)
Smoking status			
Non-smoking	327 (95.3)	217 (96.4)	110 (93.2)
Smoking	16 (4.7)	8 (3.6)	8 (6.8)
BMI (kg/m²)			
Normoweight	38 (11.1)	25 (11.1)	13 (11.0)
Underweight	5 (1.5)	4 (1.8)	1 (0.8)
Overweight	46 (13.4)	29 (12.9)	17 (14.4)
Obese	254 (74.1)	167 (74.2)	87 (73.7)
Comorbidities			
Hypertension			
No	24 (7.0)	16 (7.1)	8 (6.8)
Yes	319 (93.0)	209 (92.9)	110 (93.2)
Dyslipidaemia			
No	76 (22.2)	58 (25.8)	18 (15.3)
Yes	267 (77.8)	167 (74.2)	100 (91.9)
Gout			
No	331 (96.5)	217 (96.4)	114 (96.6)
Yes	12 (3.5)	8 (3.6)	4 (3.4)

Table 2. Continued

Variable	Total Mean (SD), n (%)	Outcome (n, %)	
		Normal (n=225)	Microalbuminuria (n=118)
Macrovascular complications			
IHD			
No	331 (96.5)	218 (96.9)	113 (95.8)
Yes	12 (3.5)	7 (3.1)	5 (4.2)
CVA			
No	340 (99.1)	223 (99.1)	117 (99.2)
Yes	3 (0.9)	2 (0.9)	1 (0.8)
PVD			
No	343 (100.0)	225 (100.0)	118 (100.0)
Yes	0 (0.0)	0 (0.0)	0 (0.0)
Microvascular complications			
Retinopathy			
No	328 (95.6)	214 (95.1)	114 (96.6)
Yes	15 (4.4)	11 (4.9)	4 (3.4)
Neuropathy			
No	328 (95.6)	219 (97.3)	109 (92.4)
Yes	15 (4.4)	6 (2.7)	9 (7.6)
Chronic kidney disease			
Stage 1	92 (26.8)	61 (27.1)	31 (26.3)
Stage 2	153 (44.6)	103 (45.8)	50 (42.4)
Stage 3a	76 (22.2)	50 (22.2)	26 (22.0)
Stage 3b	22 (6.4)	11 (4.9)	11 (9.3)
Medications			
ACEi/ARB			
No	64 (18.7)	44 (19.6)	20 (16.9)
Yes	279 (81.3)	181 (80.4)	98 (83.1)
Lab investigations			
LDL (mmol/L)	2.71 (0.9)	2.70 (0.9)	2.71 (1.0)
HDL (mmol/L)			
≥1.04	288 (84.0)	196 (87.1)	92 (78.0)
<1.04	55 (16.0)	29 (12.9)	26 (22.0)
HbA1c			
≤7.0%	229 (66.8)	163 (72.4)	66 (55.9)
>7.0%	114 (33.2)	62 (27.6)	52 (44.1)
Creatinine (μmol/L)	85.2 (26.8)	83.0 (23.4)	89.3 (26.9)
MLT (staff) performing test not according to protocol			
No	214 (62.4)	148 (65.8)	66 (55.9)
Yes	129 (37.6)	77 (34.2)	52 (44.1)

Factors associated with microalbuminuria

Simple logistic regression showed that ethnicity, dyslipidaemia, neuropathy, HDL, HbA1c, creatinine level, and staff (MLT) were significantly associated with MA at p<0.25. Chinese ethnicity (crude OR 3.96, 95% CI: 0.97, 16.15, p=0.055), dyslipidaemia (crude OR 1.93, 95% CI: 1.08, 3.46, p=0.027), and neuropathy (crude OR 3.01, 95% CI: 1.05, 8.68, p=0.041). In addition, HDL <1.04 mmol/L (crude OR 1.97, 95% CI: 1.09, 3.58, p=0.030), HbA1c >7.0% (crude OR 1.20, 95% CI: 1.07, 1.34, p=0.002), creatinine (crude OR 1.01, 95% CI: 1.00, 1.02, p=0.026), and MLT staff performing the test not according to protocol (crude OR 1.51, 95% CI: 0.96, 2.39, p=0.074) were found to be significantly associated with MA. No significant association between age, gender, duration of diabetes, smoking status, BMI, gout, macrovascular complications, retinopathy, usage of ACEi/ARBs, and LDL level with MA was observed. The results are summarised in **Table 3**.

Table 3. Simple logistic regression of factors associated with microalbuminuria (n=343).

Variable	Regression coefficient B	Crude OR (95% CI)	Wald statistic (df)	*p*-value
Age (years)	-0.04 (0.01)	1.00 (0.97, 1.02)	0.14 (1)	0.709
Gender				
Female		1.00		
Male	0.09 (0.26)	1.10 (0.66, 1.82)	0.13 (1)	0.720
Ethnicity				
Malay		1.00		
Chinese	1.38 (0.72)	3.96 (0.97, 16.15)	3.70 (1)	**0.055**
Duration of diabetes (years)	-0.01 (0.02)	0.99 (0.95, 1.04)	0.07 (1)	0.795
Smoking status				
Non-smoking		1.00		
Smoking	0.68 (0.51)	1.97 (0.72, 5.40)	1.75 (1)	0.186
BMI (kg/m²)				
Normoweight		1.00		
Other	-0.59 (0.26)	0.93 (0.55, 1.55)	0.09 (1)	0.771
Comorbidities				
Hypertension				
No		1.00		
Yes	0.05 (0.45)	1.05 (0.44, 2.54)	0.01 (1)	0.909
Dyslipidaemia				
No		1.00		
Yes	0.66 (0.30)	1.93 (1.08, 3.46)	4.87 (1)	**0.027**
Gout				
No		1.00		
Yes	-0.05 (0.62)	0.95 (0.28, 3.23)	0.00 (1)	0.937
Complications				
IHD				
No		1.00		
Yes	0.32 (0.60)	1.38 (0.43, 4.44)	0.29 (1)	0.591
CVA				
No		1.00		
Yes	-0.05 (1.23)	0.95 (0.09, 10.62)	0.00 (1)	0.969
Retinopathy				
No		1.00		
Yes	-0.32 (0.60)	0.68 (0.21, 2.20)	0.41 (1)	0.521
Neuropathy				
No		1.00		
Yes	1.10 (0.54)	3.01 (1.05, 8.68)	4.18 (1)	**0.041**
Medications				
ACEi/ARB				
Yes		1.00		
No	0.18 (0.30)	1.19 (0.67, 2.13)	0.35 (1)	0.556
Lab investigations				
LDL (mmol/L)	0.00 (0.12)	1.00 (0.79, 1.28)	0.00 (1)	0.980
HDL (mmol/L)				
≥1.04		1.00		
<1.04	0.68 (0.31)	1.97 (1.09, 3.58)	4.96 (1)	**0.030**
HbA1c				
≤7.0%		1.00		
>7.0%	0.18 (0.06)	1.20 (1.07, 1.34)	10.07 (1)	**0.002**
Creatinine µmol/L)	0.01 (0.01)	1.01 (1.00, 1.02)	4.98 (1)	**0.026**
MLT (staff)				
No		1.00		
Yes	0.42 (0.23)	1.51 (0.96, 2.39)	3.18 (1)	**0.074**

Multiple logistic regression analysis revealed that HbA1c level, HDL level, dyslipidaemia, and neuropathy were significantly associated with MA (**Table 4**). Respondents with HbA1c >7.0% had 2.19 times the odds of having MA compared with HbA1c ≤7.0% (95% CI: 1.35, 3.55, p=0.001) when adjusted for HDL level, dyslipidaemia, and neuropathy. Respondents with HDL <1.04 mmol/L had 2.44 times the odds of having MA compared to participants with HDL ≥1.04 mmol/L (95% CI: 1.32, 4.52, p=0.005). In addition, respondents with dyslipidaemia had 1.90 times the odds of having MA compared with those without hyperlipidaemia when adjusted for HbA1c, HDL, and neuropathy (95% CI: 1.03, 3.48, p=0.039). Participants with neuropathy had 3.01 times the odds of having MA compared with those without neuropathy when adjusted for HbA1c, HDL, and dyslipidaemia (95% CI: 1.02, 8.93, p=0.047).

Table 4. Multiple logistic regression of factors associated with microalbuminuria (n=346).

Variable	Regression coefficient B	Adjusted OR (95% CI)	Wald statistic (df)	*p*-value
Lab investigations				
HbA1C				
≤7.0%		1.00		
>7.0%	0.78 (0.25)	2.19 (1.35, 3.55)	10.11 (1)	0.001
HDL (mmol/L)				
≥1.04		1.00		
<1.04	0.89 (0.32)	2.44 (1.32, 4.52)	8.04 (1)	0.005
Comorbidities				
Dyslipidaemia				
No		1.00		
Yes	0.64 (0.31)	1.90 (1.03, 3.48)	4.28 (1)	0.039
Complications				
Neuropathy				
No				
Yes	1.10 (0.56)	3.01 (1.02, 8.93)	3.95 (1)	0.047

Constant = -1.642
Enter LR method was applied
No multicollinearity and no interaction
Hosmer–Lemeshow test, p-value <0.001
Classification table 68.5 % correctly classified
Area under Receiver Operating Characteristics (ROC) curve was 64.5%

Discussion

Proportion of microalbuminuria

Previous studies reported marked variation in the prevalence of MA across countries. The proportion of MA in our T2DM patients was 34.4% and was comparable with the previous MA prevalence study on hypertensive T2DM patients in Malaysia in 2006 (39.7%) and a study in India (36.3%).[13,21] The prevalence of MA in this study was much lower than the study among 289 T2DM patients in a tertiary clinic in Bostwana (44.6%) and Korea (56.5%) in a multicenter epidemiological study across 10 countries in Asia[14,25]; but higher compared to the prevalence of MA in Singapore (14.2%) Canada (15%) and the U.K. (24.9%).[26-28] This variation in prevalence can be attributed to factors such as differences in study populations, ethnic susceptibility, definition of MA, and method of assessment of MA between those studies. Adler et.al reported in the U.K. Prospective Diabetes Study (UKPDS 64) that the annual transition rate of MA to macroalbuminuria was 2.8%, and 2.3% of macroalbuminuria progressed to elevated plasma creatinine or required renal replacement therapy.[28]

Factors associated with microalbuminuria

In our study, diabetic patients who had higher HbA1c level were significantly associated with MA. In line with this finding, Lee and Tang[26] found that poorer diabetic control was associated with an almost two-fold increased risk for MA (OR 1.88, 95% CI: 1.26, 2.7). Other studies reported similar results on the relationship between poorer diabetic control and MA.[29,30] Excess intracellular glucose has been demonstrated to stimulate cellular signalling pathways, including the diacylglycerol (DAG)-protein kinase C (PKC) pathway, polyol pathway, hexosamine pathway, advanced glycation end-products (AGEs), and oxidative stress, all of which contribute to

glomerulosclerosis.[31] In addition, Rho-kinase, a small GTPase-binding protein effector, has been linked to ultrastructural damage by inducing endothelial dysfunction, excessive extracellular matrix (ECM) production in the mesangial cells, podocyte abnormalities, and tubulointerstitial fibrosis, resulting in diabetic nephropathy and MA.[32]

Our findings suggest that having dyslipidaemia and lower HDL levels were significantly associated with MA. This is supported by Sun, Xiao,[33] who reported an inverse association between MA and HDL after adjusting for blood pressure, age, gender, HbA1c, BMI, total cholesterol, triglycerides, LDL, duration of diabetes, smoking, and medications. Furthermore, insulin has been demonstrated to have a key role in the formation of ApoA-I, a major HDL apolipoprotein.[34] Therefore, the reduction in insulin action is potentially involved in the low HDL levels observed in T2DM. Moreover, the substantially impaired anti-inflammatory capacity of HDL in T2DM contributes to an increased risk of atherosclerosis.[35] Moreover in diabetic conditions, dyslipidaemia stimulates macrophage infiltration and excessive ECM production in the glomeruli, resulting in diabetic nephropathy.[32] Besides, Sasaki et.al found a substantial reduction in urine albumin excretion among diabetic patients receiving lipid-lowering therapy, corroborating the findings.[36] In contrast, Efundem and Molefe-Baikai et.al found no significant difference between dyslipidaemia, HDL level, and MA.[14,16] The observed differences in the association between HDL level and MA may be attributed to differences in the cholesterol measurement used in those studies.

Our data suggest a significant association between peripheral neuropathy and MA. There was a 4.9% higher proportion of peripheral neuropathy among the MA group than the normoalbuminuria group. Similar findings were reported in a prospective cohort study in Birmingham in which peripheral neuropathy was independently associated with MA in addition to a local study in Kelantan.[18,37] Patel et. al reported that those with peripheral neuropathy had a higher albumin excretion rate (15.2 ± 6.3 micrograms/min) than participants with normoalbuminuria.[38] These findings are consistent with the presence of a microvascular component in the pathogenesis of diabetic neuropathy. Although the staff factor is only significant at a univariate level, our findings highlight the importance of staff education and continuous assessment on performing urine microalbumin analysis, as affects the prevalence and the early identification of patients with MA and their referral for prompt treatment. The effect of the staff factor, techniques on variability, and reliability of test results has been demonstrated in other studies.[39,40] Finally, hypertension, IHD, CVA, PVD, and smoking status were not significantly associated with MA in our study; however the results should be interpretated with caution due to the small sample size of each subgroup.

Despite its associated complications, T2DM is a condition that is mostly preventable and treated. Based on our findings, in addition to the large proportion of T2DM patients who are obese (74.1%) in this study and in Malaysia as a whole, primary prevention strategies should target high-risk groups, such as obese patients, who have been identified by the WHO,[1] as a major contributor to the global rise in diabetic prevalence. Early weight intervention, diabetic screening for early diagnosis, and timely treatment to avoid diabetic progression should all be part of these prevention efforts.

These prevention strategies should include early weight intervention, diabetic screening for early diagnosis, and prompt treatment to prevent diabetic progression. For secondary prevention, MA screening should be performed annually in all patients with T2DM, especially among those with HbA1c >7.0%, HDL <1.04 mmol/L, dyslipidaemia, and peripheral neuropathy, as early treatment with CV risk reduction measures is crucial. The primary strategy is to halt the progression of renal disease via prompt treatment of diabetes and other comorbidities, including dyslipidaemia. While MA testing is crucial, ensuring proper procedure by performing staff according to protocols should be ensured through periodic audits.

To our knowledge, this is the first population-based study in Malaysia that showed the association of HbA1c >7.0%, HDL <1.04 mmol/L, dyslipidaemia, and peripheral neuropathy with MA in T2DM patients. Nevertheless, this study is not without limitations. First, due to the nature of this study, we could not establish causality. Second, only two health clinics were involved in this study, which limits its generalisability.

Nevertheless, an adequate sample size was reached based on the sample size calculation to achieved 80% power of the study. Third, due to the nature of the secondary data, information on comorbidities, such as IHD, CVA, PVD, hypertension, and smoking status, may have changed and may not have been updated from the initial records. Fourth, most patients with complications were treated in hospitals, limiting the number of patients with complications in this study. Therefore, future studies should include patients in hospitals, health clinics, and the community so that the true burden of MA can be appreciated.

In conclusion, the proportion of MA in Kuala Selangor district was 34.4%. The factors found to be associated with MA in this study were poorer diabetic control, lower HDL level, dyslipidaemia, and peripheral neuropathy. MA is not only a risk factor for ESRF in diabetes, but it is also an important marker of mortality in the diabetic population. Early detection of MA among high-risk diabetes patients and early treatment of MA would prevent the progression of diabetic nephropathy, thereby preventing premature death.

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Conflicts of interest

The research received no funding. The authors declare there are no conflicts of interest.

How does this paper make a difference in general practice?

- Given the high prevalence of T2DM and ESRF in Malaysia, this study demonstrates the critical need for aggressive public health measures aimed at preventing diabetes and early treatment for T2DM patients.
- This study identifies high-risk groups associated with MA in T2DM, including those with HbA1c ≥7.0%, dyslipidaemia, low HDL, and peripheral neuropathy.
- Although staff factors are only significant in univariate analysis, it is critical to follow proper protocols when performing MA testing (i.e., only performing testing on patients without gross proteinuria, as this would affect prevalence and early identification of patients for prompt treatment).

References

1. World Health Organization. Global report on diabetes 2016. Accessed January 11, 2021. https://www.who.int/publications/i/item/9789241565257.

2. NCD Risk Factor Collaboration. Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants. *Lancet* (London, England). 2016;387(10027):1513-30. doi:10.1016/S0140-6736(16)00618-8

3. Ministry of Health. National Health Morbidity Survey 2019. Accessed December 11,2019.http://iku.moh.gov.my/images/IKU/Document/REPORT/NHMS2019/Fact_Sheet_NHMS_2019-English.pdf.

4. World Health Organization. About Diabetes 2020. Accessed December 14,2019. https://www.who.int/diabetes/action_online/basics/en/index3.html.

5. Hill NR, Fatoba ST, Oke JL, et al. Global Prevalence of Chronic Kidney Disease - A Systematic Review and Meta-Analysis. *PLoS ONE*. 2016;11(7):e0158765-e. doi:10.1371/journal.pone.0158765

6. Hooi LS, Ong LM, Ahmad G, et al. A population-based study measuring the prevalence of chronic kidney disease among adults in West Malaysia. *Kidney Int*. 2013;84(5):1034-40. doi:10.1038/ki.2013.220.

7. Saminathan TA, Hooi LS, Mohd Yusoff MF, et al. Prevalence of chronic kidney disease and its associated factors in Malaysia; findings from a nationwide population-based cross-sectional study. *BMC Nephrol*. 2020;21(1):344.

8. Lim T, Lim Y, Morad Z, et al. 11th Report Of The Malaysian Dialysis & Transplant Registry. Malaysia: National Renal Registry. 2004. Accessed November 11, 2019. https://www.msn.org.my/msn/Doc/PublicDoc_PB/Publication/nrr_report2003/NRR11report.pdf

9. Lim Y, Ong L, Goh B. 19th Report of the Malaysian Dialysis and Transplant Registry 2011. Kuala Lumpur: National Renal Registry. 2011. Accessed November 11, 2019. https://www.msn.org.my/msn/Doc/PublicDoc_PB/Publication/nrr_report2011/fullreport.pdf

10. Ismail H, Abdul Manaf MR, Abdul Gafor AH, et al. Economic Burden of ESRD to the Malaysian Health Care System. *Kidney Int Rep*. 2019;4(9):1261-70.

11. American Diabetes Association. Nephropathy in Diabetes 2004. Accessed December 12,2019. https://care.diabetesjournals.org/content/27/suppl_1/s79

12. Hall PM. Prevention of Progression in Diabetic Nephropathy. *Diabetes Spectr*. 2006;19(1):18-24. doi:10.2337/diaspect.19.1.18

13. Varghese A, Deepa R, Rema M, et al. Prevalence of microalbuminuria in type 2 diabetes mellitus at a diabetes centre in southern India. *Postgrad Med J*. 2001;77(908):399-402. doi: 10.1136/pmj.77.908.399

14. Molefe-Baikai O, Molefi M, Cainelli F, Rwegerera G. The prevalence of microalbuminuria and associated factors among patients with type 2 diabetes mellitus in Botswana. *Niger. J. of Clin. Pract*. 2018;21(11):1430-7. Accessed December 11, 2019.

15. Aljabri K, Bokhari S, Alshareef M, et al. Frequency of Microalbuminuria in Saudi Adults with Type 2 Diabetes Mellitus. *ECEMR*. 2018. 3.1(2018): 21-2.

16. Efundem NT, Assob JCN, Feteh VF, et al. Prevalence and associations of microalbuminuria in proteinuria-negative patients with type 2 diabetes in two regional hospitals in Cameroon: a cross-sectional study. *BMC Res*. Notes. 2017;10(1):477. doi:10.1186/s13104-017-2804-5

17. Loh PT, Toh MP, Molina JA, Vathsala A. Ethnic disparity in prevalence of diabetic kidney disease in an Asian primary healthcare cluster. *Nephrology (Carlton)*. 2015;20(3):216-223. doi:10.1111/nep.12379

18. Abougalambou SS, Abougalambou AS. Prevalence and risk factors of microalbuminuria in type 2 diabetes mellitus outpatients at University Sains Malaysia Hospital. *Diabetes Metab Syndr*. 2013;7(2):64-7. doi: 10.1016/j.dsx.2013.02.034

19. Kim YS, Kim HS, Oh HY, et al. Prevalence of microalbuminuria and associated risk factors among adult Korean hypertensive patients in a primary care setting. *Hypertens. Res*. 2013;36(9):807-23. doi:10.1038/hr.2013.44

20. Simmons D, Shaw LM, Scott DJ, et al. Diabetic Nephropathy and Microalbuminuria in the Community: The South Auckland Diabetes Survey. *Diabetes Care*. 1994;17(12):1404-10. doi:10.2337/diacare.17.12.1404

21. Kong N, Chia Y, Khalid B, et al. Microalbuminuria prevalence study in hypertensive type 2 diabetic patients in Malaysia. *Med J Malaysia*. 2006;61(4):457-65.

22. Ministry of Health. CPG Management of Chronic Kidney Disease 2018. Accessed December 12,2019. https://www.moh.gov.my/moh/resources/penerbitan/CPG/CPG%20Management%20of%20Chronic%20Kidney%20%20Disease%20(Second%20Edition).pdf.

23. Pasko N, Toti F, Strakosha A, et al. Prevalence of microalbuminuria and risk factor analysis in type 2 diabetes patients in Albania: the need for accurate and early diagnosis of diabetic nephropathy. *Hippokratia*. 2013;17(4):337-41.

24. Ge P, Dong C, Ren X, Weiderpass E, et al. The High Prevalence of Low HDL-Cholesterol Levels and Dyslipidemia in Rural Populations in Northwestern China. *PLoS ONE*. 2015;10(12):e0144104-e. doi:10.1371/journal.pone.0144104

25. Wu AY, Kong NC, de Leon FA, et al. An alarmingly high prevalence of diabetic nephropathy in Asian type 2 diabetic patients: the Microalbuminuria Prevalence (MAP) Study. *Diabetologia*. 2005;48(1):17-26. doi:10.1007/s00125-004-1599-9

26. Lee ES, Tang WE. The prevalence of albuminuria among diabetic patients in a primary care setting in Singapore. *Singapore Med J*. 2015;56(12):681-6. doi:10.11622/smedj.2015189

27. Zacharias JM, Young TK, Riediger ND, et al. Prevalence, risk factors and awareness of albuminuria on a Canadian First Nation: A community-based screening study. *BMC Public Health*. 2012;12(1):290. doi:10.1186/1471-2458-12-290

28. Adler AI, Stevens RJ, Manley SE, et al. Development and progression of nephropathy in type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS 64). *Kidney Int*. 2003;63(1):225-32. doi:10.1046/j.1523-1755.2003.00712.x.

29. Chen W-Z, Hung C-C, Wen Y-W, et al. Effect of glycemic control on microalbuminuria development among type 2 diabetes with high-normal albuminuria. *Ren. Fail*. 2014;36(2):171-5. doi:10.3109/0886022X.2013.832312.

30. Ahmad T, Ulhaq I, Mawani M, et al. Microalbuminuria in Type-2 Diabetes Mellitus; the tip of iceberg of diabetic complications. *Pak J Med Sci*. 2017;33(3):519-23. doi:10.12669/pjms.333.12537

31. Lim AK. Diabetic nephropathy - complications and treatment. *Int J Nephrol Renovasc Dis*. 2014;7:361-81. doi:10.2147/IJNRD.S40172.

32. Kawanami D, Matoba K, Utsunomiya K. Signaling pathways in diabetic nephropathy. Histol Histopathol. 2016;31(10):1059-67. doi:10.14670/HH-11-777.

33. Sun X, Xiao Y, Li P-M, et al. Association of serum high-density lipoprotein cholesterol with microalbuminuria in type 2 diabetes patients. *Lipids Health Dis*. 2018;17(1):229. doi:10.1186/s12944-018-0878-2.

34. Mooradian AD, Haas MJ, Wong NCW. Transcriptional Control of Apolipoprotein A-I Gene Expression in Diabetes. *Diabetes*. 2004;53(3):513-20. doi:10.2337/diabetes.53.3.513

35. Ebtehaj S, Gruppen EG, Parvizi M, Tietge UJF, Dullaart RPF. The anti-inflammatory function of HDL is impaired in type 2 diabetes: role of hyperglycemia, paraoxonase-1 and low grade inflammation. *Cardiovasc Diabetol*. 2017;16(1):132. Published 2017 Oct 12. doi:10.1186/s12933-017-0613-8

36. Sasaki T, Kurata H, Nomura K, et al. Amelioration of proteinuria with pravastatin in hypercholesterolemic patients with diabetes mellitus. *Jpn J Med* 1990;29(2):156-63. doi:10.2169/internalmedicine1962.29.156

37. Bell DS, Ketchum CH, Robinson CA, et al. Microalbuminuria associated with diabetic neuropathy. *Diabetes Care*. 1992;15(4):528-31.

38. Patel KL, Mhetras SB, Varthakavi PK, et al. Microalbuminuria in insulin dependent diabetes mellitus. *J Assoc Physicians India*. 1999;47(6):589-95.

39. Shahangian S, Cohn RD. Variability of laboratory test results. *Am J Clin Pathol* 2000;113(4):521-7.

40. Fenta DA, Ali MM. Factors Affecting Quality of Laboratory Result During Ordering, Handling, and Testing of the Patient's Specimen at Hawassa University College of Medicine and Health Science Comprehensive Specialized Hospital. *J Multidiscip Healthc*. 2020;13:809-21. doi:10.2147/JMDH.S264671

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ORIGINAL ARTICLE

Prevalence of smartphone addiction and its associated factors among pre-clinical medical and dental students in a public university in Malaysia

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Said AH, Mohd FN, Yusof MZ, et al. Prevalence of smartphone addiction and its associated factors among pre-clinical medical and dental students in a public university in alaysia. *Malays Fam Physician.* 2022;17(3):64–73. https://doi.org/10.51866/oa.75

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Abstract

Introduction: Smartphone addiction is becoming a global concern affecting every part of society, including healthcare professionals. This study aimed to identify the prevalence of risk of smartphone addiction and its associated factors among medical and dental students in a public university in Malaysia.

Methods: This cross-sectional study was conducted among pre-clinical medical and dental students using convenience sampling. Questions regarding sociodemographic profile and responses to the Smartphone Addiction Scale Short Version (SAS-SV) and Depression, Anxiety and Stress Score questionnaire (DASS-21) were collected. Multiple logistic regression testing was used to analyse the factors associated with smartphone addiction.

Results: We invited 409 pre-clinical medical and dental students to participate voluntarily, resulting in a response rate of 80.2%. The prevalence of high-risk smartphone addiction among the participants was 47.9%. Male participants, participants who used smartphones mainly for social media, and participants with depressive symptoms were more likely to have a high risk of smartphone addiction. Medical students, participants who spent less than 3 hours per day on a smartphone, and participants who used smartphones for education-related activities were less likely to have a high risk of smartphone addiction.

Conclusion: Smartphone addiction prevalence among pre-clinical medical and dental students was high. Therefore, the authorities should overcome this problem by implementing early measures.

Introduction

The revolution of smartphones brought about numerous benefits, especially with the emergence of the internet. In addition to phone calls and text messages, many other useful applications could be easily installed on smartphones.[1] Smartphones are extensively used in the delivery of healthcare services, including record-keeping, medical references, and billing. Furthermore, they help improve communication between hospital medical staff and enhance telemedicine capability.[2] From medical and dental students' perspectives, smartphones allow them to access information easily and quickly.

Despite all the benefits and conveniences that they offer, there is a growing concern regarding the potential negative effects of excessive smartphones use on the psychology and behaviour of the individual, namely addiction. Addiction can be defined as a phenomenon that manifests with tolerance, withdrawal symptoms, and dependence, and is accompanied by social problems.[3] Previous studies have defined smartphone addiction using various terms. One of the most common definitions for smartphone addiction refers to 'dependency, excessive and uncontrolled use of smartphone'.[4] 'Smartphone addiction' can be considered one form of technological addiction.[5] Griffiths (1996) operationally defined technological addictions as a behavioural addiction involving human–machine interaction that is non-chemical.[6]

Smartphone addiction has numerous harmful effects, as it alters quality of life, including efficacy, productivity, sleep patterns, physical activity, and the behaviour of the affected

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individual.[1,3,5,7-8] Even though smartphones improve the communication efficacy of health providers, smartphone addiction was found to reduce self-efficacy and productivity among those affected.[9-10] Smartphone addiction also can lead to poor sleep quality and reduced physical activity,[1,3,5,7] and it can harm other people if negligence or ignorance occurs in public, such as using a smartphone while driving, which may cause automobile accidents.[3]

Previous studies have reported a high prevalence of smartphone addiction among medical and dental students, both in local and international settings.[7,11-13] This illustrates that most students are becoming too dependent on phones. The primary concern for educators is that usage of a smart device might negatively impact students' academic performance. In addition, Malaysia is facing increasing psychological problems, such as depression, anxiety, and stress.[14-15] Interestingly, researchers have reported that these mental health problems are significantly associated with smartphone addiction.[5,7,16-17] The findings are consistent in studies in which smartphone addiction is associated with poor mental health status among university students.[5,7-8,16-17] However, there is a paucity of similar local studies, especially among undergraduate medical and dental students; therefore, the objective of our study was to assess this association in a more relevant setting.

The aim of this study is to measure the prevalence of smartphone addiction in pre-clinical medical and dental students at the International Islamic University Malaysia (IIUM) Kuantan Campus. Furthermore, this study aims to study the possible factors associated with smartphone addiction. Identifying these factors will aid in early detection and management of this problem. Factors found to be related to smartphone addiction from previous studies include age, gender, financial status, physical activity, sleep problems, and mental health status.[1,3,5,7-8] Our study includes several other factors: the students' faculty (medical or dental), parental marriage status, family history of psychiatric illness, smoking, and scholarship status. We were interested in whether these factors had a significant association with smartphone addiction. By identifying the factors contributing to smartphone addiction, the authorities may take proper measures by creating awareness and planning for early intervention to curb this major problem.

Methods

Study design, population and sample size

A cross-sectional study was conducted at IIUM Kuantan Campus among year 1 and year 2 medical and dental pre-clinical students from 15th October 2018 to 25th August 2019 using convenience sampling. This study focused on pre-clinical students as they are considered newcomers to the university, and some are new owners of smartphones. We were interested in understanding how well the students coped with different environments, far from parental guidance, in terms of smartphone use and mental health problems. The prevalence of smartphone addiction among local university students in a previous study was 47.7%.[8] Using the single-proportion formula, the minimum required sample size was 250, with a precision of 0.05 and considering 20% non-response rate.

Study instruments and data collection

A validated Smartphone Addiction Scale Short Version (SAS-SV) was used to screen the prevalence of smartphone addiction among the students in healthcare faculties.[3] The scale consists of 10 questions. Each question is given a score: 1=strongly disagree, 2=disagree, 3=weakly disagree, 4=weakly agree, 5=agree, or 6=strongly agree. Its reliability was shown to be excellent, with a Cronbach's alpha value of 0.911. The cut-off value for high risk of smartphone addiction was ≥31 and ≥33 for males and females, respectively.

All data were collected using a self-administered questionnaire, which was divided into three parts. Part A included information on the participant's sociodemographic characteristics, which included faculty,gender, race, marital status, scholarship status, household income, regular exercise, sleep problems, smoking, parental status, family history of psychiatric problems, number of smartphones owned, time spent on a smartphone, and main usage of the smartphone. The reason for usage of smartphones was divided into 1, 'browsing the internet not related to education activities', which referred to any web browsing ot related to medical or dental education; 2, 'social media', which referred to browsingany social media application, such as 'Facebook', 'Instagram', or 'Twitter'; 3, 'basic phone services', which referred to basic services, such as 'making a call' and 'texting'; 4, games; and 5, 'education-related activities', which referred to any activities using smartphones for education purposes, including website browsingand video calls for teaching purposes.

Part B screened for the presence of smartphone addiction among the students of healthcare faculties using the validated Smartphone Addiction Scale Short Version (SAS-SV).[3] Based on a previous local study, we used 3 hours per day as the cut-off point to identify participants with a smartphone addiction.[12] Part C determined the presence of depression, anxiety, and stress among the participants using the validated Depression, Anxiety and Stress Scale 21 (DASS-21).[18] The conditions were further classified as normal, mild, moderate, severe, or extremely severe. Only participants with normal levels in these three components were grouped as having no depression, anxiety, or stress. The DASS-21 is one of the most used questionnaires to assess mental health problems and was validated several years earlier. This questionnaire also possesses excellent psychometric properties, with a Cronbach's alpha of 0.81 for depression, 0.89 for anxiety, and 0.78 for stress subscales.[19]

Data analysis

Data entry and analysis were performed using IBM SPSS version 25.0. Categorical variables are reported as frequencies and percentages. Sociodemographic characteristics and level of depression, anxiety, and stress were analysed using a chi-square test and Fisher's exact test. A 95% confidence interval (CI) was used, and a p-value <0.05 was considered statistically significant. Later, the factors associated with smartphone addiction were analysed using a binary logistic regression test. The odds ratio (OR) at 95% CI was reported to measure the likelihood of the factors being associated with smartphone addiction.

Ethical considerations

This study was approved by the Kulliyyah of Medicine and IIUM Research Ethics Committee (IREC), ID no. IREC 2019-143. Participation was entirely voluntary. A written consent form was signed by all participants who agreed to participate in the survey. Furthermore, they were well-informed that their data confidentiality was preserved. Participants who were found to have severe or extremely severe anxiety, stress, or depression were contacted and advised to seek treatment at our clinic.

Results

Three hundred and twenty-eight students participated in this study; 225 students were from Faculty of Medicine and 102 students were from Kulliyyah of Dentistry, with a response rate of 80.2%.

The participants' sociodemographic profiles and mental health statuses are summarised in **Table 1**. Most participants owned only one smartphone (88.4%) and spent more than 3 hours per day on their smartphone (79.9%). The three main reasons for smartphone usage among the participants were social media (78.0%), browsing the internet not related to educational activities (53.4%), and education-related activities (43.9%).

Regarding mental health status, 41.2% of the participants had symptoms of depression, but most had only mild-to-moderate symptoms. More than half of the participants had symptoms of moderate-to-extremely severe anxiety (50.2%), but their stress levels were mostly normal (66.2%).

Table 1. Sociodemographic profile and mental health status of the participants.

Variable	n	%
Medicine	225	68.6
Dentistry	103	31.4
Gender		
Female	246	75.0
Male	82	25.0
Race		
Malay	322	98.2
Non-Malay	6	1.8
Marital status		
Single	328	100.0
Married	0	0.0
Scholarship status		
Yes	159	48.5
No	169	51.5

Table 1. Continued		
Variable	**n**	**%**
Household income		
B40	83	26.3
M40	89	28.2
T20	144	45.6
Regular exercise		
Yes	117	35.7
No	211	64.3
Sleep problems		
Yes	103	31.4
No	225	68.6
Parents' marital status		
Married	305	93.0
Divorce	23	7.0
Smoking status		
Smoker	5	1.5
Non-smoker	323	98.5
Family history of psychiatric problems		
Yes	18	5.5
No	310	94.5
Number of smartphones owned		
≤1	290	88.4
≥2	38	11.6
Time spent on a smartphone (hours/day)		
>3	262	79.9
0–3	66	20.1
Smoking status		
Smoker	5	1.5
Non-smoker	323	98.5
Main usage of smartphone		
Surfing the internet not related to educational activities		
Yes	175	53.4
No	153	46.6
Social media		
Yes	256	78.0
No	72	22.0
Basic phone services		
Yes	130	39.6
No	198	60.4
Games		
Yes	61	18.6
No	267	81.4
Education-related activities		
Yes	144	43.9
No	184	56.1
Level of depression, anxiety, and stress		
Depression		
Normal	193	58.8
Mild	43	13.1
Moderate	54	16.5
Severe	20	6.1
Extremely severe	18	5.5
Anxiety		
Normal	126	38.5
Mild	37	11.3
Moderate	63	19.3
Severe	45	13.8
Extremely severe	56	17.1

Table 1. Continued		
Variable	**n**	**%**
Level of depression, anxiety, and stress		
Stress		
Normal	217	66.2
Mild	49	14.9
Moderate	35	10.7
Severe	20	6.1
Extremely severe	7	2.1

Figure 1 presents the risk of smartphone addiction among the participants. Almost half (47.9%) of the students had a high risk of smartphone addiction.

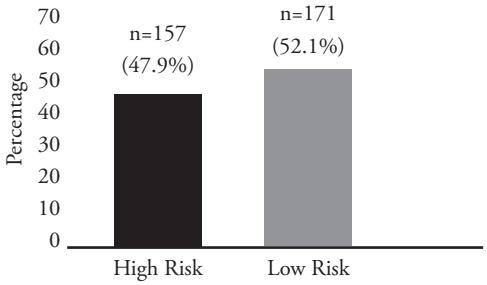

Figure 1. Prevalence of the risk of smartphone addiction among the participants.

The factors associated with smartphone addiction are presented in **Table 2**. There was a significant association between the risk of smartphone addiction and Kulliyyah, gender, sleep problems, time spent on the smartphone, usage of smartphones for social media and for education-related activities. The result revealed a significant relationship between risk of smartphone addiction and depression (p=0.001) and stress (p=0.007).

Table 2. Association between sociodemographic profile, mental health status, and risk of smartphone addiction.

Variable	Risk of smartphone addiction		χ^2	P
	High risk n (%)	Low riskn (%)		
Kulliyyah				
Medicine	98 (62.4)	127 (74.3)	5.33	**0.021***
Dentistry	59 (37.6)	44 (25.7)		
Gender				
Female	104 (66.2)	142 (83.0)	12.32	**<0.001***
Male	53 (33.8)	29 (17.0)		
Race				
Malay	155 (98.7)	167 (97.7)	0.52	0.472
Non-Malay	2 (1.3)	4 (2.3)		
Scholarship status				
Yes	70 (44.6)	89 (52.0)	1.82	0.177
No	87 (55.4)	82 (48.0)		
Household income				
B40	41 (26.5)	42 (26.1)	0.44	0.801
M40	46 (29.7)	43 (26.7)		
T20	68 (43.9)	76 (47.2)		
Regular exercise				
Yes	51 (32.5)	66 (38.6)	1.33	0.248
No	106 (67.5)	105 (61.4)		
Sleep problems				
Yes	60 (38.2)	43 (25.1)	6.50	**0.011***
No	97 (61.8)	128 (74.9)		
Parents' marital status				
Married	146 (93.0)	159 (93.0)	0.00	0.997
Divorce	11 (7.0)	12 (7.0)		
Smoking status				
Smoker	4 (2.5)	1 (0.6)	2.10	0.197
Non-smoker	153 (97.5)	170 (99.4)		

Table 2. Continued				
Variable	Risk of smartphone addiction		χ^2	P
	High risk n (%)	Low riskn (%)		
Family history of psychiatric problems				
Yes	12 (7.6)	6 (3.5)	2.70	0.100
No	145 (92.4)	165 (96.5)		
Number of smartphones owned				
≤1	138 (87.9)	152 (88.9)	0.08	0.779
≥2	19 (12.1)	19 (11.1)		
Time spent on a smartphone (hours/day)				
>3	138 (87.9)	124 (72.5)	12.05	**<0.001***
0–3	19 (12.1)	47 (27.5)		
Main usage of smartphone				
Surfing the internet not related to educational activities				
Yes	66 (58.0)	84 (49.1)	2.66	0.109
No	66 (42.0)	87 (50.9)		
Social media				
Yes	131 (83.4)	125 (73.1)	5.11	**0.024***
No	26 (16.6)	46 (26.9)		
Basic phone services				
Yes	60 (38.2)	70 (40.9)	0.25	0.615
No	97 (61.8)	101 (59.1)		
Games				
Yes	31 (19.7)	30 (17.5)	0.26	**0.609**
No	126 (80.3)	141 (82.5)		
Education-related activities				
Yes	56 (35.7)	88 (51.5)	8.29	**0.004***
No	101 (64.3)	83 (48.5)		
Level of depression, anxiety, and stress				
Depression				
Yes	80 (51.0)	55 (32.2)	11.94	**0.001***
No	77 (49.0)	116 (67.8)		
Anxiety				
Yes	103 (65.6)	98 (57.6)	2.18	0.172
No	54 (34.4)	72 (42.4)		
Stress				
Yes	65 (41.4)	56 (26.9)	7.69	0.007*
No	92 (58.6)	125 (73.1)		

*p-value <0.05

Multiple logistic regression analysis was performed to evaluate the factors associated with risk of smartphone addiction (**Table 3**). Male participants, participants who used the smartphone mainly for social media, and participants with depression were more likely to have high risk of smartphone addiction. Participants from Kulliyyah of medicine, participants who spent less than 3 hours per day on their smartphone, and participants who used their smartphones for education-related activities were less likely to have a high risk of smartphone addiction. Sleep problems and having anxiety and stress symptoms were not significantly associated with smartphone addiction.

Table 3. Multiple logistic regression analysis to determine factors associated with high risk of smartphone addiction.

Variable	B	Wald	AOR+	95% CI#	P
Kulliyyah					
Dentistry (reference)					
Medicine	0.57	4.68	0.56	0.34–0.95	**0.03***
Gender					
Female (reference)					
Male	0.80	7.61	2.23	1.26–3.94	**0.01***
Sleep problems					
Yes (reference)					
No	0.24	0.83	0.79	0.47–1.32	0.36
Time spent on smartphone (hours per day)					
>3 (reference)					
0–3	0.87	7.40	0.42	0.23–0.79	**0.01***
Use of smartphone for social media					
No (reference)					
Yes	0.63	4.08	1.87	1.02–3.43	**0.04***
Use of smartphone for education-related activities					
No (reference)					
Yes	0.70	7.24	0.50	0.30-0.83	**0.01***
Depression					
No (reference)					
Yes	0.63	5.85	1.87	1.13–3.12	**0.02***
Stress					
No (reference)					
Yes	0.34	1.60	1.41	0.83–2.39	0.21

Discussion

The prevalence of participants with high-risk smartphone addiction was 47.9%, which was marginally lower than a local study conducted among medical students at UiTM Sungai Buloh and Selayang Campus, where the prevalence was more than one-half.[12] In contrast, another local study conducted at a private university reported that only one-third of dental students exhibited excessive smartphone use.[13] This difference might be due to different tools used to measure the phenomenon. The dental students were interviewed using a pre-tested and self-rated questionnaire, resulting in a subjective estimation of the problem. In addition, there was a notable difference in the prevalence of smartphone addiction compared to international findings. A study conducted in China found a lower prevalence of smartphone addiction (29%).[7] In contrast, a study conducted in Saudi Arabia reported a higher prevalence of smartphone addiction (71%).[20] Therefore, the prevalence of smartphone addiction among medical and dental students varies between countries, and it would be of interest to study the reasons for these differences.

This study further investigated the pattern of smartphone use: most participants spent more than 3 hours per day on their smartphone, and their primary use was social media, which was consistent with a local study among medical students and staff at Malaysian public universities.[12] Moreover, a study conducted in Saudi Arabia reported that most dental students spent more than 3 hours on their smartphones; however, most of these students used their smartphones for web surfing.[20] Therefore, smartphone usage is part of the daily activities for most medical and dental students. Smartphone addiction is a major problem in this era both globally and locally. Because smartphone addiction can lead to poor productivity and quality of life among students, which will affect their future careers, the authorities should take proper measures regarding mental health problems related to this technology by focusing more research on factors associated with smartphone addiction, creating awareness, and planning early interventions to minimise this problem.

Dental students were found to be more likely than medical students to have a high risk of smartphone addiction. This finding was likely due to pre-clinical-year dental students having a more open schedule than pre-clinical-year medical students, allowing them more time

to spend on their smartphones. Surprisingly, there have been no studies comparing the risk of smartphone addiction in students in medical and dentistry. In our study, males had a significantly higher risk of smartphone addiction than females. This finding was inconsistent with a study conducted among medical and dental students in Malaysia and China that showed no significant variation among genders.[7,12] However, a study conducted among university students in other programmes reported that females had a higher prevalence of smartphone addiction than males.[21] Due to inconsistencies in findings regarding the prevalence of smartphone addiction among males and females, further studies with a larger sample size are necessary to clarify the inconsistent results.

Our study found that smartphone use for social media and educational purposes were significant determinants smartphone addiction; participants who used smartphones primarily for social media had a higher risk of smartphone addiction, and vice versa for those who used smartphones primarily for educational purposes. Previous research showed that social networking was one of the significant predictors of smartphone addiction among university students in the United States.[22] This could be because the population studies involved young adults, an age group in which social networking is the preferred medium for socialising via smartphones. Otherwise, no research has been published on the relationship between smartphone use for education and the risk of smartphone addiction. Fortunately, this discovery in our study suggests that smartphones used for educational purposes can be promoted to students without fear of smartphone addiction.

Furthermore, participants with depression were more likely to have a high risk of smartphone addiction than participants without depression. This finding was supported by a previous study that identified depression as one of the major initiators of internet addiction.[23] The current study's findings are consistent with a study conducted among medical students in China that revealed a significant relationship between smartphone addiction and depression.[7] The possible reason for this association is that students who have depression might use their smartphones as an escape from feeling depressed. A previous study found that smartphone use could act as an avoidance strategy to aversive emotional content.[7] In addition, people with depression may have sleep problems and could use a smartphone throughout the night in attempt to overcome this problem; this could occur repeatedly, which may lead to smartphone addiction. It would be interesting to determine whether the use of smartphones can help people with depression improve their symptoms or if it makes their symptoms worse.

Unfortunately, this study failed to find a link between sleep problems, anxiety, stress symptoms, and smartphone addiction. It differed from studies conducted in China and Lebanon, where these variables were discovered to be significant independent factors for smartphone addiction.[7,16,25] These findings may indicate that medical and dental students in the our study did not use smartphones as a coping mechanism against sleep or psychological problems, including anxiety and stress. Therefore, it would be of interest for future research to identify our students' coping mechanisms.

There were several limitations of this study. First, the prevalence of smartphone addiction in this study cannot be generalised to the general population due to non-random sampling. However, the sample size was large and adequate to represent pre-clinical medical and dental students in IIUM Kuantan Campus, which allowed us to observe statistically significant results. Moreover, the present study had a sufficient response rate as the participants cooperated well in this survey. Second, the study tools used to determine the participants' sociodemographic profiles depended on self-reported measures that could have been overestimated, such as the questions regarding sleep problems and regular exercise. Otherwise, the tools used to measure the risk of smartphone addiction and level of depression, anxiety, and stress among the participants were validated. Other limitations include recall and reporting bias, as participants had to recall their time spent on the smartphone and may have omitted some information, such as smoking status and monthly household income. Nonetheless, the current study had reliable responses, as it used fixed-response questions, which reduced the variability in the results that differences among the interviewers may have caused.

Some recommendations for future research can be implemented. To accurately generalise the results to the population, researchers

should use probability sampling techniques, such as random sampling. Furthermore, a future study population could be expanded to a larger geographical area involving multiple universities from both public and private sectors. For more accurate statistical analysis, we recommend that each group for each independent variable have an equal number of participants. Furthermore, it is recommended that appropriate agencies conduct more research on emerging mental health problems associated with rapidly evolving technologies.

Conclusion

The risk of smartphone addiction among pre-clinical medical and dental students at IIUM Kuantan was high. Of all the variables studied, male gender, depression, and using a smartphone primarily for social media were associated with a high risk of smartphone addiction. Medical students, who spent less than 3 hours per day on a smartphone and used smartphones mainly for education-related activities were less likely to have a smartphone addiction. Because it is well known that smartphone addiction can have negative impacts, it is essential to raise awareness of the high prevalence of smartphone addiction and to plan for early intervention among these future doctors and dentists

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Nil.

Conflicts of interest

The authors declare that they have no competing interests or any possible conflicts of interest regarding the publication of this paper.

How does this paper make a difference in general practice?

- Early screening for smartphone addiction among adolescents and young adults is essential for early detection and prevention.
- Usage of smartphones for educational activities should be encouraged as it is associated with a low risk of smartphone addiction.

References

1. Cain J, Malcom DR. An Assessment of Pharmacy Students' Psychological Attachment to Smartphones at Two Colleges of Pharmacy. *Am J Pharm Educ*. 2019 Sep;83(7):7136. doi:10.5688/ajpe7136.

2. Payne KFB, Wharrad H, Watts K. Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): A regional survey. *BMC Med. Inform. Decis. Mak*. 2012; (12):1–11. doi:10.1186/1472-6947-12-121

3. Kwon M, Lee J-Y, Won W-Y, et al. Development and Validation of a Smartphone Addiction Scale (SAS). *PLoS ONE*. 2013;8(2): e56936. doi:10.1371/journal.pone.0056936

4. Billieux J, Van der Linden M, D'Acremont M, et al. Does impulsivity relate to perceived dependence on and actual use of the mobile phone? *Appl Cogn Psychol*. 2007;(21):527-37. doi:10.1002/acp.1289

5. Tang J, Yu Y, Du Y, et.al. Prevalence of internet addiction and its association with stressful life events and psychological symptoms among adolescent internet users. *Addict Behav*. 2014; Mar 39(3):744-7. doi: 10.1016/j.addbeh.2013.12.010

6. Griffiths MD. Internet addiction: an issue for clinical psychology? *Clinical Psychology Forum*. 1996;97:32-36.

7. Chen B, Liu F, Ding S, Ying X, Wang L, Wen Y. Gender differences in factors associated with smartphone addiction: a cross-sectional study among medical college students. *BMC Psychiatry*. 2017;17(1):341. Published 2017 Oct 10. doi:10.1186/s12888-017-1503-z

8. Ithnain N, Ghazali SE, Jaafar N. Relationship between Smartphone Addiction with Anxiety and Depression among Undergraduate Students in Malaysia. *Int J Heal Sci Res*. 2018;(8):163.

9. Lee S, Kim HJ, Choi HG, Yoo YS. Smartphone Addiction and Interpersonal Competence of Nursing Students. *Iran J Public Health*. 2018 Mar;47(3):342-349.

10. Young-Ju Kim. The Influence of Smartphone Use and Stress on Quality of Sleep among Nursing Students. *Indian J Sci Technol*. 2015;(8)35:1-6.

11. Ramesh Masthi NR, Cadabam SR, Sonakshi S. Facebook addiction among health university students in Bengaluru. *Int J Heal Allied Sci*. 2015;(4):18–22.

12. Nikmat AW, Hashim NA, Saidi MF, Mohd Zaki NS, Hasan Shukri NN, Abdulla NB. The use and addiction to smart phones among medical students and staffs in a public university in Malaysia. *ASEAN J Psychiatry* 2018;19(1):98–104.

13. Lee YL, Verma RK, Yadav H, Barua A. Health impacts of Facebook usage and mobile texting among undergraduate dental students: it's time to understand the difference between usage and an excessive use. *Eur J Dent Educ* 2016; (20):218–228. doi:10.1111/eje.12164

14. The C, Ngo C, Zulkifli R, Vellasamy R, Suresh K. Depression, Anxiety and Stress among Undergraduate Students: A Cross Sectional Study. *Open J of Epidemiol*. 2015; (5):260-268. doi:10.4236/ojepi.2015.54030.

15. Mohd Nayan NA, Che Daud AH, Tengku Jamaluddin TIB, et al. Perceived Depression, Anxiety and Stress among UiTM Dental Undergraduates in Clinical Years. In Proceeding of the 3rd ABRA International Conference on Quality of Life. 2017; 81–86 doi:10.21834/e-bpj.v2i6.954.

16. Wang JL, Wang HZ, Gaskin J, Wang LH. The role of stress and motivation in problematic smartphone use among college students. *Comput Human Behav.* 2015;(53):181–188.

17. Chiu SI. The relationship between life stress and smartphone addiction on taiwanese university student: A mediation model of learning self-Efficacy and social self-Efficacy. *Comput Human Behav.* 2014;(34):49–57.

18. Parkitny L, McAuley J. The Depression Anxiety Stress Scale (DASS). *J Physiother*. 2010;56(3):204. doi:10.1016/s1836-9553(10)70030-8

19. Coker AO, Coker OO, Sanni D. Psychometric properties of the 21-item Depression Anxiety Stress Scale (DASS-21). *African Res. Rev*. 2018; (12):135.

20. Venkatesh E, Jemal MYA, Samani ASA. Smart phone usage and addiction among dental students in Saudi Arabia: a cross sectional study. *Int J Adolesc Med Health*. 2017;31(1):10.1515/ijamh-2016-0133. Published 2017 Apr 6. doi:10.1515/ijamh-2016-0133

21. Jenaro C, Flores N, Gómez-Vela M, González-Gil F, Caballo C. Problematic internet and cell-phone use: Psychological, behavioral, and health correlates. *Addict Res Theory*. 2007;(15):309-320. doi: 10.1080/16066350701350247

22. Salehan M, Negahban A. Social networking on smartphones: When mobile phones become addictive. *Comput Human Behav.* 2013;(29):2632–2639.

23. Chang FC, Chiu CH, Lee CM, Chen PH, Miao NF. Predictors of the initiation and persistence of internet addiction among adolescents in Taiwan. *Addict Behav*. 2014;39(10):1434-1440. doi:10.1016/j.addbeh.2014.05.010

24. Demirci K, Akgönül M, Akpinar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *J Behav Addict.* 2015;4(2):85-92. doi:10.1556/2006.4.2015.010

25. Matar Boumosleh J, Jaalouk D. Depression, anxiety, and smartphone addiction in university students- A cross sectional study. *PLoS One.* 2017;12(8):e0182239. Published 2017 Aug 4. doi:10.1371/journal.pone.0182239

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ORIGINAL ARTICLE

Patient profile and antibiotic use in a dedicated upper respiratory tract infection clinic based in a primary healthcare setting during COVID-19 pandemic in Malaysia: A cross sectional study

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Ooi ZY, Ghazali NA, Zahari NJ, et al. Patient profile and antibiotic use in a dedicated upper respiratory tract infection clinic based in a primary healthcare setting during COVID-19 pandemic in Malaysia: A cross sectional study. *Malays Fam Physician.* 2022;17(3):74–83. https://doi.org/10.51866/oa.38

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Abstract

Introduction: Upper respiratory tract infection (URTI) is commonly encountered at the primary care level. Its management is particularly challenging due to the similarity of its symptoms to coronavirus disease 2019 (COVID-19) infection. Our study evaluated the profiles and antibiotic use of patients seeking care from a dedicated community-based URTI clinic during the COVID-19 pandemic.

Methods: A cross-sectional study was conducted. Data were obtained from the medical records of patients visiting the URTI clinic at the Alor Setar Primary Healthcare Centre between March and April 2020.

Results: Overall, 587/4388 (13.3%) patients received treatment at the URTI clinic. Most patients were male (60.6%) and aged between 20 and 39 years (35.5%). Their most common symptoms were cough (68.4%), fever (31.6%), runny nose (24.6%), and sore throat (24.1%). Most patients were diagnosed with acute nasopharyngitis (52.5%), acute pharyngitis (18.6%), or acute tonsillitis (5.3%). The symptomatic medication prescription rate was 96.5%. Only 26 of the 435 patients diagnosed with URTI received antibiotics, yielding an antibiotic use rate of only 6.0% for URTI relative to overall drug use. Acute tonsillitis was more common in children <12 years old ($p<0.001$), while a cough and runny nose were more commonly indicative of acute nasopharyngitis than other conditions ($p<0.001$). Sore throat was more likely to be a symptom of acute pharyngitis ($p<0.001$) and acute tonsillitis ($p<0.001$).

Conclusion: Despite the challenges faced during the COVID-19 pandemic, the findings suggest that patients with URTI-like symptoms were properly managed, and the rate of antibiotic usage remained reasonable.

Introduction

Upper respiratory tract infection (URTI) is characterised by an infectious process involving the upper respiratory tract, including the nose, para-nasal sinuses, pharynx, larynx, or trachea.[1] The National Medical Care Statistics (NMCS) 2014 by the Ministry of Health Malaysia and several other local studies reported that respiratory conditions were the most common medical problem seen in primary care, ranging from 26.8% to 37.2% of all problems.[2-4] In Singapore, surveys of primary healthcare clinics conducted in 2010 and 2014 found that URTIs were the dominant disease diagnosed in primary healthcare centres, comprising 25% of all diagnoses made in 2010 and 20% in 2014.[5] In 2013, 18.8 billion cases of URTI were recorded worldwide.[6]

Currently, the world is stuck by a novel viral pandemic known as coronavirus disease 2019 (COVID-19). The pandemic not only threatens global health but impacts nearly every country, including Malaysia. The World Health Organisation (WHO) declared the outbreak of novel coronavirus as a pandemic on 11 March 2020.7 Diagnosing URTI can be challenging during the COVID-19 pandemic. COVID-19 can have wide spectrum of symptoms, including fever (76.5–98.6%), cough (50.0–70.0 %), flu-like symptoms (4.0–4.8%), and sore throat (1.7–4.0%), all overlapping with

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URTI symptoms.[8,9] Our clinic implemented a new URTI clinic as one of the methods of preventing COVID-19 transmission in line with the Centres for Disease Control and Prevention (CDC) guideline entitled 'Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 in Healthcare Settings'; one of the key concepts is to limit how germs can enter the facility.[10]

All patients who attend our facility are screened for suspected COVID-19 at triage and are stratified into low or high risk for COVID-19 in accordance with the 2020 Ministry of Health Malaysia guidelines on COVID-19 management.[11] Low-risk COVID-19 patients are seen in the URTI clinic, while highly suspected patients are diverted to the COVID-19 swab team. This is crucial for several reasons: first, a suspected case of COVID-19 needs to be isolated promptly to halt further spread of the virus;[11] next, the usage of personal protective equipment needs to be optimised to prevent waste.[9] These considerations highlight how challenging a balanced approach is to a patient with a URTI during COVID-19 pandemic.

This study will help to outline patterns in the sociodemographic and clinical characteristics of patients attending the URTI clinic in addition to practices among healthcare providers regarding diagnosis and antibiotic usage for treating URTIs in patients attending Alor Setar Primary Healthcare Centre during the COVID-19 pandemic. Our study will also investigate the association between sociodemographic characteristics and diagnosis in addition to the common presentations and diagnosis of URTI. These results will aid primary care physicians in identifying opportunities for intervention, such as minimising unnecessary prescription of antibiotics and symptomatic drugs, and proper allocation of resources for other medical illness during pandemic.

Methods

A cross-sectional study was conducted at Alor Setar Health Clinic (also known as Klinik Kesihatan Bandar Alor Setar, or KKBAS), a large government polyclinic in the district of Kota Setar in Kedah that provides subsidised general outpatient, maternal, and child health services for the residents of Kota Setar, Kedah—a population of 366 787 according to figures from the 2010 census.[12] The total patient attendance at KKBAS from 23 March 2020 to 28 April 2020 was 4 388; of these patients, 587 (13.3%) were seen in the URTI clinic. All patients attending KKBAS were stratified to low or high risk for COVID-19. High risk for COVID-19 was suspected when a patient presented to the triage counter with the following features: attended an event or visited an area associated with known COVID-19 cluster or red zone OR travelled to or resided in a foreign country within 14 days of the onset of illness OR close contact 14 days before illness onset with a confirmed case of COVID-19. Low-risk COVID-19 patients with respiratory symptoms were seen in the URTI clinic.

All eligible patients were included in the study, and sampling was not conducted. The cases involved in this study were identified by reviewing the medical records of patients who attended the URTI clinic between 23 March 2020 and 28 April 2020. All the patients who attended the URTI clinic were marked, and only those fulfilling the criteria were selected and analysed. Patients who attended the clinic for medication prescription refills, patients with high risk of COVID-19 infection, and patients with medical records with incomplete information were excluded from this study.

The medical records from the study period were retrieved from the medical record room. The information extracted and recorded from these medical records included basic demographic details, clinical symptoms and signs, physical examination results, investigations, diagnoses, and management provided. The collected data was then analysed using SPSS software version 12, and appropriate statistical calculations for qualitative and quantitative data were used to determine whether the results were significant, indicated by a p value less than or equal to 0.05. Descriptive statistics were employed for selected variables. The findings are presented based on the type of data and their distribution: categorical data are presented as frequencies and percentages, and numerical data are presented as means and standard deviations if normally distributed and as medians and interquartile ranges if not normally distributed.

Pearson's chi-square test was used to compare the distribution of a categorical variable in a sample or a group with its distribution in another group. If the distribution of the categorical variable was not different between different groups, we concluded that the

distribution of the categorical variable was not related to the variable of groups. Fisher's exact test was used to detect non-random associations between two categorical variables. Pearson's chi-square test and Fisher's exact test were used to determine the association between diagnosis and sociodemographic characteristics in addition to the association between common presentation and diagnosis. The significance level was set at $P < 0.05$.

Results

3.1 Sociodemographic characteristics

Over a 1-month period, 4 388 patients visited the outpatient clinic of KKBAS from 23 March 2020 to 28 April 2020; 587 (13.3%) of the patients sought treatment in the URTI clinic. A total of 564 patients met the inclusion criteria, while 23 patients were excluded, giving an overall proportion of patients attending the URTI clinic of 564/4 388 (13.3%). Most of the patients who attended the URTI clinic were male (342/564, 60.6%), and the most common age group was 20–39 years old (222/564, 35.5%). The mean age of the patients who attended the URTI clinic was 41.2 ± 21.9 years. A total of 84 cases (15.0%) were children (aged ≤18 years old) and 480 cases (85.0%) were adults; 67 (11.9%) of the patients were aged <9 years, while 139/564 (24.6%) were elderly, aged >60 years old, which was in line with the recommendations of the Ministry of Health Malaysia.

Common comorbidities, such as diabetes mellitus, hypertension, ischaemic heart disease, bronchial asthma, or chronic obstructive pulmonary disease (COPD) were included in this study. The most common positive findings in the medical history of the patients who visited the URTI clinic were hypertension (108/564, 19.1%) and diabetes mellitus (72/564, 12.8%). The demographic details of the study population are summarised in **Table 1**.

Table 1. Demographic and clinical characteristics of the study population (n=564).

Characteristic	n	%
Age, years [a]		
0–9	67	11.9
10–19	19[b]	3.4
20–29	88	15.6
30–39	112	19.9
40–49	54	9.6
50–59	85	15.1
60–69	80	14.2
70–79	46	8.2
80–89	13	2.3
Gender		
Male	342	60.6
Female	222	39.4
History of illness [c]		
Diabetes mellitus	72	72/564, 12.8%
Hypertension	108	108/564, 19.1%
Ischaemic heart disease	14	14/564, 2.5%
Asthma or COPD	36	36/564, 6.4%

COPD, chronic obstructive pulmonary disease.

[a] Mean age = 41.2 ± 21.9 years.

[b] Out of 19 patients in the age category 10–19 years, 2 were 19 years old.

[c] Patients without comorbidities are not included in the table. A patient could have more than one illness.

3.2 Common symptoms, diagnosis of patients, and antibiotic prescription rate in the URTI clinic

Most of the patients presented with various symptoms and reported having multiple symptoms during their visit to the URTI clinic (**Table 2**). The most common symptoms were cough (68.4%), fever (31.6%), runny nose (24.6%), and sore throat (24.1%). Only one patient reported anosmia (0.2%) and was treated as acute nasopharyngitis. Chest pain (2.0%) and shortness of breath (5.3%) were rare. ICD-10 codes for acute respiratory infection were used to record the provisional diagnosis after consultation on the clerking sheet. The diagnoses included 1- acute nasopharyngitis, 2- acute sinusitis, 3- acute pharyngitis, 4- acute tonsillitis, 5- acute laryngitis and tracheitis, 6- acute obstructive laryngitis and epiglottitis, 7- acute bronchitis,

8- acute bronchiolitis, 9- asthma, 10- COPD, 11- bronchiectasis, 12- viral pneumonia, 13- bacterial pneumonia, and 14- others. The most common diagnosis for the patients seen in the URTI clinic were acute nasopharyngitis (52.5%), acute pharyngitis (18.6%), and acute tonsillitis (5.3%). The other patients were diagnosed with acute bronchitis (0.7%), acute sinusitis (0.7%), asthma (2.1%), or other (20.0%). URTI was diagnosed in 435 patients (435/564, 77.1%).

Table 2. Symptoms of patients (n=564) and diagnoses in the URTI clinic of KKBAS.

Characteristic	n[a]	%
Symptoms		
Cough	385	68.3
Runny nose	139	24.6
Sore throat	136	24.1
Anosmia	1	0.2
Fever	178	31.6
Chest pain	11	2.0
Shortness of breath	30	5.3
Diagnosis		
Acute nasopharyngitis	296	52.5
Acute pharyngitis	105	18.6
Acute tonsillitis	30	5.3
Acute bronchitis	4	0.7
Acute sinusitis	4	0.7
Asthma	12	2.1
Other	113	20.0

[a] One patient could have more than one symptom.

A total of 544 patients (544/564, 96.5%) were provided with symptomatic treatment in the URTI clinic, which included antipyretics (51.8%), antihistamines (49.8%), and antitussive agents (45.9%) (**Table 3**). The mean number of medications prescribed per visit was 1.6. Of the 564 patients who visited the URTI clinic, only 35 (6.2%) were prescribed an antibiotic; 26 patients (26/435, 6.0%) diagnosed with URTI were prescribed an antibiotic, making the prescription rate of antibiotics among URTI patients acceptably low. Among all antibiotics, the penicillin group was the most prescribed, constituting of 68.57% (n=24) of the total antibiotics prescribed for all cases, followed by macrolides (erythromycin ethyl succinate). Augmentin was the least prescribed antibiotic, representing 5.7% of prescriptions for URTI.

Table 3. Type of treatment provided to the patient (n=564) in the URTI clinic of KKBAS.

Type of Treatment Provided	n[a]	%	Current evidence
Antipyretic	292	292/564, 51.8	May help in fever
Antitussive	259	259/564, 45.9	May reduce symptoms
Antihistamine	281	281/564, 49.8	Not effective
Antibiotic[b]	35[c]	35/564, 6.2	Little evidence of benefit in uncomplicated URTI

[a] One patient could have received more than one type of treatment
[b] The type of antibiotics used: amoxicillin (n=24), erythromycin ethyl succinate (n=6), amoxicillin/clavulanate (n=2), and others (n=3).
[c] 26 out of 35 patients prescribed with an antibiotic were diagnosed with URTI.

3.3 Bivariate analysis of association

Pearson's chi-square test revealed a significant association between acute tonsillitis and children <12 years old ($p<0.001$). However, no significant association was reported among other study variables (**Table 4**).

Table 4. Characteristics associated with the diagnoses of the patients.

Characteristic	Acute nasopharyngitis		Acute pharyngitis		Acute tonsillitis		Others	
	n (%)	p[a]	n (%)	p[a]	n (%)	p[a]	n (%)	p[a]
Age, years								
<12	31 (43.1)	0.230	14 (19.4)	0.422	11 (15.3)	**<0.001**	16 (22.2)	0.875
12–64	214 (53.9)		69 (17.4)		18 (4.5)		96 (24.2)	
≥65	51 (53.7)		22 (23.2)		1 (1.1)		21 (22.1)	
Gender								
Male	181 (52.9)	0.794	60 (17.5)	0.416	18 (5.3)	0.941	83 (24.3)	0.633
Female	115 (51.8)		45 (20.3)		12 (5.4)		50 (22.5)	
Diabetes mellitus								
No	254 (51.6)	0.287	94 (19.1)	0.436	28 (5.7)	0.408[b]	116 (23.6)	0.995
Yes	42 (58.3)		11 (15.3)		2 (2.8)		17 (23.6)	
Hypertension								
No	237 (52.0)	0.619	84 (18.4)	0.806	26 (5.7)	0.405	109 (23.9)	0.711
Yes	59 (54.6)		21 (19.4)		4 (3.7)		24 (22.2)	
Ischaemic heart disease								
No	288 (52.4)	0.724	102 (18.5)	0.732[b]	30 (5.5)	>0.95[b]	130 (23.6)	>0.95[b]
Yes	8 (57.1)		3 (21.4)		0 (0.0)		3 (21.4)	
Asthma/chronic obstructive pulmonary disease								
No	282 (53.4)	0.091	100 (18.9)	0.451	29 (5.5)	0.712[b]	117 (22.2)	**0.002**
Yes	14 (38.9)		5 (13.9)		1 (2.8)		16 (44.4)	

[a] Pearson's chi-square test.
[b] Fisher's exact test.

The symptoms of cough and runny nose were significantly associated with the diagnosis of acute nasopharyngitis (p <0.001) and non-URTI-related disease (p<0.001). The patients with sore throat were significantly more likely to receive a diagnosis of acute pharyngitis, acute tonsillitis, or other (p<0.001). Fever was significantly associated with diagnosis of acute tonsillitis (p=0.001), and shortness of breath was significantly associated with acute nasopharyngitis (p=0.001).

Table 5. Symptoms associated with the diagnoses of the patients.

Symptom	Acute nasopharyngitis		Acute pharyngitis		Acute tonsillitis		Others	
	n (%)	p[a]	n (%)	p[a]	n (%)	p[a]	n (%)	p[a]
Cough								
No	65 (36.3)	**<0.001**	28 (15.6)	0.216	12 (6.7)	0.318	74 (41.3)	**<0.001**
Yes	231 (60.0)		77 (20.0)		18 (4.7)		59 (15.3)	
Runny nose								
No	206 (48.5)	**0.001**	82 (19.3)	0.470	22 (5.2)	0.792	115 (27.1)	**0.001**
Yes	90 (64.7)		23 (16.5)		8 (5.8)		18 (12.9)	
Sore throat								
No	226 (52.8)	0.786	62 (14.5)	**<0.001**	13 (3.0)	**<0.001**	127 (29.7)	**<0.001**
Yes	70 (51.5)		43 (31.6)		17 (12.5)		6 (4.4)	
Anosmia								
No	295 (52.4)	>0.95[b]	105 (18.7)	>0.95[b]	30 (5.3)	>0.95[b]	133 (23.6)	>0.95[b]
Yes	1 (100.0)		0 (0.0)		0 (0.0)		0 (0.0)	
Fever								
No	206 (53.4)	0.535	71 (18.4)	0.841	12 (3.1)	**0.001**	97 (25.1)	0.202
Yes	90 (50.6)		34 (19.1)		18 (10.1)		36 (20.2)	
Chest pain								
No	292 (52.8)	0.280	104 (18.8)	0.699[b]	30 (5.4)	>0.95[b]	127 (23.0)	**0.025[b]**
Yes	4 (36.4)		1 (9.1)		0 (0.0)		6 (54.5)	
Shortness of breath								
No	289 (54.1)	**0.001**	101 (18.9)	0.445	30 (5.6)	0.395[b]	114 (21.3)	**<0.001**
Yes	7 (23.3)		4 (13.3)		0 (0.0)		19 (63.3)	

[a] Pearson's chi-square test.
[b] Fisher's exact test.

Discussion

There was a relatively lower attendance (13.3%) of patients with respiratory symptoms during the COVID-19 pandemic in our study compared with other studies, as patients with influenza-like illness and suspected cases of COVID-19 were advised to visit designated COVID-19 swab areas. The gender distribution in our study is proportionate to the estimation population of Kedah in 2019, which was 2.18 million in total: 1.11 million males (50.9%) and 1.07 million females (49.1%).[12] However, this observation is inconsistent with the findings of the NMCS 2014, which reported that more females than males used services at public primary care facilities in Malaysia.[4] The beginning of the Movement Control Order (MCO) period might lead to the reduction in visits to congested places, such as government clinics, because females were more incline to view themselves at risk for COVID-19 than males.[13]

The younger, 20–39-year-old group of patients frequently seeks treatment in primary care for mild respiratory symptoms. This age group engages in more social activities in person and contracts upper respiratory tract infection easily.[14] In addition, the younger generation is exposed to social media, which has become a first-hand information channel during the pandemic, and they have greater awareness of the disease during this period.[15,16] Interestingly, 76% of confirmed COVID-19 cases were diagnosed in adults less than 65 years of age, with most aged 18–29 years;[17,18] this observation is consistent with our study results. Furthermore, the paediatric group aged <9 years (11.6%) accounted for a small proportion in our clinic, in contrast with the data reported by the Upper Respiratory Tract Infection Expert Meeting Consensus, which claimed that over 50.0% of visits to a primary care centre were paediatric visits according to a survey of primary medical clinics in Singapore.[5] This can be explained by the implementation of the MCO, whereby the government implemented national school closures related to COVID-19, which resulted in a potentially significant reduction in transmission of URTIs among school-aged children. In contrast, adults with comorbidities comprised most of the attendees at the URTI clinic as they were prone to respiratory tract infections or COVID-19 due to their immune-compromised state.[19]

The diagnosis of acute respiratory infection in this study was based on the ICD-10 codes, which was different from several previous studies in Malaysia in which the infections were classified based on the International Classification of Primary Care.[3,20,21] Compared to a study by Hak et al. (2006), the five most common URTI diagnoses presenting to the general practitioner in the Netherlands were acute rhinitis, acute sinusitis, acute bronchitis, acute otitis media, and acute tonsillitis.[21] This inconsistency might be due to different coding methods and unfamiliarity of the attending medical officers with the disease classification system. Classification is difficult in primary care, especially for vague and symptom-based conditions. Training should be provided to all primary care physicians to enhance the quality of data collected based on the ICD-10.

The occurrence of acute tonsillitis is more common in preteen children (<12 years old). Similar observations from studies by Hidaya Qarqani Bukhari et al. (2019) and Middleton et al. (1988) reported that most tonsillitis cases from the 6–12-year-old age group were due to low and immature immunity in this age group.[22,23] Cough, fever, runny nose, and sore throat remained the most common symptoms experienced by patients visiting the URTI clinic. All the symptoms were significantly associated with a URTI diagnosis. Moreover, most patients with a sore throat had pharyngitis and acute tonsillitis.[24,25] This suggests the utility and accuracy of ICD-10 coding for URTIs. Specific infectious agents resulting in a respiratory disease are difficult to identify at the initial visit. Therefore, the presence of classical features or symptoms that are statistically associated with URTIs in the absence of warning signs is sufficient to guide the diagnosis. Diagnostic testing, which is not readily available in our setting, is usually not necessary[1]

There was no conclusive evidence to suggest anosmia as a clinical feature of COVID-19 during the early outbreak of pandemic, with one Chinese study reporting that 5.1% of affected patients had anosmia.[8] Subsequently, several later literature reviews concluded that a significant number of COVID-19 patients (53%) had symptoms of anosmia.[26] As COVID-19 resources are limited, universal testing for anyone with signs and symptoms of COVID-19, as recommended by the CDC

(2021), was not widely implemented in the early COVID-19 era.[10,24] Our country still relies on epidemiological features, including contact with a confirmed COVID-19 case, to suspect the disease. Therefore, patients with anosmia were treated as URTIs in our clinic. Viral URTI with runny nose and nasal congestion may contribute to conductive olfactory loss.[27] During the early phase of COVID-19, this overlapping symptomatology was a diagnostic challenge and further hindered accurate diagnosis and early containment.

Shortness of breath is usually a cardinal sign suggesting more sinister pathologies; however, it can also be seen in acute upper respiratory infections.[28] Interestingly, our study found that shortness of breath was statistically associated with acute nasopharyngitis. Shortness of breath, a subjective syndrome of breathing discomfort that varies in intensity, is associated with interactions between multiple factors, included physiological, psychological, social, and environmental factors.[29] With an aggravation of breathing discomfort in URTI, patients may consider breathlessness as a threat associated with anxiety or depressive symptoms, which may induce secondary physical responses. A study regarding public psychological and behavioural responses during the COVID-19 outbreak reported that a greater proportion of the public may have experienced anxiety disorders as the COVID-19 outbreak progressed.[30] The public is more likely to express higher anxiety levels if they perceive they are at risk of becoming infected with COVID-19.[31]

It is important to understand the pathophysiology of the symptoms of URTI, as most treatments for URTI focus on symptomatic relief as the symptoms are perceived as a nuisance despite the self-limiting nature of the illness; antibiotic usage is thus unnecessary. A study found that 96.6% of cases were prescribed symptomatic drugs, similar to the 98% URTI drug prescription patterns of Hong Kong doctors.[32] Possible explanations for a higher symptomatic prescription rate may be related to the nature of our healthcare system, where consultation fees are heavily subsidised and include the cost of medication, patients' relatively low self-medication rates, and high expectations for receiving a prescription for medication during consultations despite the self-limiting nature of the illness. However, there is limited evidence that these medications are effective for URTI, as shown in Table 3.[32]

The URTI-specific antibiotic prescription rates in the Netherlands and Hong Kong in 2010 were 17% and 5%, respectively.[32,33] From National Medical Care Study (NMCS) 2010 data, 46.2% of patients diagnosed with URTI reported receiving antibiotic treatment. This data includes 16.8% of public and 57.7% of private clinic patients.[20] The antibiotic prescription rate for URTI in our study was much lower than previous studies. Guidance based on the local National Antimicrobial Guidelines from 2019[34] includes a modified Centor Score playing a role in judicious antibiotic use among public primary care doctors. A standard approach for assessment and management of patients presenting with respiratory tract infection and the role of antibiotics based on best available evidence is needed to avoid overuse of antibiotics for URTIs in the COVID-19 era.[35] Choices of antibiotics in this study were consistent with the NMCS 2010; the most prescribed antibiotics for URTI were amoxicillin, cephalexin, and erythromycin, at rates of 35.0%, 15.1%, and 12.0%, respectively.[36]

Overall, compared to the non-pandemic studies on URTIs, the characteristics of patients have changed. For example, the paediatric group <12 years old were the dominant group (>1/3) pre-pandemic, while in our study, the 20–39-year-old age group visited the URTI clinic most often (>1/3).[2] This implies that there might be changes in healthcare-seeking behaviour by symptom and age during the pandemic. Antibiotic usage remained low, and symptomatic medication prescription rates were high both pre-pandemic and during the pandemic. Analysing the characteristics of patients who utilised primary care during the pandemic, targeted patient education should be provided via public health promotion to empower self-management and reasonable indication for medical attention during the pandemic. As there is limited evidence for the benefit of symptomatic treatment in URTI, with heavy cost to public health, this issue should also be addressed. Gaps have been highlighted between primary care practice and evidence-based management of URTIs. This study was unable to ascertain COVID-19 among URTI

patients. Key clinical features that may guide in differentiating a COVID-19 case, which require specific testing, from upper respiratory and/or influenza-like illnesses of other aetiologies were not determined in this study.

Conclusion

Although the number of COVID-19 cases is still increasing in Malaysia and the pandemic has yet to reach its peak, URTI patients are properly managed during the pandemic. Low antibiotic prescription rate indicate judicious antibiotic use among public primary care doctors, particularly in the study region, during the pandemic era. The high number of symptomatic drug prescriptions and the relationship with patients' expectation and doctors' prescription habits during consultations should be further explored. From the study of association between sociodemographic characteristics and diagnosis, URTI remains common in the younger age group (<12 years old). Diagnosis and common symptoms of URTI are correlated with high significance. Our URTI clinic is another line of defence that was implemented to improve detection and prevent further spread of COVID-19 by understanding patient profiles to aid in best management practices, improve healthcare resource utilisation, adequately protect the community, and provide optimal care to patients with URTIs during the COVID-19 pandemic. Furthermore, this study highlights the need for symptom-based screening or better application of diagnostic tests during the pandemic.

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Conflicts of Interest

All authors declare no conflicts of interest.

Author's Contribution

Designed the study and acquired the data: Dr Norsiah, Dr Nang, Dr Liani, Dr Firdaus, Dr Ooi, Dr Redhuan, Dr Abidah
Analysed and interpreted the data: Mr Chan, Dr Abidah, Dr Ooi
Drafted and critically revised the manuscript: Dr Nang, Mr Chan, Dr Ooi, Dr Abidah
All authors reviewed and approved the final manuscript.

How does this paper make a difference in general practice?

- This study provides useful insights for primary care doctors regarding the pattern of sociodemographic characteristics of patients attending the URTI clinic in addition to practices among healthcare providers regarding diagnosis and antibiotic usage for treating URTIs during the COVID-19 pandemic.
- This study demonstrates the low antibiotic-prescribing rate in the studied public primary care setting. This study provides evidence of appropriate antibiotic prescribing for self-limiting conditions, even during the COVID-19 pandemic.

References

1. Thomas M, Bomar PA. Upper Respiratory Tract Infection. *In: StatPearls*. Treasure Island (FL); StatPearls Publishing ; June 30, 2021.
2. Teng CL, Nurjahan MI, Hashim NA, Punithambigai P, Leong KC, Mihat O. Upper respiratory tract infections: To what extent is the management evidence-based? *Med J Malaysia*. 2003;58(2):159–66.
3. Mimi O, Tong S, Nordin S, et al. A comparison of morbidity patterns in public and private primary care clinics in Malaysia. *Malays Fam Physician*. 2011;6(1):19-25. Published 2011 Apr 30.
4. Sivasampu S, Wahab YF, Ong SM, Ismail SA, Goh PP, Jeyaindran S. National Medical Care Statistics (NMCS) 2014. Kuala Lumpur: National Clinical Research Centre, National Healthcare Statistics Initiative; 2016.
5. Ministry of Health Singapore. Primary Care Survey 2014. Health Information Division, Ministry of Health Singapore; 2014.
6. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015;386(9995):743–800. doi:10.1016/S0140-6736(15)60692-4

7. Rampal L, Liew BS. Coronavirus disease (COVID-19) pandemic. *Med J Malaysia*. 2020;75(2):95–97.

8. Bertolino L, Vitrone M, Durante-Mangoni E. Does this patient have COVID-19? A practical guide for the internist. *Intern Emerg Med*. 2020;15(5):791–800. doi:10.1007/s11739-020-02377-1

9. World Health Organization. Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19) and considerations during severe shortages. World Health Organization. Updated April 2020. Accessed July 12, 2021. https://apps.who.int/iris/handle/10665/338033.

10. CDC. Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. 2020;2:1–10. Accessed March 23, 2020. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html

11. Ministry of Health Malaysia. Guidelines on COVID-19 Management 2020. Updated April 2020. Accessed July 12,2021. http://covid-19.moh.gov.my/garis-panduan/garis-panduan-kkm/Annex_2c_Screening_and_Triaging_30092020.pdf

12. Department of Statistic Malaysia. Malaysia @ a Glance, Kedah. Updated 20 August 2021. Accessed September 17, 2021. https://www.dosm.gov.my/v1/index.php?r=column/cone&menu_id=M25ucnhaYUMwbjFwc3hhWkhrQ2tIUT09#

13. Zeballos Rivas DR, Lopez Jaldin ML, Nina Canaviri B, Portugal Escalante LF, Alanes Fernández AMC, Aguilar Ticona JP. Social media exposure, risk perception, preventive behaviors and attitudes during the COVID-19 epidemic in La Paz, Bolivia: A cross sectional study. *PLoS One*. 2021;16(1):e0245859. Published 2021 Jan 22, doi:10.1371/journal.pone.0245859

14. Chen SC, Hsieh NH, You SH, Wang CH, Liao CM. Behavioural response in educated young adults towards influenza A(H1N1)pdm09. *Epidemiol Infect*. (2015);143(9):1846–1857. doi:10.1017/S0950268814002714

15. Alnasser AHA, Al-Tawfiq JA, Al Kalif MSH, et al. The positive impact of social media on the level of covid-19 awareness in Saudi Arabia: A web-based cross-sectional survey. *Infez Med*. 2020;28(4):545–550.

16. Saud M, Mashud M, Ida R. Usage of social media during the pandemic: Seeking support and awareness about COVID-19 through social media platforms. *J Public Affairs*. 2020;20:e2417. doi:10.1002/pa.2417

17. Abbasi J. Younger Adults Caught in COVID-19 Crosshairs as Demographics Shift. *JAMA*. 2020;324(21):2141–2143. doi:10.1001/jama.2020.21913

18. Centers for Disease Control and Prevention. Risk for COVID-19 Infection, Hospitalization, and Death By Age Group. Updated 2021. Accessed July 12 2021. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html#print

19. Feng W, Zong W, Wang F. et al. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): a review. *Mol Cancer*. 2020;100(1). doi:10.1186/s12943-020-01218-1

20. Ab Rahman N, Teng CL, Sivasampu S. Antibiotic prescribing in public and private practice: A cross-sectional study in primary care clinics in Malaysia. *BMC Infect Dis*. 2016;16:208.16(1):1–8 Published 2016 May 17. doi:10.1186/s12879-016-1530-2

21. Hak E, Rovers MM, Kuyvenhoven MM, Schellevis FG, Verheij TJ. Incidence of GP-diagnosed respiratory tract infections according to age, gender and high-risk co-morbidity: The Second Dutch National Survey of General Practice. *Fam Pract*. 2006;23(3):291–294. doi:10.1093/fampra/cmi121

22. Middleton DB, D'Amico F, Merenstein JH. Standardized symptomatic treatment versus penicillin as initial therapy for streptococcal pharyngitis. *J Pediatr*.1988;113(6):1089-1094. doi:10.1016/s0022-3476(88)80588-2

23. Bukhari HQ, Madloul MH, Alorinan BI. et al. Prevalence study of acute tonsillitis among pediatrics age groups. *Int J Med Rev Case Reports*. 2019; 3(3): 99-103. doi: 10.5455/IJMRCR.acute-tonsilitis-pediatrics

24. Vincent MT, Celestin N, Hussain AN. Pharyngitis. *Am Fam Physician*. 2004 ;69(6):1465–1470.

25. Anderson J, Paterek E. Tonsillitis. In Treasure Island (FL); StatPearls Publishing; April 30,2022.

26. Najafloo R, Majidi J, Asghari A, et al. Mechanism of Anosmia Caused by Symptoms of COVID-19 and Emerging Treatments. *ACS Chem Neurosci*. 2021;12(20):3795-3805. doi:10.1021/acschemneuro.1c00477

27. Han AY, Mukdad L, Long JL, Lopez IA. Anosmia in COVID-19: Mechanisms and Significance. *Chem Senses*. 2020 Jun 17:bjaa040. doi: 10.1093/chemse/bjaa040.

28. Berliner D, Schneider N, Welte T, Bauersachs J. The Differential Diagnosis of Dyspnea. *Dtsch Arztebl Int*. 2016;113(49):834-845. doi:10.3238/arztebl.2016.0834

29. Parshall MB, Schwartzstein RM, Adams L, et al. An official American Thoracic Society statement: update on the mechanisms, assessment, and management of dyspnea. *Am J Respir Crit Care Med*. 2012;185(4):435-452. doi:10.1164/rccm.201111-2042ST

30. Wong LP, Alias H. Temporal changes in psychobehavioural responses during the early phase of the COVID-19 pandemic in Malaysia. *J Behav Med*. 2021;44(1):18-28. doi:10.1007/s10865-020-00172-z

31. Li X, Tian J, Xu Q. The Associated Factors of Anxiety and Depressive Symptoms in COVID-19 Patients Hospitalized in Wuhan, China. *Psychiatr Q*. 2021;92(3):879-887. doi:10.1007/s11126-020-09865-9

32. Kung K, Wong CK, Wong SY, et al. Patient presentation and physician management of upper respiratory tract infections: a retrospective review of over 5 million primary clinic consultations in Hong Kong. *BMC Fam Pract*. 2014;15(1):1-7. doi:10.1186/1471-2296-15-95

33. van den Broek d'Obrenan J, Verheij TJ, Numans ME, van der Velden AW. Antibiotic use in Dutch primary care: relation between diagnosis, consultation and treatment. *J Antimicrob Chemother*. 2014;69(6):1701-1707. doi:10.1093/jac/dku005

34. Ministry of Health Malaysia. National Antimicrobial Guideline 2019: Ministry of Health Malaysia ;2019.

35. Leis JA, Born KB, Theriault G, Ostrow O, Grill A, Johnston KB. Using antibiotics wisely for respiratory tract infection in the era of covid-19. *BMJ*. 2020;371:m4125. Published 2020 Nov 13. doi:10.1136/bmj.m4125

36. Rezal RS, Hassali MA, Alrasheedy AA, et al. Prescribing patterns for upper respiratory tract infections: a prescription-review of primary care practice in Kedah, Malaysia, and the implications. *Expert Rev Anti Infect Ther*. 2015;13(12):1547-1556. doi:10.1586/14787210.2015.1085303

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ORIGINAL ARTICLE

Scalp psoriasis and Dermatology Life Quality Index: A retrospective study based on 12-year data from the Malaysian Psoriasis Registry

Wei Cheng Leong, Jyh Jong Tang

Leong WC, Tang JJ, et al. Scalp psoriasis and Dermatology Life Quality Index: A retrospective study based on 12-year data from the Malaysian Psoriasis Registry. *Malays Fam Physician.* 2022;17(3):84–88. https://doi.org/10.51866/oa.146

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Abstract

Introduction: Psoriasis affects approximately 2–3% of the population worldwide, although the overall prevalence in Asia is <0.5%. Scalp psoriasis is a common initial presentation of psoriasis, which affects almost 80% of patients with psoriasis.

Methods: This retrospective descriptive study investigated 1,671 patients with psoriasis with scalp involvement registered with the Malaysian Psoriasis Registry (MPR) from January 2007 to December 2018.

Results: A total of 21,859 patients with psoriasis were registered with the MPR during the study period; among them, scalp involvement was seen in 7.6% (n=1,671). Female sex preponderance (61%) was observed in the majority of Malay patients (58.5%), followed by the Chinese (16.9%), Indian (17.1%) and other ethnic patients (7.5%). A positive family history of psoriasis was identified in 22.7% (n=380). Approximately 34.8% (n=581) and 11% (n=172) of the patients had nail changes and psoriatic arthropathy, respectively. The mainstay treatment modality was topical treatment (93.6%), followed by systemic therapy (10%) and phototherapy (0.5%). The comorbidities found among the patients with scalp psoriasis included hypertension (27.9%), obesity (26%), dyslipidaemia (21%), diabetes mellitus (18.4%), ischaemic heart disease (5.4%) and cerebrovascular disease (1.3%). Approximately 23% reported a Dermatology Life Quality Index (DLQI) of >10, which indicated moderate-to-severe impairment.

Conclusion: The proportion of patients with psoriasis with scalp involvement in our study (7.6%) is much lower than previous reports. Scalp psoriasis markedly negatively impacts the DLQI.

Introduction

Psoriasis is a common, chronic, immunologically mediated inflammatory disease with polygenic predisposition and is associated with triggering environmental factors.[1] It affects approximately 2–3% of the population worldwide, although the overall prevalence in Asia is <0.5%.[2] Scalp psoriasis is a common initial presentation of psoriasis, which has been reported to affect almost 80% of patients with psoriasis.[3] It is characterised by sharply demarcated scaly lesions with silvery-white scale, which often advance beyond the hair border to the face or retro-auricular region.[4] Scalp psoriasis can be psychologically and socially distressing.[5] It poses a therapeutic challenge, as it is difficult to treat, although many treatment modalities are available. Herein, we describe the demographics, clinical characteristics, treatment given and quality of life among patients with scalp psoriasis in Malaysia using data obtained over a 12-year period from the Malaysian Psoriasis Registry (MPR).

Methods

This retrospective descriptive study investigated 1,671 patients with psoriasis with scalp involvement who were registered with the MPR from January 2007 to December 2018. The demographic data, medical history, clinical findings, treatment modalities and Dermatology Life Quality Index (DLQI) were obtained for descriptive analyses. Published in 1994, the DLQI was the first dermatology-specific quality of life questionnaire. It consists of 10 questions concerning patients' perception of the impact of skin diseases on different aspects of their health-related quality of life (HRQOL) over the last week. The domains include symptoms and feelings, daily activities, leisure, work and school, personal relationships and treatment. The total score ranges from 0 to 30, with higher scores indicating a

greater impact on HRQOL.[6] A DLQI of >10 indicates moderate-to-severe impairment of HRQOL. Descriptive statistics were presented as numbers and percentages for categorical variables. Means with standard deviations were used for normally distributed data and medians with interquartile ranges for non-normally distributed data. Collected data were tabulated using the Statistical Package for Social Sciences for Windows version 22.0 (SPSS, Chicago, IL, USA).

Results

A total of 21,859 patients with psoriasis were registered with the MPR during the study period, of whom 7.6% (n=1,671) showed scalp involvement. Female patients (n=1,019) accounted for the majority of the patients with scalp psoriasis (61%), yielding a male-to-female sex ratio of 1:1.56. In terms of ethnicity, most patients with scalp psoriasis were Malay (58.5%, n=977), followed by Chinese (16.9%, n=282), Indian (17.1%, n=286) and other ethnicities (7.5%, n=126). A positive family history of psoriasis was identified in 22.7% (n=380) of the patients. The mean age at onset was earlier in the women (29.16±16.78 years) than in the men (35.53±17.41 years). (**Table 1**)

Table 1. Sociodemographic characteristics of the patients with scalp involvement (n=1,671).

	n (%)
Sex	
Female	1019 (61.0)
Male	652 (39.0)
Ethnicity	
Malay	977 (58.5)
Chinese	282 (16.9)
Indian	286 (17.1)
Others	126 (7.5)
Family history	
Positive	380 (22.7)
Negative	1291 (77.3)
Mean age at onset	
Male	35.53±17.41
Female	29.16±16.78

Nail changes were seen in 34.8% (n=581) of the patients, of which nail pitting was the most common finding (49.4%) (**Figure 1**). Arthropathy was seen in 11% (n=172) of the patients with scalp psoriasis. Symmetrical polyarthropathy was the predominant form observed (34.4%), followed by oligo/monoarthropathy (32.8%) and distal hand joint arthropathy (25.2%); spondylitis/sacroiliitis and arthritis mutilans each accounted for 3.8% of the scalp psoriasis cases associated with arthropathy. (**Figure 2**)

Figure 1. Nail involvement in the patients with scalp psoriasis

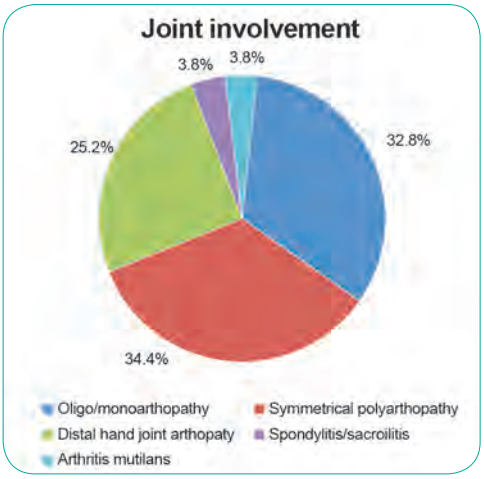

Figure 2. Joint involvement in the patients with scalp psoriasis

Regarding the treatment modalities for patients with psoriasis with scalp involvement, the majority (93.6%) (n=1,542) were using topical treatment. Topical corticosteroids were most commonly used (81.1%), followed by tar preparations (73.3%), keratolytics (46.2%), calcipotriol with betamethasone dipropionate (11.5%) and vitamin D analogues (11.2%). Phototherapy was prescribed for 0.5% (n=10) of the patients, of whom all received narrow band UVB. Systemic therapy was used by 10% (n=164) of the patients with scalp psoriasis in the MPR. Methotrexate was the most commonly prescribed form of systemic treatment (68.3%), followed by sulphasalazine (15.2%), acitretin (11.6%), cyclosporin (2.4%) and systemic corticosteroids (1.8%). Biologics accounted for only 4.3% of the systemic treatments used by the patients with scalp psoriasis.

Regarding comorbidities, hypertension was the most common type observed (27.9%), followed by obesity (26%), dyslipidaemia (21%), diabetes mellitus (18.4%), ischaemic heart disease (5.4%) and cerebrovascular accident (1.3%).

The DLQI was recorded in 39% (n=651) of the patients with scalp psoriasis in the MPR. Of these patients, approximately 23% reported a DLQI of >10, which indicated moderate-to-severe impairment of HRQOL. A DLQI of 0–1 (no effect on patient's HRQOL) was obtained in 16.1%; a score of 2–5 (small effect on patient's HRQOL) in 34.8%; a score of 6–10 (moderate effect on patient's HRQOL) in 25.8%; a score of 11–20 (very large effect on patient's HRQOL) in 20.4%; and a score of 21–30 (extremely large effect on patient's HRQOL) in 2.9%.

Discussion

Demographics

Scalp involvement was seen in 7.6% (n=1,671) of all patients with psoriasis registered with the MPR (n=21,859) from 2007 to 2018. This proportion (7.6%) is significantly lower than previous findings.[7] The frequency of scalp involvement in patients with psoriasis has been reported to range from 50% to 80%[8]; thus, the scalp represents the most commonly involved area of the body. Scalp psoriasis can be observed at the onset of disease or later. Scalp involvement can co-occur with any other type of psoriasis and at different phases of the disease (initial, intermittent or chronic).[9] A 2017 nationwide survey of over 12,000 patients with psoriasis in China reported a mean age at onset of scalp disease of 30±14 years in men and 27±15 years in women,[10] which is comparable to the mean age at onset of scalp psoriasis in our study (35.53±17.41 years in men; 29.16±16.78 years in women). The male-to-female sex ratio among the patients in our study was 1:1.56, showing a slightly higher prevalence among women, which was comparable to the ratio of 1:1.15 obtained by Egeberg et al.[7] Our findings of a positive family history of scalp psoriasis among 22.7% of the patients is similar to those from a study conducted in China, which reported a positive family history among 23.1% of 12,000 patients with psoriasis.[10]

Clinical features

The proportion of patients with nail changes in our cohort was lower than the 57.1% observed in the MPR from 2007 to 2016.[2] Nail pitting was the most common form of nail change observed, which is similar to prior MPR findings.[2] The prevalence of psoriatic arthropathy has been reported to range from 6% to 42% in patients with psoriasis.[11] The cause of the wide variation may be attributed to the different screening strategies employed.[11] The prevalence of psoriatic arthropathy in the patients with scalp psoriasis in the MPR was 11% compared with 13.7% in the MPR between 2007 and 2016.[2] The most common pattern of psoriatic arthropathy in our study was symmetrical polyarthropathy (34.4%), followed by oligo/monoarthropathy (32.8%). This differs from MPR findings from 2007 to 2016, which showed oligo/monoarthropathy (37.3%) to be the predominant form, followed by symmetrical polyarthropathy (30.6%).[2] In comparison, Kumar et al. showed the symmetrical polyarticular form to be the most common pattern (58%), followed by spondyloarthropathy (49%), asymmetric oligoarthritis (21%), isolated spondyloarthropathy (5%), predominant distal interphalangeal arthritis (3%) and arthritis mutilans (1%).[11]

The association between psoriatic arthropathy and other features of psoriasis is well known. The risk of developing psoriatic arthropathy is increased by 3.89 times among patients with scalp psoriasis compared with that among those without scalp psoriasis.[12] Similarly, patients with psoriasis and nail dystrophy had a threefold higher risk of developing psoriatic arthritis than those without nail dystrophy.[12]

Treatment

Psoriasis can be treated with topical therapy, phototherapy or systemic therapy. Topical therapy is recommended as the first-line treatment for all patients.[13] Topical agents (93.6%) were also the mainstay treatment in our cohort study, with topical corticosteroids (81.1%) being the most common topical treatment prescribed. Wang et al. revealed topical corticosteroid therapy as the most common treatment for scalp psoriasis,[3] which typically provides good control of the disease. This is followed by topical tar preparations, keratolytics, calcipotriol, vitamin D analogues, emollients and dithranol.[3,4] The factors that may influence the choice of treatment include disease severity, patient preference, prior response and cost.[13] Systemic treatments are usually provided to patients with scalp psoriasis with intractable diseases.[4]

Comorbidities

The association between psoriasis and several systemic comorbidities is well known. Patients with psoriasis are 2.2 times more likely to have metabolic syndrome than the general population.[14] The prevalence of comorbidities, including hypertension, dyslipidaemia, diabetes mellitus and ischaemic heart disease, among patients with scalp psoriasis in the MPR is higher than that among patients with psoriasis in China,[9] for whom lower rates of hypertension (16.4%), dyslipidaemia (13.7%), diabetes mellitus (7.8%) and ischaemic heart disease (2.4%) have been reported. The findings of the comorbidities among the patients with scalp psoriasis in our study are similar to those from the MPR from 2007 to 2016, with hypertension (27.9%) representing the most common comorbidity reported, followed by obesity (26%), dyslipidaemia (21%), diabetes mellitus (18.4%), ischaemic heart disease (5.4%) and cerebrovascular accident (1.6%).[2]

DLQI

Approximately 23% of our patients had a DLQI of >10, which indicated moderate-to-severe impairment of HRQOL. This rate is lower than that in the study conducted by Cakmur et al. in Turkey: 58% of the patients with scalp psoriasis reported a DLQI of >10.[15] The most frequent and distressing symptoms of scalp psoriasis are itching and scaling.[5] Scalp psoriasis is associated with significant impairments in the DLQI and negative impacts on patients' self-confidence and social acceptance.[4,5,9] This can be attributed to the visibility of the scalp region, which is considered a difficult-to-treat area, as scalp skin is relatively difficult to access, therefore reducing the efficacy of topical treatment.[16] The significant number of patients with missing DLQI data (n=1,015) may limit the interpretation and generalisability of these findings.

Limitations

The limitations of this study include the retrospective study design and the significant number of missing data, which might impact the accuracy of the results reported. Missing data could result from the lack of data collection from patients or inadequate documentation.

Conclusion

This study describes the demographic characteristics, clinical features, treatment modalities and DLQI among patients with scalp psoriasis in Malaysia. Demographic studies on scalp psoriasis are limited worldwide. There is a need for more demographic studies on scalp psoriasis to help improve the care and treatment among patients.

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Conflicts of interest

The authors declare no conflicts of interest.

How does this paper make a difference in general practice?

- The study provides an overview of the demographic characteristics, clinical features, treatment modalities and Dermatology Life Quality Index of patients with scalp psoriasis in Malaysia.
- The findings could help improve the diagnosis and care among patients with scalp psoriasis in primary care settings.
- Topical treatments are the most common treatments for scalp psoriasis, which could be initiated in primary care settings. In cases with poor response to topical treatments, early referral to a dermatology clinic may be warranted.

References

1. Sewon Kang.Chapter 28, Fitzpatrick's Dermatology, 9th Edition.Volume 1.United States of America. *McGraw- Hill Education* 2019. p.457-97

2. Mohd Affandi A, Khan I, Ngah Saaya N. Epidemiology and Clinical Features of Adult Patients with Psoriasis in Malaysia: 10-Year Review from the Malaysian Psoriasis Registry (2007-2016). *Dermatol Res Pract*. 2018;2018:4371471. Published 2018 Apr 23. doi:10.1155/2018/4371471

3. Wang TS, Tsai TF. Managing Scalp Psoriasis: An Evidence-Based Review. *Am J Clin Dermatol*. 2017;18(1):17-43. doi:10.1007/s40257-016-0222-4

4. van de Kerkhof PC, Franssen ME. Psoriasis of the scalp. Diagnosis and management. *Am J Clin Dermatol*. 2001;2(3):159-165. doi:10.2165/00128071-200102030-00005

5. van de Kerkhof PC, de Hoop D, de Korte J, Kuipers MV. Scalp psoriasis, clinical presentations and therapeutic management [published correction appears in Dermatology 1999;198(2):222]. *Dermatology*. 1998;197(4):326-334. doi:10.1159/000018026

6. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)--a simple practical measure for routine clinical use. *Clin Exp Dermatol*. 1994;19(3):210-216. doi:10.1111/j.1365-2230.1994.tb01167.x

7. Egeberg A, See K, Garrelts A, Burge R. Epidemiology of psoriasis in hard-to-treat body locations: data from the Danish skin cohort. *BMC Dermatol*. 2020;20(1):3. Published 2020 May 20. doi:10.1186/s12895-020-00099-7

8. Kragballe K. Management of difficult to treat locations of psoriasis. Scalp, face, flexures, palm/soles and nails. *Curr Probl Dermatol*. 2009;38:160-171. doi:10.1159/000232309

9. Wozel G, Klein E, Mrowietz U, Reich K, Sebastian M, Streit V. Scalp psoriasis [published correction appears in J Dtsch Dermatol Ges. 2011 Oct;9(10):872]. *J Dtsch Dermatol Ges*. 2011;9(1):70-74. doi:10.1111/j.1610-0387.2010.07412.x

10. Chen K, Wang G, Jin H, et al. Clinic characteristics of psoriasis in China: a nationwide survey in over 12000 patients. *Oncotarget*. 2017;8(28):46381-46389. doi:10.18632/oncotarget.18453

11. Kumar R, Sharma A, Dogra S. Prevalence and clinical patterns of psoriatic arthritis in Indian patients with psoriasis. *Indian J Dermatol Venereol Leprol*. 2014;80(1):15-23. doi:10.4103/0378-6323.125472

12. Wilson FC, Icen M, Crowson CS, McEvoy MT, Gabriel SE, Kremers HM. Incidence and clinical predictors of psoriatic arthritis in patients with psoriasis: a population-based study [published correction appears in Arthritis Rheum. 2010 Apr;62(4):574]. *Arthritis Rheum*. 2009;61(2):233-239. doi:10.1002/art.24172

13. Frez ML, Asawanonda P, Gunasekara C, et al. Recommendations for a patient-centered approach to the assessment and treatment of scalp psoriasis: a consensus statement from the Asia Scalp Psoriasis Study Group. *J Dermatolog Treat*. 2014;25(1):38-45. doi:10.3109/09546634.2012.742176

14. Ferdinando LB, Fukumoto PK, Sanches S, Fabricio LHZ, Skare TL. Metabolic syndrome and psoriasis: a study in 97 patients. *Rev Assoc Med Bras* (1992). 2018;64(4):368-373. doi:10.1590/1806-9282.64.04.368

15. Çakmur H, Derviş E. The relationship between quality of life and the severity of psoriasis in Turkey. *Eur J Dermatol*. 2015;25(2):169-176. doi:10.1684/ejd.2014.2511

16. Ortonne J, Chimenti S, Luger T, Puig L, Reid F, Trüeb RM. Scalp psoriasis: European consensus on grading and treatment algorithm. *J Eur Acad Dermatol Venereol*. 2009;23(12):1435-1444. doi:10.1111/j.1468-3083.2009.03372.x

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ORIGINAL ARTICLE

Effectiveness of Fit and Trimmed Staffs (FATS) program on weight management among the healthcare providers at Simpang Health Clinic, Perak: A pre-post interventional study.

Shing Ni Leow, Chai Li Tay, Wei Wei Ng, Mior Nurshafiq Mior Mohammad Jafri

Leow SN, Tay CL, Ng WW, et al. Effectiveness of Fit and Trimmed Staffs (FATS) program on weight management among the healthcare providers at Simpang Health Clinic, Perak: A pre-post interventional study. *Malays Fam Physician.* 2022;17(3):89–96. https://doi.org/10.51866/oa.107

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Abstract

Introduction: Obesity is associated with an increased risk for non-communicable diseases. Local studies have shown that 33.1% of healthcare providers (HCPs) are overweight, while 21.1% are obese. Interventions that consist of diet, physical exercise and cognitive behavioural training have been shown to be successful in reducing weight.

Methods: We designed a weight loss programme for our HCPs named the 'Fit and Trimmed Staff' programme, which consisted of 3 months of group education on obesity-related health problems led by a doctor, a pharmacist, a nutritionist and an occupational therapist among HCPs. Monthly individual dietary counselling by a nutritionist was also provided for 6 months. We measured the body weight, body mass index, percentage of body fat, visceral fat and percentage of skeletal muscle of the HCPs before and after the intervention.

Results: Forty-five (56.25%) HCPs at Simpang Health Clinic were either overweight or obese; the majority of them were drivers and administrative clerks (100%), followed by health attendants (69.2%) and medical assistants (63.6%). At 6 months post-intervention, there was a trend towards a non-significant reduction in the fat percentage (median=-0.8%, P=0.423). Approximately 42% (n=19) of the HCPs lost weight, while 58% gained weight. Weight loss was observed more commonly in the male HCPs (>50%) than in the female HCPs.

Conclusion: A weight loss programme solely consisting of health discussion and nutritional advice is inadequate to induce weight reductions. A multimodal approach may be considered in managing weight among HCPs.

Introduction

Obesity is one of the risk factors for developing hypertension, dyslipidaemia, type 2 diabetes mellitus, cardiovascular disease, stroke and cancer. It is also associated with reduced work productivity, physical fitness and muscular strength and increased risk for musculoskeletal pain.[1–3] Healthcare providers (HCPs) should act as role models, promote public awareness of obesity prevention and advocate a healthy lifestyle among patients. They are commonly thought as being well informed about the risks of obesity. Ironically, studies from Scotland, Botswana and India have consistently found that HCPs have a higher risk of obesity than the general population.[4–6] A Malaysian study revealed that 33.1% of HCPs were overweight, while 21.1% were obese. Being a nurse was significantly associated with a higher risk of obesity.[7] Female HCPs also have a higher prevalence of metabolic syndrome than their male counterparts.[4]

A meta-analysis showed that when HCPs provided weight loss advice, it positively influenced patients' self-efficacy and motivation in weight loss behaviour.[7] Obesity among HCPs is a barrier in obesity care. A study indicated that HCPs with obesity were less confident in providing healthy nutritional/exercise advice to their patients.[8] HCPs with a normal body mass index (BMI) perceived that weight loss advice from doctors with overweight/obesity lack trustworthiness and authenticity.[8] Lack of training/education on weight management among HCPs has led to their inability to accurately estimate calorie and salt contents in food and their unawareness about the amount of exercise required to burn off excess calories.[9] There is a need to support and educate HCPs to better manage the

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challenges associated with obesity. This is an imperative that enables HCPs with a normal BMI to advocate for weight management more effectively.

There are multimodal strategies in managing weight among HCPs. Behavioural (e.g. counselling by a trained professional, exercise training session or cooking demonstration) and educational strategies (e.g. lecture or educational material) are able to modify diet and physical activity behaviours of HCPs.[10] Organisational support strategies, such as provision of incentives, are also effective for weight loss by improving diet and physical activity behaviours.[10] Environmental strategies, including access to healthier meals, to manage the weight of HCPs via healthy eating behaviours also yield positive results.[11] Interventions targeting both diet and physical activity behaviours have been successful in improving weight outcomes.[12] The FINALE-health study indicated that interventions consisting of diet, physical exercise and cognitive behavioural training during working hours for 1 hour/week significantly reduced body weight, BMI and body fat percentage among female HCPs with overweight over 12 months.[13]

Weight management can be challenging among HCPs owing to their busy schedule and lack of motivation. Interventions at the workplace may enhance motivation for weight management. Therefore, we developed the 'Fit and Trimmed Staff' (FATS) programme to utilise our workplace as an arena for weight loss initiatives among HCPs with overweight/obesity. The FATS programme is a self-initiated programme by the authors. It consists of 3 months of group education on obesity-related health problems led by a doctor, a pharmacist, a nutritionist and an occupational therapist. Monthly individual dietary counselling by a nutritionist was also provided for 6 months. Owing to manpower constraints during the COVID-19 pandemic, interventions occurred at a 3–4-week interval, rather than at a 1–2-week interval as in other studies. This study aimed to assess the effectiveness of the FATS programme in weight management among HCPs with overweight/obesity at Simpang Health Clinic and determine the changes in the BMI, percentage of body fat, visceral fat and percentage of skeletal muscle after the FATS programme.

Methods

This pre–post interventional study consisted of two overlapping phases. In the first phase, we provided HCPs with overweight/obesity working at Simpang Health Clinic with 3 months of weekly group education on obesity-related health problems. Each session lasted 1 hour and was conducted by a doctor, a pharmacist, a nutritionist and an occupational therapist. The topics covered were obesity and its complications, pharmacotherapy for obesity and its side effects, healthy diet for weight reduction and healthy lifestyle. This phase spanned 3 months (from 1 September to 31 December 2020). In the second phase, monthly individual dietary counselling by a nutritionist was provided, with each session lasting 10–15 minutes. This phase spanned 6 months (from 1 September 2020 to 15 March 2021). The body weight, BMI, percentage of body fat, visceral fat and percentage of skeletal muscle of the HCPs were measured between 1 and 15 September 2020 before the interventions started. The second set of measurements was taken immediately after the intervention between 1 and 15 March 2021.

HCPs who were overweight or obese, working at Simpang Health Clinic between 1 September 2020 and 15 March 2021 and had attended both phases of the intervention were included. HCPs who were on maternity leave, pregnant or on long medical/study leave were excluded. Epi Info version 3.5.4 (Centers for Disease Control and Prevention (CDC), Atlanta, Georgia (US)). It was used to calculate the sample size based on the following: a) The overweight/obesity rates among public sector HCPs was 54.2% based on a Malaysian study;[14] b) the total number of HCPs at Simpang Health Clinic during the study period was 80; and c) the confidence level was set at 95% and the significance level at $P<0.05$. The estimated sample size was 67. The universal sampling method was used. In our setting, 45 (56.25%) HCPs were overweight or obese and thus included in our study.

Our study instruments consisted of an electrical weighing machine (OMRON Body Composition Monitors Model: HBF-214) and a data collection form used to collect information on demographics (age, sex or designation), date of measurement, height, weight, BMI, percentage of body fat, visceral fat and percentage of skeletal muscle.

Recruitment was performed on the basis of the body weight, BMI, percentage of body fat, visceral fat and percentage of skeletal muscle of all 80 HCPs at Simpang Health Clinic. Measurements were conducted by a nutritionist, and results were charted in a pocket-sized data collection form. The data form was kept by the participants themselves; they were encouraged to keep them among their essential belongings, such as in their wallets, to serve as a frequent reminder to watch their weight. All HCPs with overweight/obesity (n=45) identified were invited by the principal investigator to participate in the study. All of them provided written consent. At the end of the study period, data were retrieved from the pocket-sized data form kept by the participants.

Data were analysed using the SPSS version 25. Continuous data were plotted onto histograms and tested for normal distribution using the Kolmogorov–Smirnov test. Normally distributed continuous variables, including age, were presented as means with standard deviations. Non-normally distributed data, including weight, BMI, fat percentage, visceral fat and percentage of skeletal muscle, were presented as medians with interquartile ranges. Categorical variables, such as sociodemographic data and BMI, were described as frequencies and percentages. Pre- and post-intervention weight, BMI, percentage of body fat, visceral fat and percentage of skeletal muscle were compared using the Wilcoxon signed rank test. A P-value of <0.05 was considered statistically significant.

Results

A total of 80 HCPs working at Simpang Health Clinic were screened, among whom 45 (56.25%) were overweight/obese. The majority of the HCPs with overweight/obesity were men (63.6%) and aged between 45 and 56 years (80%). The highest prevalence of overweight/obesity was found among drivers and administrative clerks (100%), followed by health attendants (69.2%) and medical assistants (63.6%). The mean age of the HCPs with overweight/obesity was 39.24±8.33 years

We included the two staff with morbid obesity who were unwilling to consider bariatric surgery despite being counselled about the poor outcomes of diet and education interventions alone. All staff with comorbidities, including diabetes mellitus and hypertension, were followed up under the family medicine specialist in the clinic. No staff had medical/psychiatric conditions that may affect their BMI/weight.

After the intervention, 42% (n=19) of the HCPs lost weight, while 58% (n=26) gained weight. Among those who lost weight, the percentage of change ranged from 0.1% to 9.3%; among those who gained weight, the percentage of change ranged from 0.4% to 15.1%. According to profession, 100% of the pharmacists, 75% of the allied health professionals and 60% of the drivers and administrative clerks successfully lost weight. Weight loss was most commonly observed in those aged 23–34 years (64.7%). Among the 19 HCPs who lost weight, 57.1% (n=8) were men, and 35.5% (n=11) were women. More than 50% and approximately 35.5% had weight loss after the intervention among the male and female HCPs with overweight/obesity, respectively (**Table 1**).

Table 1. Sociodemographic data of the HCPs at Simpang Health clinic (n=80).

Variable	Total no. of HCPs (n=80)	HCPs with overweight/obesity, percentage according to each variable (n=45), n (%)	Weight change after the intervention (n=45)	
			Weight loss (n=19), n (%)	Weight gain (n=26), n (%)
Designation				
Doctors	13	7 (53.8)	3 (42.9)	4 (57.1)
Pharmacists	7	3 (42.9)	3 (100.0)	0 (0.0)
Nurses	23	10 (43.5)	3 (30.0)	7 (70.0)
Medical assistants	11	7 (63.6)	2 (28.6)	5 (71.4)
Health attendants	13	9 (69.2)	2 (22.2)	7 (77.8)
Allied health professionals (radiographers, occupational therapists or laboratory technicians	8	4 (50.0)	3 (75.0)	1 (25.0)
Drivers and administrative clerks	5	5 (100.0)	3 (60.0)	2 (40.0)

Table 1. Continued

Variable	Total no. of HCPs (n=80)	HCPs with overweight/ obesity, percentage according to each variable (n=45), n (%)	Weight change after the intervention (n=45)	
			Weight loss (n=19), n (%)	Weight gain (n=26), n (%)
Age (year)				
23–34	35	17 (48.6)	11 (64.7)	6 (35.3)
35–44	30	16 (53.3)	6 (37.5)	10 (62.5)
45–56	15	12 (80.0)	2 (16.7)	10 (83.3)
Sex				
Male	22	14 (63.6)	8 (57.1%)	6 (42.9%)
Female	58	31 (53.4)	11 (35.5%)	20 (64.5%)

HCP, healthcare provider

Before the intervention, 53.3% (n=24) of the HCPs with an abnormal BMI were categorised to have overweight; 35.6% (n=16), obesity I; 6.7% (n=3), obesity II; and 4.4% (n=2), obesity III. After the intervention, 2.2% (n=1) of the HCPs who were overweight successfully achieved a normal BMI. There was a twofold increase in the number of participants with obesity II post-intervention, contributed by one from the overweight category and two from the obesity I category pre-intervention. Two of the HCPs with obesity III remained in the same classification after the intervention (**Table 2**).

Table 2. Classification of BMI pre-intervention and 6 months post-intervention (n=45).

BMI (kg/m²)	Classification	Pre-intervention		6 months post-intervention	
		Number	Percentage	Number	Percentage
18.5–24.9	Normal	0	0	1	2.2
25.0–29.9	Overweight	24	53.3	22	48.9
30.0–34.9	Obesity I	16	35.6	14	31.1
35.0–39.9	Obesity II	3	6.7	6	13.3
≥40	Obesity III	2	4.4	2	4.4

BMI was classified in accordance with the Malaysian Clinical Practice Guidelines on Management of Obesity (2004) and Malaysian Clinical Practice Guidelines on Management of Type 2 Diabetes Mellitus (6th edition, 2020) adapted from the WHO Consultation Group. BMI, body mass index

There was a 0.8% reduction in the median fat percentage post-intervention; however, the result was not significant (P=0.423). The weight, BMI, fat percentage, visceral fat and muscle percentage did not significantly change post-intervention. The median weight did not significantly change throughout the 6-month study period: pre-intervention, 74.4 kg; first month, 74.4 kg; third month, 75.5 kg; fourth month, 75.4 kg; fifth month, 75.3 kg; post-intervention, 74.4 kg. Therefore, only two sets of measurements – pre- and post-programme weight charts – were retrieved in our study (**Table 3**).

Table 3. Median weight, BMI, fat percentage, visceral fat and muscle percentage pre- and post-intervention (n=45).

Variables	Median (interquartile range)		Z statistic	P-value*
	Pre-intervention	Post-intervention		
Weight	74.40 (67.90, 81.95)	74.40 (68.70, 80.85)	-1.321	0.186
BMI	29.20 (26.45, 32.20)	29.20 (26.55, 33.05)	-1.668	0.095
Fat percentage	36.60 (29.85, 39.20)	35.80 (29.85, 39.35)	-0.801	0.423
Visceral fat	12.00 (10.00, 17.25)	13.00 (10.00, 18.00)	-1.861	0.063
Muscle percentage	24.00 (22.35, 29.85)	24.30 (22.45, 30.00)	-0.015	0.988

* Wilcoxon signed rank test. BMI, body mass index

Discussion

Our study showed that more than half of the HCPs were overweight or obese. This finding is similar to that of other local studies among HCPs in Malaysia.[14,15] A study conducted in the United States also reported that HCPs had a significantly higher risk of becoming obese than workers in other industry categories.[16] The high percentage of obesity among HCPs is likely attributed to the long working hours, unhealthy diet, job stress and poor self-perception about body weight.[5,14,17,18]

In our study, the drivers and administrative clerks had the highest prevalence of obesity among all job categories, which is dissimilar to other local and international reports, where nurses contributed to the highest prevalence.[5,14,19] Our findings could be explained by the sedentary nature of the work of drivers and clerks. Generally, our study is similar to a study conducted in India, which found the prevalence of obesity to be significantly lower among nurses than among doctors.[20] Taken together, occupational categories may have an impact on obesity among HCPs.[5,14,19,20] Accordingly, weight reduction programmes targeting more drivers and administrative clerks may be needed in the future.

Sex disparities in excess weight gain could be attributed to different eating patterns. Women tend to prefer dairy products or foods high in added sugars (e.g. cookies, chocolate and ice cream), while men tend to prefer meat-based products with greater protein content and that do not affect fat mass.[21,22] This supports our results that the female HCPs had a higher prevalence of obesity or overweight than the male HCPs, also similar to most other reports.[17,23–25] However, our results differ from those of other local studies that discovered men to have a higher prevalence of obesity.[14,15]

Our study intervention focusing on education and diet did not have a significant impact on body weight, which is similar to the findings of a previous meta-analysis.[26] We found that 42.2% of the HCPs had improvements in their body weight after 6 months; however, it was not statistically significant. Despite this, we postulate that awareness of the importance of maintaining a healthy body weight had been instilled to nearly half of them, and hence, effort was made for weight loss. HCPs often deal with patients who are overweight and obese; thus, they play an important role in the prevention and management of obesity,[27] as most patients will take action if provided with counselling regarding obesity management.[28] Therefore, awareness of a healthy body image among HCPs is important in such situations.

Another plausible reason for the insignificant weight loss seen among our HCPs after the dietary approach and educational programme alone may be attributed to their unhealthy eating behaviours and the unsupportive eating environment in our health clinic during the movement control order (MCO) for the COVID-19 pandemic.[29] Individuals with obesity tend to show a significantly higher preference for take-out food over home-cooked food.[30,31] A supportive eating environment in a health clinic[32] and dietary adherence[33] are two key factors contributing to behavioural change and weight loss. In our programme, the nutritional advice given to the participants was more focused on the Malaysia Healthy Plate, involving advice to reduce sugary drinks and fatty food intake and increase high fibre intake. This involves a need to change daily eating habits, whether in the form of food portions or cooking methods. However, during the MCO, the mushrooming of food delivery services has enabled easy access to various types of unhealthy food. The increase in food delivery services and the lack of time to prepare home-cooked meals owing to added workload during the COVID-19 pandemic likely contributed to an unhealthy eating environment among the HCPs. This was noted during the monthly dietary counselling by the nutritionists. However, our study did not evaluate the knowledge, attitude and practice of the HCPs before and after the intervention.

According to a randomised controlled trial,[13] a weight management programme combining diet, physical exercise and cognitive behavioural training was more successful in controlling weight than a monthly oral presentation. As such, a regular exercise schedule was initially planned as part of the FATS programme. However, physical distancing measures during the COVID-19 pandemic have deterred the continuation of the exercise programme. Most HCPs at Simpang Health Clinic also served as front liners (n=31), and this reduced their physical activities during working hours. The Malaysian Obesity Task Force also noted that at baseline, Malaysians have a sedentary lifestyle, and their energy costs (kcal/min)

of habitual activities are lower than those of Caucasians.[32] The implementation of the MCO further impeded outdoor physical activities among HCPs.[29] This may be one of the reasons contributing to 58% of our HCPs gaining weight 6 months after the intervention.

In our study, younger age, pharmacist job and male sex were associated with higher success rates in weight loss. This finding can be useful in future weight reduction programmes where individuals with these factors can be utilised as small group leaders championing weight loss initiatives. Improvisations are proposed to increase the effectiveness of the FATS programme. The FATS programme consisted only of a series of health education sessions and dietary advice. It did not involve any counselling or physiotherapy owing to limited availability. This was deemed inadequate to induce behavioural change for sustained weight loss. A counsellor or psychologist can implement a cognitive behavioural approach to increase the success rate and consistency of weight loss.[13,34] Occupational therapists can provide guidance on occupational balance that can enhance incorporation of physical activities into daily routine, leading to sustainable behavioural changes.[35] The involvement of family members may also enhance the efficacy of weight management programmes because family is the pillar of lifestyle modification and support.[36] Thus, incorporating a broad-based multimodal approach in the FATS programme is likely to make it more successful.[13,33–36]

The limitation of this study is its small sample size. This was also part of the reason why we did not assess the participants' readiness to lose weight, as it may further reduce the sample size of our study. Its design without a comparator arm limits the conclusions able to be drawn. Its conduct during the COVID pandemic also makes generalisation of the results to non-pandemic situations difficult.

Conclusion

A weight loss programme solely consisting of a series of health discussion and nutritional advice is inadequate to induce weight reductions. A more broad-based multimodal approach, involving counsellors or psychologists and physiotherapists, may be considered in managing weight among HCPs.

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How does this paper make a difference in general practice?

- Increase understanding of weight management program used in clinical practice.
- Suggests multimodal approach to be used in weight management program instead of health discussion and nutritional advice alone.

References

1. Cash SW, Beresford SA, Henderson JA, McTiernan A, Xiao L, Wang CY, et al. Dietary and physical activity behaviours related to obesity-specific quality of life and work productivity: baseline results from a worksite trial. *Br J Nutr*. 2012;108(6):1134-42. doi: 10.1017/S0007114511006258

2. Miyatake N, Miyachi M, Tabata I, Sakano N, Hirao T, Numata T. Relationship between muscle strength and anthropometric, body composition parameters in Japanese adolescents. *Health*. 2012;Vol.04No.01:5. doi:10.4236/health.2012.41001

3. Heuch I, Heuch I, Hagen K, Zwart JA. A Comparison of Anthropometric Measures for Assessing the Association between Body Size and Risk of Chronic Low Back Pain: The HUNT Study. *PLoS One*. 2015;10(10):e0141268. doi: 10.1371/journal.pone.0141268

4. Garrido RA, Semeraro MB, Temesgen SM, Simi MR. Metabolic syndrome and obesity among workers at Kanye Seventh-Day Adventist Hospital, Botswana. *S Afr Med J*. 2009;99(5):331-4.

5. Kyle RG, Neall RA, Atherton IM. Prevalence of overweight and obesity among nurses in Scotland: A cross-sectional study using the Scottish Health Survey. *Int J Nurs Stud*. 2016;53:126-33. doi:10.1016/j.ijnurstu.2015.10.015

6. Ramachandran A, Snehalatha C, Yamuna A, Murugesan N. High prevalence of cardiometabolic risk factors among young physicians in India. *J Assoc Physicians India*. 2008;56:17-20.

7. Rose SA, Poynter PS, Anderson JW, Noar SM, Conigliaro J. Physician weight loss advice and patient weight loss behavior change: a literature review and meta-analysis of survey data. *Int J Obes (Lond)*. 2013;37(1):118-128. doi:10.1038/ijo.2012.24

8. Bleich SN, Bennett WL, Gudzune KA, Cooper LA. Impact of physician BMI on obesity care and beliefs. *Obesity (Silver Spring)*. 2012;20(5):999-1005. doi:10.1038/oby.2011.402

9. Cottrell E, Chambers R. Healthcare professionals' knowledge of calories. *Nurs Stand*. 2013;27(21):35-41. doi:10.7748/ns2013.01.27.21.35.e5961

10. Kullgren JT, Troxel AB, Loewenstein G, et al. Individual- versus group-based financial incentives for weight loss: a randomized, controlled trial. *Ann Intern Med*. 2013;158(7):505-514. doi:10.7326/0003-4819-158-7-201304020-00002

11. Leedo E, Beck AM, Astrup A, Lassen AD. The effectiveness of healthy meals at work on reaction time, mood and dietary intake: a randomised cross-over study in daytime and shift workers at an university hospital. *Br J Nutr*. 2017;118(2):121-129. doi:10.1017/S000711451700191X

12. Upadhyaya M, Sharma S, Pompeii LA, Sianez M, Morgan RO. Obesity Prevention Worksite Wellness Interventions for Health Care Workers: A Narrative Review. *Workplace Health Saf*. 2020;68(1):32-49. doi:10.1177/2165079919863082

13. Christensen JR, Overgaard K, Carneiro IG, Holtermann A, Søgaard K. Weight loss among female health care workers--a 1-year workplace based randomized controlled trial in the FINALE-health study. *BMC Public Health*. 2012;12:625. Published 2012 Aug 8. doi:10.1186/1471-2458-12-625

14. Kunyahamu MS, Daud A, Jusoh N. Obesity among Health-Care Workers: Which Occupations Are at Higher Risk of Being Obese?. *Int J Environ Res Public Health*. 2021;18(8):4381. Published 2021 Apr 20. doi:10.3390/ijerph18084381

15. Ehsan S. A Study of Obesity among Health Staff at Kulaijaya District Health Department 2012. *Johor Health J*. 2012;10:27.

16. Luckhaupt SE, Cohen MA, Li J, Calvert GM. Prevalence of obesity among U.S. workers and associations with occupational factors. *Am J Prev Med*. 2014;46(3):237-248. doi:10.1016/j.amepre.2013.11.002

17. Skaal, Linda & Pengpid, Supa. Obesity and health problems among South African healthcare workers: Do healthcare workers take care of themselves?. *S. Afr. Fam. Pract*. 2014;53(6). 563-567. Doi:10.1080/20786204.2011.10874153.

18. Aslam M, Siddiqui AA, Sandeep G, Madhu SV. High prevalence of obesity among nursing personnel working in tertiary care hospital. *Diabetes Metab Syndr*. 2018;12(3):313-316. doi:10.1016/j.dsx.2017.12.014

19. Kyle RG, Wills J, Mahoney C, Hoyle L, Kelly M, Atherton IM. Obesity prevalence among healthcare professionals in England: a cross-sectional study using the Health Survey for England. *BMJ Open* 2017;7:e018498. doi:10.1136/bmjopen-2017-018498

20. Hegde SKB, Sathiyanarayanan S, Venkateshwaran S, Sasankh A, Parasuraman G, Ramraj B. Prevalence of Diabetes, Hypertension and Obesity among Doctors and Nurses in a Medical College Hospital in Tamil Nadu, India. *Natl. j. community med*. 2015;4:235-9.

21. Ribas-Barba L, Serra-Majem L, Salvador G, et al. Trends in dietary habits and food consumption in Catalonia, Spain (1992-2003). *Public Health Nutr*. 2007;10(11A):1340-1353. doi:10.1017/S136898000700095X

22. Bray GA, Smith SR, de Jonge L, Xie H, Rood J, Martin CK, et al. Effect of dietary protein content on weight gain, energy expenditure, and body composition during overeating: a randomized controlled trial. *Jama*. 2012;307(1):47-55. doi: 10.1001/jama.2011.1918.

23. Darebo T, Mesfin A, Gebremedhin S. Prevalence and factors associated with overweight and obesity among adults in Hawassa city, southern Ethiopia: a community based cross-sectional study. *BMC Obes*. 2019;6:8. Published 2019 Mar 4. doi:10.1186/s40608-019-0227-7

24. Chong T, Lee P. Prevalence of overweight and obesity in Malaysia, 2010-2016: a comprehensive meta-analysis. *Southeast Asian J. Trop. Med. Public Health*. 2018;49(5):859-69.

25. Adaja T, Idemudia O. Prevalence of overweight and obesity among health-care workers in University of Benin Teaching Hospital, Benin City, Nigeria. *Ann. Trop. Pathol*. 2018;9(2):150-4. DOI: 10.4103/atp.atp_30_18

26. Wu T, Gao X, Chen M, van Dam RM. Long-term effectiveness of diet-plus-exercise interventions vs. diet-only interventions for weight loss: a meta-analysis. *Obes Rev*. 2009;10(3):313-23. doi: 10.1111/j.1467-789X.2008.00547.x.

27. Haslam D. Obesity in primary care: prevention, management and the paradox. *BMC Medicine*. 2014;12(1):149. doi: 10.1186/1741-7015-12-149.

28. Greaney ML, Cohen SA, Xu F, Ward-Ritacco CL, Riebe D. Healthcare provider counselling for weight management behaviours among adults with overweight or obesity: a cross-sectional analysis of National Health and Nutrition Examination Survey, 2011-2018. *BMJ Open*. 2020;10(11):e039295. Published 2020 Nov 23. doi:10.1136/bmjopen-2020-039295

29. Ammar A, Brach M, Trabelsi K, et al. Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients*. 2020;12(6):1583. Published 2020 May 28. doi:10.3390/nu12061583

30. Proserpio C, Laureati M, Bertoli S, Battezzati A, Pagliarini E. Determinants of Obesity in Italian Adults: The Role of Taste Sensitivity, Food Liking, and Food Neophobia. *Chem Senses*. 2016;41(2):169-176. doi:10.1093/chemse/bjv072

31. Jiang Y, Wang J, Wu S, et al. Association between Take-Out Food Consumption and Obesity among Chinese University Students: A Cross-Sectional Study. *Int J Environ Res Public Health*. 2019;16(6):1071. Published 2019 Mar 25. doi:10.3390/ijerph16061071

32. Prioritizing Food Policy Options to Reduce Obesity in Malaysia : ASM Obesity Task Force Advisory Report. *ASM Advisory Report* 4/2013. ed. Kuala Lumpur: ASM; 2013.

33. Fock KM, Khoo J. Diet and exercise in management of obesity and overweight. *J Gastroenterol Hepatol*. 2013;28 Suppl 4:59-63. doi:10.1111/jgh.12407

34. Dalle Grave R, Calugi S, Centis E, El Ghoch M, Marchesini G. Cognitive-behavioral strategies to increase the adherence to exercise in the management of obesity. *J Obes*. 2011;2011:348293. doi:10.1155/2011/348293

35. Matuska K, Bass J. Life Balance and Stress in Adults With Medical Conditions or Obesity. *OTJR (Thorofare N J)*. 2016;36(2):74-81. doi:10.1177/1539449216628859

36. McLean N, Griffin S, Toney K, Hardeman W. Family involvement in weight control, weight maintenance and weight-loss interventions: a systematic review of randomised trials. *Int J Obes Relat Metab Disord*. 2003;27(9):987-1005. doi:10.1038/sj.ijo.0802383

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ORIGINAL ARTICLE

Animated educational video using health belief model on the knowledge of anemia prevention among female adolescents: An intervention study

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Abstract

Introduction: As the younger female generation, female adolescents should understand anaemia prevention. This study examined the effects of animated educational videos on the knowledge of anaemia prevention among female adolescents using the Health Belief Model (HBM).

Methods: A quasi-experimental method with a randomised pre-test and post-test control group design was applied. Animated educational videos about anaemia prevention were used as the intervention. One hundred sixty-one female adolescents were recruited through multistage random sampling and divided into intervention (n=78) and control (n=83) groups. The intervention group received education via animated educational videos. The HBM questionnaire was used to measure the nine HBM indicators (r=0.8); the item categories were valid and reliable. Descriptive analyses, independent t-tests and repeated-measures ANOVA were used to analyse the data.

Results: The animated educational videos played thrice significantly increased the knowledge of the intervention group (mean score: pre-test, 94; post-test one, 99; post-test two, 102). The scores for anaemia examination barriers (P=0.001), anaemia susceptibility (P=0.001), anaemia severity (P=0.001), anaemia prevention benefits (P=0.001), anaemia examination benefits (P=0.001), self-efficacy for obtaining iron tablets (P=0.001), self-recognition of anaemia signs and symptoms (P=0.001), signs of anaemia prevention (P=0.001) and health motivation (P=0.001) significantly changed. Meanwhile, the knowledge of the control group did not significantly increase (pre-test, 93; post-test one, 94; post-test two, 97). The intervention group had significantly higher mean scores in both the first and second measurements than the control group (P=0.05).

Conclusion: Animated educational videos significantly increased the knowledge of anaemia prevention, including the nine HBM indicators.

Introduction

Female adolescents are vulnerable to anaemia. According to the Indonesia Basic Health Research, the population with anaemia in Indonesia is dominated by patients aged 15–24 years, accounting for 32% of all populations in 2018.[1] Classic physical examination of paleness can rule out and unassumingly rule in severe anaemia,[2] allowing adolescents to indicate it by themselves. Female adolescents in Indonesia have a low level of knowledge on anaemia, including that of its definition, aetiology and prevention.[3] Knowledge of anaemia is inversely proportional to the incidence of anaemia.

The mild impacts of anaemia include impaired growth, weakened cognitive and physical capacities, irregular menstrual cycle and decreased academic performance or low learning concentration.[4,5] Meanwhile, severe impacts include decreased blood cell count, increased oxygen demand in cells, and impaired systemic blood circulation. Students who took iron supplements have been reported to have significantly increased math scores compared with those who did not. Thus, iron affects cognitive abilities and intelligence through increased concentration and attention.[6]

The Indonesia Ministry of Health, in collaboration with the United Nations Children's Fund, has initiated weekly iron and folic acid supplementation, an anaemia management programme that focused on providing weekly iron tablets to female adolescents.[7] However, this programme was not fully effective because of low interest

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in consumption of iron and folic acid supplementation, and the knowledge level about the function of iron tablets remains low.8 Increasing the knowledge of and motivating female adolescents to consume iron tablets regularly implemented to manage this problem.[9] The Health Belief Model (HBM) is a theoretical model that can be used to guide health promotion and disease prevention programmes. Health education based on the HBM has been reported to significantly improve individual behaviours, habits and beliefs as well as knowledge, attitudes and practices.[10-12]

Previous findings evidenced that old media, such as leaflets, booklets and flipcharts, had less effectiveness to be used for the current generation. They highlighted that educational video media and simulation methods are more effective in increasing adolescent knowledge about anaemia than conventional media.[13] Educational media using an animation video have been reported to effectively capture participants' attention, increase their pleasure, contentment and knowledge and influence their behaviour owing to longer retention of information.[14, 15]

Therefore, the present study developed animated videos as informative, comprehensive and interesting health educational media to increase the knowledge of anaemia prevention among female adolescents.

Methods

Study design and participants

This study used a quantitative research method with a quasi-experimental randomised pre-test and post-test design with a control group. It was performed in 2021 in Semarang City, Central Java, Indonesia. A four-stage random sampling method was used to select two senior high schools from a total of 12 senior high schools in Semarang City, with a 1.101 female student population. Two classes from two different schools were then selected randomly to recruit female students as the study's specific sample. The sample size was calculated using the proportion formula developed by Lemeshow et al. (1990). The minimum sample size required for both intervention and control groups was 84, with an attrition consideration value of 20%.

A total of 161 female students were recruited from two senior high schools and assigned to intervention (n=78) and control (n=83) groups. The inclusion criteria were age of 14–19 years, ongoing menstrual cycle and absence of anaemia symptoms, such as anaemic conjunctiva and paleness on the face, lips, tongue, nails and palms. The signs and symptoms of anaemia were directly examined by conducting head-to-toe physical examination. The data were collected during task submission or COVID-19 protocol education in their schools. Paleness was identified as an abnormal skin colour on the face, lip, tongue, nails and palms.

Video animation

The video contents were arranged on the basis of the qualitative data collection via interviews with 35 female adolescents using the following questions: 'What is anaemia?' and 'What kind of video makes it easier for you to understand anaemia?' The interview was conducted via multiple techniques (online and offline). Recorded interviews was analysed, and was used for formulating video content. All relevant information was first explained to the professional animation video creator to ensure that the video details were not missed.

A 10-minute video duration consist of general anaemia information, such as definition, pathophysiology, signs and symptoms and aetiology. The content was adapted from Becker's (1974) HBM with nine indicators, which included the following variables: disease susceptibility, severity, health motivation and self-efficacy. Another part included specific information about anaemia, such as the impact, prevention and management or treatment of anaemia. The HBM was also applied to the material in part two on the following variables: perceived severity, benefits, barriers, cues to act, self-efficacy and health motivation. It included the substances at the primary, secondary and tertiary preventive levels.

Data collection

The data were collected online using Gforms and the website system of education for female adolescent (web-SeaRP). Informed consent was obtained from the participants by sending a free Jotform application link. The intervention group was required to watch the video three times and undergo first post-test after they had finished watching and second post-test 4 weeks after the previous. Meanwhile, the control group received education using the video intervention after the research activities were completed.

The questionnaire consisted of items on anaemia prevention that were adapted and modified from a previous study.[16] Pearson product-moment correlation coefficients were used to test the validity and reliability of the Indonesian version (r=0.8). The item categories were found to be valid and reliable. The pre and post-test was administered online.

Data analysis

A descriptive analysis was used to examine all demographic characteristics, including age and class levels. Furthermore, a bivariate t-test and the Mann–Whitney test were used to investigate the differences in the anaemia prevention knowledge between the intervention and control groups. The data distribution was examined using skewness values. Furthermore, general linear model repeated ANOVA and the Friedman test were used to compare the effects of the video on the knowledge of anaemia between the two groups.

Ethical consideration

The Ethics Committee Review Board of the Faculty of Health, Universitas Muhammadiyah Semarang (number 527/KEPK-FKM/UNIMUS/2021) approved this study. All participants were informed that they were free to withdraw from this study any time without any consequences.

Results

The average age of the intervention and control groups was 16.09 and 16.06 years, respectively. There were no significant differences in age, class category or anaemia knowledge between the groups before the intervention (P=0.05) (**Table 1**).

Table 1. Demographic characteristics of the participants (n=161).

Characteristics	Intervention (n=78)				Control (n=83)				X^2	P
	M±SD	Min–Max	n	%	M±SD	Min–Max	n	%		
Age	16.09±0.724	14–18			16.06±0.631	15–18				0.783[b]
Class category										
10th class			39	50.0			33	39.8	1.706	0.208[a]
11th class			39	50.0			50	60.2		
Information about anaemia before the intervention										
Never received information			72	92.3			70	84.3	2.454	0.145[a]
Received information			6	7.7			13	15.7		

[a] Fisher's exact test; [b] Independent t-test

Three repeated measurements on the nine variables between the groups revealed a significant difference (P=0.000) (**Table 2**). The mean scores of anaemia examination barriers, anaemia susceptibility, self-efficacy to obtain iron tablets and self-recognition of anaemia signs and symptoms were significant (P<0.05). Meanwhile, anaemia severity, benefits of anaemia prevention, benefits of anaemia examination, signs of anaemia prevention and health motivation did not significantly differ (P>0.05). However, the intervention group demonstrated a significant increase in knowledge on all component variables (P=0.05), whereas the control group demonstrated a significant increase in the following three variables only (P=0.05): anaemia examination barriers, anaemia susceptibility and benefits of anaemia prevention.

In the intervention group, the following variables improved significantly (P<0.05) after the intervention (**Table 2**): anaemia examination barriers, anaemia susceptibility , anaemia severity, benefits of anaemia prevention, benefits of anaemia examination, self-efficacy to obtain iron tablets, self-recognition of anaemia signs and symptoms, signs of anaemia prevention and health motivation.

In the control group (**Table 2**), the following variables improved significantly (P<0.05): anaemia examination barriers, anaemia susceptibility and benefits of anaemia prevention. Meanwhile, the following variables did not significantly change (P>0.05).: anaemia severity , benefits of anaemia examination, self-efficacy to obtain iron tablets, self-recognition of anaemia signs and symptoms, signs of anaemia prevention and health motivation.

Table 2. Average knowledge of anaemia prevention among the intervention and control groups based on the nine Health Belief Model variables (n=161).

Variable	Measurement	Intervention (n=78)	Control (n=83)	P	P Intervention (n=78)	P Control (n=83)
		M±SD	M±SD			
Anaemia prevention knowledge	Pre	94±7.155	93±6.595	1.000[a]	0.000[c]	0.000[c]
	Post 1	99±5.948	94±6.953	0.000[a]		
	Post 2	102±4.261	97±6.851	0.000[a]		
PERCEIVED						
Barriers to anaemia examination	Pre	19±2.536	15±1.820	0.295[a]	0.0001[c]	0.0001[c]
	Post 1	19.5±1.513	19±1.913	0.028[a]		
	Post 2	20±0.418	20±2.332	0.0001[a]		
Susceptibility to anaemia	Pre	6±1.241	6±1.478	0.447[a]	0.0001[c]	0.0001[c]
	Post 1	6±1.664	6±1.668	0.663[a]		
	Post 2	9±1.059	7±1.604	0.0001[a]		
Severity of anaemia	Pre	7±1.276	7±1.393	0.875a	0.0001[c]	0.826[c]
	Post 1	7±1.292	7±1.392	0.811a		
	Post 2	7.5±1.139	7±1.297	0.104a		
Benefits of preventing anaemia	Pre	10±0.819	10±0.987	0.275[a]	0.0001[c]	0.001[c]
	Post 1	10±0.559	10±1.072	0.177[a]		
	Post 2	10±0.559	10±0.879	0.702[a]		
Benefits of anaemia examination	Pre	10±1.069	10±1.177	0.449[a]	0.0001[c]	0.761[c]
	Post 1	10±0.812	10±1.177	0.472[a]		
	Post 2	10±0.812	10±1.060	0.387[a]		
SELF-EFFICACY						
Self-efficacy to obtain iron tablets	Pre	15±2.209	15±2.10	0.886[a]	0.0001[c]	0.319[c]
	Post 1	15±1.778	15±2.099	0.122[a]		
	Post 2	15.5±1.045	15±1.730	0.003[a]		
Self-recognition of anaemia signs and symptoms	Pre	7.9±1.689	7.8±1.883	0.591[b]	0.0001[c]	0.467[d]
	Post 1	10±1.412	7.8±1.882	0.000[a]		
	Post 2	10±1.412	7.9±1.894	0.0001[a]		
CUES TO ACTION						
Signs of anaemia prevention	Pre	13±1.634	13±1.713	0.857[a]	0.0001[c]	0.204[c]
	Post 1	14±1.273	13±1.828	0.092[a]		
	Post 2	14±1.273	13±1.512	0.076[a]		
HEALTH MOTIVATION						
Health motivation	Pre	9±1.343	8.37±1.176	0.636[a]	0.0001[c]	0.649[d]
	Post 1	8.80±1.057	8.37±1.176	0.015[b]		
	Post 2	9±1.057	8±1.298	0.041[b]		

[a] Mann–Whitney test; [b] Independent t-test; [c] Friedman test; [d] GLM repeated ANOVA

The video intervention had a large power size of 1.000 (**Table 3**). Further analysis of the nine HBM variables revealed large effect and power sizes for the benefits of anaemia examination (0.852 and 0.951, respectively). In contrast, anaemia susceptibility had a small effect size (0.402; power size: 1.000).

Table 3. Effect and power sizes of the animated educational video intervention in the intervention group (n=78)

Indicators	Wilk's lambda		
	Effect size	Power size	P
Self-efficacy to obtain iron tablets	0.654	1.000	0.000
Barriers to anaemia examination	0.620	1.000	
Susceptibility to anaemia	**0.402**	1.000	
Severity of anaemia	0.795	0.979	
Signs of anaemia prevention	0.733	0.999	
Benefits of preventing anaemia	0.692	1.000	
Health motivation	0.726	1.000	
Benefits of anaemia examination	**0.852**	0.951	
Self-recognition of anaemia signs and symptoms	0.524	1.000	

Discussion

Health education based on the HBM has been demonstrated to significantly improve individual behaviours, habits and beliefs as well as knowledge, attitudes and practices.[10,11] Herein, an animated educational video based on the HBM was created to increase female adolescents' awareness of anaemia prevention. Knowledge, attitudes, self-efficacy, reinforcing factors (family and academic factors) and supporting factors (access to information and educational resources) all influence anaemia prevention behaviours.[17] In the present study, the video intervention significantly increased the knowledge of the female adolescents about anaemia prevention, as evidenced by the results of the first measurement, and their knowledge persisted for 4 weeks after the intervention. The use of animated educational videos significantly increases knowledge and reduces barriers to prevention.[14,18]

A factor that plays a critical role in the learning process is the education media. In recent studies, animated educational videos confined comprehensive, informative and creative information. They were efficient and appropriate for the clients' situations and requirements.[19,20] The combination of images and sound is more effective in increasing knowledge and changing client behaviours than single media such as images (leaflets, booklets or posters) or audio only (radio or lectures). This is why the predominance of images over characters makes information more easily received and understood,[21,22] particularly information pertaining to action processes.

Animation videos is more interesting and easier to understand because of the high-quality images and sound, appealing images, setting and storylines tailored to the respondent's condition. Video media are also more accessible, effective and efficient.[22] Educational videos with audio-visuals yielded more significant results in terms of increasing knowledge, and the information obtained lasted a long time.18 A three-dimensional material was used as an instructive medium.[23] The selection of animation video types based on the preferences of participants can make the educational process more enjoyable and prevent boredom.[20,21,24]

Some of HBM variables were significantly improved. These findings indicated that the animated educational video was successful in transferring information to the female adolescents, as evidenced by an increase in the average knowledge level. Watching interesting and informative animated videos has also been previously reported to improve children's knowledge, long-term memory, adherence to taking medications for secondary prevention and self-abilities.[24] Another study found that if a female adolescent realised she was more susceptible to anaemia owing to her menstrual cycle, she could recognise and be aware of the signs and symptoms of anaemia.[25] This condition necessitates increased iron intake as well as further investigation.[25] The important consideration in increasing the knowledge of female adolescents will positively impact adolescent behaviours.

In the present study, some other HBM indicators did not change significantly. The insignificant increase in the knowledge of the anaemia severity in this study could be attributed to the fact that some female adolescents included had never experienced a severe form of the condition. Many

female adolescents are generally unaware that they are anaemic because they do not understand the symptoms of anaemia in depth.[26] Furthermore, most people interpret anaemia as severe when a person requires blood transfusions as part of their treatment or when a person exhibits symptoms of jaundice, splenomegaly, shortness of breath and pale tongue.[27] Accordingly, when people believe that healthy behaviours will help them prevent the disease, they will be more likely to adopt them.[28]

Although some variables yielded no significant results, the video intervention had a large power size of 1.000 that means it can increase the knowledge of anaemia prevention among female adolescents. The effect size ranged from medium to high. Short of frequency and duration exposed may be a factor. The amount of additional information absorbed by the audience varied according to the duration of the video materials.[29] Repeated education is required because it can increase knowledge or improve behaviours.[30] Health belief does not adequately address some of the individual factors that affect health behaviours. The small sample size, lack of random selection and control of the comparison group may also limit the applicability of the study findings; when addressed, these factors might contribute to the improvement of the level of knowledge in the control group.

Because of the COVID-19 pandemic, research plans that were supposed to be conducted offline have moved online to avoid crowds and thus reduce COVID-19 transmission. We acknowledge some limitations of this study. The intervention necessitated the online as well as the adjustment of the viewing schedule to the school's online learning schedule. Therefore, whether this increase in knowledge would be sustainable over time is unclear. The application of the study findings in clinical practice may be limited; the evaluation of knowledge is complex, and contributing factors need to be controlled. As this study only focused on the knowledge of the participants, the improved health outcome of reducing the incidence or manifestations of anaemia among women may not be achieved unless the knowledge is put into practice. Further studies that would evaluate the long-term applicability of the findings into practice are needed to assess the actual impact of the intervention.

Conclusion

Based on the study findings, the animated educational video can be used as educational media to increase female adolescents' knowledge of anaemia prevention during the COVID-19 pandemic. Educational programmes using video animation can be made more appealing and interesting to promote good health among female adolescents.

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Conflicts of interest

The authors declare no conflicts of interest.

How does this paper make a difference in general practice?

- Animated educational video was constructed referring to Health Belief Model.
- Video was started by qualitative method before to conduct by quantitative method.
- Online educational video through a website-based platform easy to use.
- Animated educational video can be used for preventing anaemia in female adolescents.
- Animated educational video culturally acceptable for Indonesian population.

References

1. Ministry of Health, Indonesia. National Report of Health Basic Research 2018. Jakarta: Health Research and Development Agency. 2019; 53(9):154-165.

2. Kalantri A, Karambelkar M, Joshi R, Kalantri S, Jajoo U. Accuracy and reliability of pallor for detecting anaemia: a hospital-based diagnostic accuracy study. *PLoS One*. 2010;5(1):e8545. Published 2010 Jan 1. doi:10.1371/journal.pone.0008545

3. Laksmita S, Yenie H. Hubungan Pengetahuan Remaja Putri Tentang Anemia dengan Kejadian Anemia di Kabupaten Tenggamus (The Relationship of Young Women's Knowledge of Anemia with the Incidence of Anemia in Tenggamus District). *J Ilm Keperawatan Sai Betik*. 2018;14(1):104. doi:10.26630/jkep.v14i1.1016

4. Vir SC, ed. Public Health and Nutrition in Developing Countries (Part I and II). In: *Public Health and Nutrition in Developing Countries (Part I and II)*. WPI Publishing; 2015:0-1244. doi:10.1201/B18288

5. Soleimani N, Abbaszadeh N. Relationship between Anaemia, caused from the iron deficiency, and academic achievement among third grade high school female students. *Procedia-Social and Behavioral Sciences*. 2011;29:1877-1884. doi:10.1016/j.sbspro.2011.11.437

6. Garcia-Casal MN, Pena-Rosas JP, Zamora G. *Nutritional Anaemias : Tools for Effective Prevention*. World Health Organization ; 2017. Accessed October 5, 2019. https://www.who.int/publications/i/item/9789241513067

7. Roche ML, Bury L, Yusadiredja IN, et al. Adolescent girls' nutrition and prevention of anaemia: a school based multisectoral collaboration in Indonesia [published correction appears in BMJ. 2018 Dec 17;363:k5321. Yusadiredjai IN [corrected to Yusadiredja IN]]. *BMJ*. 2018;363:k4541. Published 2018 Dec 7. doi:10.1136/bmj.k4541

8. Kinyoki D, Osgood-Zimmerman AE, Bhattacharjee NV; Local Burden of Disease Anaemia Collaborators, Kassebaum NJ, Hay SI. Anemia prevalence in women of reproductive age in low- and middle-income countries between 2000 and 2018. *Nat Med*. 2021;27(10):1761-1782. doi:10.1038/s41591-021-01498-0

9. Jalambo M, Karim N, Naser I, Sharif R. Effects of iron supplementation and nutrition education on haemoglobin, ferritin and oxidative stress in iron-deficient female adolescents in Palestine: randomized control trial. *East Mediterr Health J*. 2018;24(6):560-568. Published 2018 Jul 29. doi:10.26719/2018.24.6.560

10. Shojaei S, Farhadloo R, Aein A, Vahedian M. Effects of the Health Belief Model (HBM)-Based Educational Program on the Nutritional Knowledge and Behaviors of CABG Patients. *J Tehran Heart Cent*. 2016;11(4):181-186.

11. Khoramabadi M, Dolatian M, Hajian S, et al. Effects of Education Based on Health Belief Model on Dietary Behaviors of Iranian Pregnant Women. *Glob J Health Sci*. 2015;8(2):230-239. Published 2015 Jun 25. doi:10.5539/gjhs.v8n2p230

12. Rosenstock IM. Historical Origins of the Health Belief Model. Health Education Monographs. 1974;2(4):328-335. doi:10.1177/109019817400200403

13. Anggraeni Y, Rochmah N, Tresno IA, et al. The Effectiveness of Health Education Using Leaflet and Video on Students' Knowledge About the Dangers of Smoking in Vocational High School 2 Purwokerto. In: Atlantis Press; 2020:369-375. doi:10.2991/AHSR.K.200204.076

14. Greenlaw C, Elhefnawy Y, Jonas R, Douglass LM. Using an animated video to promote an informed discussion on SUDEP with adolescents. *Epilepsy Behav*. 2021;122:108182. doi:10.1016/j.yebeh.2021.108182

15. Vandormael A, Adam M, Greuel M, et al. The Effect of a Wordless, Animated, Social Media Video Intervention on COVID-19 Prevention: Online Randomized Controlled Trial. *JMIR Public Health Surveill*. 2021;7(7):e29060. Published 2021 Jul 27. doi:10.2196/29060

16. Che Mohamed N, Moey SF, Lim BC. Validity and Reliability of Health Belief Model Questionnaire for Promoting Breast Self-examination and Screening Mammogram for Early Cancer Detection. *Asian Pac J Cancer Prev*. 2019;20(9):2865-2873. Published 2019 Sep 1. doi:10.31557/APJCP.2019.20.9.2865

17. Khani Jeihooni A, Hoshyar S, Afzali Harsini P, Rakhshani T. The effect of nutrition education based on PRECEDE model on iron deficiency anemia among female students. *BMC Womens Health*. 2021;21(1):256. Published 2021 Jun 24. doi:10.1186/s12905-021-01394-2

18. Melissa Goad, Huntley-Dale RW. The Use of Audiovisual Aids for Patient Education in the Interventional Radiology Ambulatory Setting: A Literature Review. *J Radiol Nurs*. 2018;37(3):198-201

19. Hébert C, Dagenais C, Mc Sween-Cadieux E, Ridde V. Video as a public health knowledge transfer tool in Burkina Faso: A mixed evaluation comparing three narrative genres. *PLoS Negl Trop Dis*. 2020;14(6):e0008305. Published 2020 Jun 10. doi:10.1371/journal.pntd.0008305

20. Govender R, Taylor SA, Smith CH, Gardner B. Helping Patients With Head and Neck Cancer Understand Dysphagia: Exploring the Use of Video-Animation. *Am J Speech Lang Pathol*. 2019;28(2):697-705. doi:10.1044/2018_AJSLP-18-0184

21. Kayler LK, Keller MM, Crenesse-Cozien N, Dolph B, Cadzow R, Feeley TH. Development and preliminary evaluation of ilearnKAS: An animated video about kidney allocation to support transplant decision-making. *Clin Transplant*. 2019;33(8):e13638. doi:10.1111/ctr.13638

22. Al Owaifeer AM, Alrefaie SM, Alsawah ZM, Al Taisan AA, Mousa A, Ahmad SI. The effect of a short animated educational video on knowledge among glaucoma patients. *Clin Ophthalmol*. 2018;12:805-810. Published 2018 May 1. doi:10.2147/OPTH.S160684

23. Cleeren G, Quirynen M, Ozcelik O, Teughels W. Role of 3D animation in periodontal patient education: a randomized controlled trial. *J Clin Periodontol*. 2014;41(1):38-45. doi:10.1111/jcpe.12170

24. Saengow VE, Chancharoenchai P, Saartying W, et al. Epilepsy video animation: Impact on knowledge and drug adherence in pediatric epilepsy patients and caregivers. *Clin Neurol Neurosurg*. 2018;172:59-61. doi:10.1016/j.clineuro.2018.06.031

25. Ghaderi N, Ahmadpour M, Saniee N, Karimi F, Ghaderi C, Mirzaei H. Effect of education based on the Health Belief Model (HBM) on anemia preventive behaviors among iranian girl students. *Int J Pediatr*. 2017;5(6):5043-5052. doi:10.22038/ijp.2017.22051.1844

26. Pasricha SR, Drakesmith H. Iron Deficiency Anemia: Problems in Diagnosis and Prevention at the Population Level. *Hematol Oncol Clin North Am.* 2016;30(2):309-325. doi:10.1016/j.hoc.2015.11.003

27. Dhabangi A, Idro R, John CC, et al. Community perceptions of paediatric severe anaemia in Uganda. *PLoS One*. 2019;14(1):e0209476. Published 2019 Jan 3. doi:10.1371/journal.pone.0209476

28. Valladão Júnior JBR, Suemoto CK, Goulart AC, et al. Anemia and Cognitive Performance in the ELSA-Brasil Cohort Baseline. *J Neuropsychiatry Clin Neurosci*. 2020;32(3):227-234. doi:10.1176/appi.neuropsych.19040088

29. Arsyad AA, Muljono P, Matindas K. Pengaruh Durasi Shot dan Tempo Narasi Terhadap Penyerapan Informasi Video Inovasi Jambu Kristal (Effect of Shot Duration and Narrative Tempo on Information acceptance of Crystal Guava Innovations). *J Komun Pembang*. 2015;13(1).

30. Takaku Y, Kurashima K, Ohta C, et al. How many instructions are required to correct inhalation errors in patients with asthma and chronic obstructive pulmonary disease?. *Respir Med*. 2017;123:110-115. doi:10.1016/j.rmed.2016.12.012

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ORIGINAL ARTICLE

Impact of Diabetes Medication Therapy Adherence Clinic (DMTAC) appointment intervals on glycemic control in public health clinics across Perak, Malaysia

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Beh YS, Gopalsamy K, Lee LF, et al. Impact of Diabetes Medication Therapy Adherence Clinic (DMTAC) appointment intervals on glycemic control in public health clinics across Perak, Malaysia. *Malays Fam Physician.* 2022;17(3):105–113. https://doi.org/10.51866/oa1341

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Abstract

Introduction: Frequent diabetes medication therapy adherence clinic (DMTAC) appointments may lead to more rapid glycaemic control. This study aimed to evaluate the association between appointment intervals and glycaemic control (haemoglobin A1c [HbA1c] level) along with blood pressure (BP) and lipid profile (LP) during DMTAC appointments.

Methods: This study retrospectively reviewed all recorded baseline and completed DMTAC data, including HbA1c level, LP and BP, of 318 eligible participants from 29 DMTACs across Perak. The participants were divided into shorter appointment interval (SAI) (≤30 days) and longer appointment interval (LAI) groups.

Results: The majority of the baseline socio-demographic and clinical characteristics did not significantly differ between the SAI and LAI groups ($p>0.05$). Ischaemic heart disease (Odds ratio, OR=3.457; 95% CI=1.354–8.826; $p=0.009$) and hypertension (OR=0.521; 95% CI=0.276–0.992; $p=0.044$) were significantly associated with the appointment intervals. Upon completion of eight DMTAC visits, the HbA1c and FBS levels and DBP significantly improved ($p<0.05$). However, the mean HbA1c level (1.35±2.18% vs 0.87±2.11%, $p=0.548$), FBS level (1.25±4.82mmol/L vs 2.29±6.23mmol/L, $p=0.538$), SBP (3.28±21.82mmHg vs 3.65±18.35mmHg, $p=0.343$) and LDL level (0.09±0.98mmol/L vs 0.07±1.13mmol/L, $p=0.246$) did not significantly differ between the SAI and LAI groups.

Conclusion: Longer DMTAC appointment intervals had similar improvement in glycaemic controls, blood pressure and lipid profiles as compared to shorter appointment intervals. A longer interval can be scheduled for lower-risk patients to optimise the use of human resources and minimise costs.

Introduction

The International Diabetes Federation Atlas estimated the prevalence of diabetes globally to be 9.3% (463 million people) in 2019. It is expected to increase by 0.9% and 1.6% in 2030 and 2045, respectively.[1] The 2019 National Health and Morbidity Survey showed that the prevalence of Type 2 Diabetes Mellitus, T2DM had increased in Malaysia from 13.4% in 2015 to 18.3% in 2019.[2] Therefore, a multidisciplinary approach is crucial for the management of T2DM.[3]

As part of multidisciplinary teams, pharmacists run diabetes medication therapy adherence clinics (DMTACs) in collaboration with physicians since 2004 in Malaysia by optimising the use of medications and providing patient education on disease, adherence and lifestyle.[4] The involvement of pharmacists following a structured educational module training has been reported to significantly improve medication adherence and glycaemic control.[1,3,5-9] Interventions are provided at every visit regardless of the interval of visits following a standard guideline of 30–120 days in Malaysia.[8,9]

Regarding visit intervals, frequent clinic appointments every 7–14 days were found to be superior in glycaemic control ($p<0.05$) in Brazil and the United States.[10,11] This strategy helps physicians to control clinical inertia by optimising and intensifying diabetes management with multidisciplinary staff.[10] Furthermore, a more frequent clinic visit could improve medical outcomes and reduce costs on a long-term basis because of markedly fewer

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visits to the emergency room.[12] However, no studies have yet to specifically evaluate the impact of DMTAC appointment intervals in achieving the HbA1c level target in Malaysia. Frequent or short-interval clinic visits may be challenging among pharmacists owing to the increasing patient load according to the Annual Report 2017 by the Ministry of Health in Malaysia.[13]

This study primarily aimed to determine the association between glycaemic control (haemoglobin A1c [HbA1c] and fasting blood sugar [FBS] levels) and appointment intervals in DMTACs following a standard practice of 30-day appointment scheduling for partial supply medication collection in pharmacies as a cut-off point. Shorter appointment intervals (SAIs; ≤30-day interval) with frequent clinic visits were compared with longer appointment intervals (LAIs) with fewer clinic visits. In addition, the impact of DMTAC appointment intervals on the lipid profile (LP) and blood pressure (BP) was evaluated.

Methods

Study design

In this retrospective observational study, we identified DMTAC patients recruited from January to December 2017 by a pharmacist with ≥1-year experience. The inclusion criteria were as follows: (1) at least eight completed DMTAC visits and (2) availability of clinical data (HbA1c or FBS level, LP and BP) within 6 months pre-recruitment and after the eighth completed visit. The exclusion criteria were as follows: (1) incomplete DMTAC visits, (2) unavailability of clinical data (HbA1c or FBS level, LP and BP) within 6 months pre-recruitment and after the eighth completed visit.

Study clinic

A total of 29 established public DMTACs in Perak were included, with a total number of 1,105 newly recruited DMTAC patients from January to December 2017 as shown in **Figure 1**. These clinics have conducted >1 year of DMTAC service, according to the protocol by the Pharmaceutical Services Division, Ministry of Health, Malaysia.[4] Pharmacists underwent 5–10 days of structured training module before the service. During the visits, patients were recruited following the criteria stated in the protocol: (i) uncontrolled diabetes despite optimum medications and dose prescribed, (ii) non-compliance with medications, (iii) HbA1c level of >8.0% or (iv) co-morbidities, multiple medications or complications (macro-vascular and micro-vascular) with available baseline data on the HbA1c and FBS levels, LP and BP. The patients were required to complete a minimum of eight DMTAC visits. Each intervention during the visit was performed accordingly.[4,14] Upon completion of the eighth visit, the HbA1c and FBS levels, LP and BP were recorded again.

Study population

We identified 341 study participants from manual and electronic medical records (Pharmacy Information System) and obtained socio-demographic data, clinical characteristics, appointment intervals, laboratory parameters and medication information.

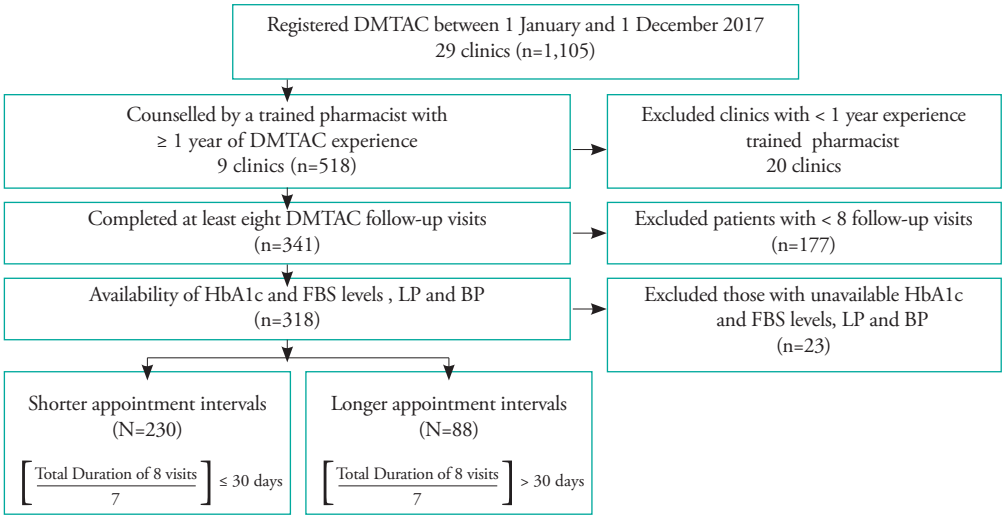

Figure 1. Methodology
Abbreviations: DMTAC, Diabetes medication therapy adherence clinic; HbA1c, glycated haemoglobin; FBS, fasting blood sugar; LP, lipid profile; BP, blood pressure.

Appointment interval

The patients were grouped into the SAI group with frequent clinic visits and LAI group with fewer clinic visits. According to the DMTAC protocol, the number of visits per patient must be ≥8.[4] Therefore, the participants were grouped by summing the total duration between each appointment and dividing it by 7, as there are a total of seven intervals in between eight visits. The final value was used for grouping.

Matching

The recruited patients were matched in terms of (a) mean age (<55, 55–64 , 65– 74 and ≥75 years) and (b) mean baseline anti-glycaemic regimen (oral hypoglycemic agent [OHA] only, OHA + basal only, OHA + premixed, OHA + basal bolus or insulin only) at baseline between the SAI and LAI groups to reduce discrepancies in the HbA1c level.[15,16] This is because the HbA1c level target for each person varies. A younger patient's HbA1c level target is 6.0–6.5%, while an older patient's target is 7.1–8.0%. Hence, the management varies according to the target. The treatment regimen for each patient also affects the HbA1c level, as each group of OHAs and insulin type have different HbA1c level reduction power.[17] Therefore, these two factors were included as part of the matching criteria.

Statistical analysis

Data were analysed using IBM SPSS Statistics 23.0 (IBM SPSS Statistics, IBM Corporation, Armonk, New York). Baseline data were examined using the Chi-square test and independent t-test. Association between the variables and outcome was evaluated using binary logistic regression. During comparison within and between the groups, the mean HbA1c level, FBS level, BP and LDL level were analysed using repeated measures ANOVA. The data were presented as frequencies (percentages), means (standard deviations) or mean differences (95% CIs), as appropriate. For all analyses, a *p-value* of <0.05 was considered statistically significant.

Results

A total of 318 patients were included in this study and divided into the SAI (mean: 25±5.63 days; n=230) and LAI groups (mean: 50±23.17 days; n=88) according to their mean appointment interval throughout eight visits. As shown in **Table 1a**, the patient age ranged from 25 to 91 years, and the mean age was 59.8±10.3 years. The male-to-female sex ratio was 1:1.4, and majority of the participants were Malays (48.1%), followed by Chinese (27.7%), Indians (23.6%) and others (0.6%). Meanwhile, 16 patients had missing data and hence were excluded from the analysis.

Table 1a. Baseline socio-demographic data of the participants.

Variable	Shorter appointment interval group n, (%) 230 (100)	Longer appointment interval group n, (%) 88 (100)	*P-value*
Age (year)			
<55	72 (31.3)	17 (19.3)	0.068[a]
55–64	93 (40.4)	34 (38.6)	
65–74	52 (22.6)	29 (33.0)	
≥75	13 (5.7)	8 (9.1)	
Sex			
Male	98 (42.6)	34 (38.6)	0.51[a]
Female	132 (57.4)	54 (61.4)	
Ethnicity			
Malay	131 (57.0)	22 (25.0)	<0.001[a]
Chinese	45 (19.6)	43 (48.9)	
Indian	53 (23.0)	22 (25.0)	
Others	1 (0.4)	1 (1.1)	

[a] Chi-square test

Table 1b. Baseline clinical characteristics of the participants.

Variable	Shorter appointment interval group n, (%) 230 (100)	Longer appointment interval group n, (%) 88 (100)	*P-value*
BMI (kg/m²) [mean±SD]	28.06 (6.09)	27.45 (5.71)	0.492[a]
Blood pressure (mmHg) [mean±SD]			
Systolic	142.66 (21.67)	137.90 (17.74)	0.081[a]
Diastolic	81.82 (11.06)	77.94 (9.98)	0.007[a]
Blood sugar profile [mean±SD]			
FBS (mmol/L)	10.87 (4.46)	10.71 (4.24)	0.792[a]
RBS (mmol/L)	12.15 (5.10)	10.98 (4.68)	0.176[a]
HbA1c (%)	10.61 (2.27)	10.33 (2.05)	0.383[a]
Lipid profile (mmol/L) [mean±SD]			
Total cholesterol	5.08 (1.51)	4.79 (1.06)	0.169[a]
Triglyceride	1.95 (1.24)	2.01 (1.18)	0.736[a]
LDL	2.71 (1.09)	2.69 (1.17)	0.971[a]
HDL	1.28 (0.44)	1.48 (1.15)	0.160[a]
Renal profile [mean±SD]			
Creatinine (umol/L)	91.54 (51.59)	95.17 (56.96)	0.641
Type of co-morbidities			
Ischaemic heart disease	11 (4.8)	13 (14.8)	0.003[b]
Hypertension	184 (80.0)	62 (70.5)	0.069[b]
Dyslipidaemia	136 (59.1)	53 (60.2)	0.859[b]
Chronic kidney disease	22 (9.6)	11 (12.5)	0.443[b]
Anti-diabetic regimen[c]			
OHA only	47 (21.5)	19 (21.8)	0.997[b]
OHA + basal insulin	64 (29.2)	23 (26.4)	
OHA + pre-mixed insulin	40 (18.3)	17 (19.5)	
OHA + basal bolus insulin	49 (22.4)	21 (24.1)	
Insulin only	16 (7.3)	6 (6.9)	

[a] Independent t-test; [b] chi-square test; [c] Sixteen patients had missing data.

All baseline characteristics as shown in **Table 1a** and **1b** did not significantly differ between the SAI and LAI groups (p>0.05), except for ethnicity, diastolic blood pressure (DBP) and ischaemic heart disease (IHD). Variables with p<0.25 were subjected to binary logistic regression analysis as summarised in **Table 2**.

Table 2. Binary logistic regression analysis for the association between the baseline variables and appointment intervals.

Variables	OR	95% CI	*p-value*
Socio-demographic			
Age (year)			
<55	1		
55–64	1.428	0.688–2.961	0.339
65–74	2.047	0.935–4.482	0.073
≥75	1.775	0.555–5.678	0.334
Ethnicity			
Malay	0.127	0.007–2.284	0.162
Chinese	0.624	0.035–11.289	0.750
Indian	0.310	0.017–5.623	0.428
Others	1		
Clinical characteristics			
Blood pressure			
Systolic	1.022	0.990–1.054	0.176
Diastolic	0.953	0.903–1.006	0.083
Glycaemic control			
Random blood sugar	0.965	0.872–1.069	0.497

Table 2. Continued

Variables	OR	95% CI	*p-value*
Co-morbidity: ischaemic heart disease			
Yes	3.457	1.354–8.826	0.009
Co-morbidity: hypertension			
Yes	0.521	0.276–0.982	0.044
Cholesterol level			
Total cholesterol	1.398	0.941–2.076	0.097
HDL	1.214	0.701–2.103	0.488

Abbreviations: OR, odds ratio; CI, confidence interval; HDL, high-density lipoprotein

In **Table 3**, HbA1c level, FBS level and DBP significantly differed between baseline and after the eighth visit within the groups.

Table 3. Within-group comparison of glycaemic control, BP and LDL level after completing the eight visits using repeated measures ANOVA.

Variables		SAI			LAI		
		Mean (SD)	Mean diff	*p-value*	Mean (SD)	Mean diff	*p-value*
HbA1c	Baseline	10.16 (1.98)	1.35	<0.001	10.21 (2.14)	1.08	<0.001
	After the eighth visit	8.81 (1.83)			9.13 (1.93)		
FBS	Baseline	10.65 (4.86)	1.25	0.018	10.80 (4.19)	2.29	0.005
	After the eighth visit	9.40 (3.64)			8.51 (5.42)		
SBP	Baseline	140.55 (21.02)	3.28	0.107	138.50 (18.07)	3.65	0.09
	After the eighth visit	137.26 (18.87)			134.85 (31.87)		
DBP	Baseline	81.62 (1.03)	2.39	0.018	78.15 (1.10)	3.49	0.01
	After the eighth visit	79.23 (0.86)			74.66 (1.82)		
LDL	Baseline	2.62 (0.16)	0.15	0.568	2.85 (0.17)	0.07	0.688
	After the eighth visit	2.53 (0.14)			2.78 (0.20)		

Abbreviations: SAI, shorter appointment interval; LAI, longer appointment interval; SD, standard deviation; HbA1c, glycated haemoglobin; FBS, fasting blood sugar; SBP, systolic blood pressure; DBP, diastolic blood pressure; LDL, low-density lipoprotein.

As shown in **Table 4**, the mean HbA1c level (p=0.548), FBS level (p=0.538), systolic blood pressure (SBP) (p=0.343) and LDL level (p=0.246) after the eighth visit did not significantly differ between the SAI and LAI groups. The mean difference in each variable was compared, and the normality of continuous data was determined using the central limit theorem. All the variables used in this study are defined in **Table 5**.

Table 4. Main effect of the appointment intervals on glycaemic control, BP and LDL level between the groups using repeated measures ANOVA.

Variable	Group (n)	Mean diff (SD)	*p-value*
Difference in the HbA1c level	**SAI (75)**	1.35 (2.18)	0.548
	LAI (52)	0.87 (2.11)	
Difference in the FBS level	**SAI (86)**	1.25 (4.82)	0.538
	LAI (62)	2.29 (6.23)	
Difference in the SBP	**SAI (117)**	3.28 (21.82)	0.343
	LAI (76)	3.65 (18.35)	
Difference in the DBP	**SAI (117)**	2.39 (10.75)	0.002
	LAI (74)	3.49 (11.58)	
Difference in the LDL level	**SAI (42)**	0.09 (0.98)	0.246
	LAI (41)	0.07 (1.13)	

Abbreviations: SAI, shorter appointment interval; LAI, longer appointment interval; SD, standard deviation; HbA1c, glycated haemoglobin; FBS, fasting blood sugar; SBP, systolic blood pressure; DBP, diastolic blood pressure; LDL, low-density lipoprotein.

Discussion

DMTAC service in primary public health clinics across Perak significantly improved glycaemic control (HbA1c and FBS levels) and BP compared with the baseline in this study, which is consistent with previous findings.[8,9,14,18] However, whether LAIs confer better benefits in terms of the HbA1c level, FBS level, BP and LDL level than do SAIs after the completion of eight DMTAC visits remains unclear.

Glycaemic control (HbA1c and FBS levels)

Our study observed a larger mean HbA1c level reduction in the SAI group than in the LAI group, although the mean difference was not significant. According to Silva et al., intensive training for self-titrating insulin doses combined with structured SMBG can significantly reduce the HbA1c level, but with no significant difference from less intensive training (p=0.051).[19] In our study, the existence of IHD as co-morbidity in the LAI group (14.8%) compared with that in the SAI group (4.8%) yielded a larger mean HbA1c level reduction in the SAI group. This is possibly where a less stringent HbA1c level goal for patients with IHD is required, leading to a smaller mean HbA1c level reduction in accordance with the Clinical Practice Guidelines for T2DM in Malaysia. A more aggressive blood glucose level normalisation has no significant benefit on primary cardiovascular endpoints in patients with T2DM and only increases the risk of hypoglycaemia or weight gain.[14]

However, a higher percentage of Chinese in the LAI group skewed the mean HbA1c level difference to be insignificant. Ethnicity affects glycaemic control as well as complication profiles according to the 2019 National Health Morbidity Survey. Indians have been reported to have the highest prevalence, followed by the Malays and Chinese.[2] The Chinese in the LAI group had a lower prevalence owing to less insulin resistance, which led to better glycaemic control with a larger mean HbA1c or FBS level reduction, than the other ethnicities.[20]

There is also a complex interaction among different factors, including the patient's diet, individual motivation, self-care behaviour and knowledge for better glycaemic control.[19,20] Of these, a dedicated self-care behaviour, including diet control, physical activity and medication adherence along with blood glucose monitoring, is a key factor.

Blood pressure

DMTAC services significantly improved the DBP in both groups but did not significantly affect the SBP. DBP elevation is easier to control by reducing arteriolar resistance to blood flow using current antihypertensive agents than SBP elevation in terms of reducing the arterial stiffness.[21]

Herein, the LAI group had a proportionately larger margin of mean DBP reduction than the SAI group. This is conflicting with several findings that BP control was achieved sooner in patients with SAIs.[22-24] This difference could be attributed to the higher percentage of participants with cardiovascular co-morbidities (IHD) in the LAI group than in the SAI group, affecting the management plan throughout the visits. The baseline DBP was also significantly higher in the LAI group. According to Tsujimoto et al. and Upadhya et al., a more intensive treatment approach is needed to achieve the target SBP and DBP goals to decrease the risk of subsequent cardiovascular events and death.[25,26]

Cholesterol level

The LDL level did not significantly differ between the SAI and LAI groups (p=0.246). This result was expected, as LDL cholesterol levels are dependent on multifactorial causes. Dietary modifications, physical activity, reluctancy of dose titration by the patient and limited consultation time in changing behaviours towards achieving LDL level goals are challenging.[27,28]

Strengths and limitations

Most prior studies examined only the effects of DMTAC services involving a structured educational programme with scheduled clinic visits on glycaemic control in patients with diabetes without severe hypoglycaemic events.[15,16] These services usually require at least eight follow-up visits for each patient. To our knowledge, our study is the first to analyse the association between DMTAC appointment interval and glycaemic control. We identified the appropriateness of scheduled appointments (1–3 months) by analysing all registered DMTAC patients in Perak. Furthermore, we did not exclude DMTAC patients with hypoglycaemic events. Our findings can then be generalised to populations with T2DM registered with DMTACs in Perak.

Despite these strengths, the study also has several limitations. The existence of

confounding factors, such as IHD and hypertension, was inevitable during matching at baseline. This might have contributed to the outcomes that were inconsistent with most previous findings.[3-7,16] Nevertheless, the participants were grouped after matching based on the average duration of clinic visits for a total of eight visits to eliminate confounding factors, including the mean age and baseline anti-glycaemic regimen. In terms of internal validity, there was no control group employed in the study.

Implications for clinical practice and research

In this study, glycaemic control, BP and LDL level did not significantly differ between the SAI and LAI groups. This finding is consistent with actual data in the practice of scheduling DMTAC appointments in Malaysia ranging from 1 to 3 months. This study can help pharmacists determine appropriate appointment intervals in public health clinics with a low manpower and high patient volume. Nevertheless, a higher frequency of visits is linked to improved treatment adherence and opportunities for medication intensification.[8,9,29,30] Hence, an effective DMTAC service workflow can be generated by considering a proper follow-up appointment scheduling to improve glycaemic control. The care of patients with high-risk factors, such as hypoglycaemic events and co-morbidities, should not be compromised while scheduling appointments for closer monitoring during each clinic visit.[14,18,20,23] Further prospective investigations into other confounding factors, which would most likely yield a more reliable outcome, are needed.

Conclusion

Longer DMTAC appointment intervals had similar improvement in glycaemic controls, blood pressure and lipid profiles as compared to shorter appointment intervals. Longer intervals can be scheduled for lower-risk patients to optimise the use of human resources and minimise costs.

Acknowledgements

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Conflicts of interest

The authors declare no conflicts of interest.

How does this paper make a difference to general practice?

- The study findings can help pharmacists determine appropriate diabetes medication therapy adherence clinic (DMTAC) appointment intervals in public health clinics with a low manpower and high patient volume.
- DMTACs in Malaysia may consider providing a longer DMTAC appointment interval for lower-risk patients.

References

1. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract*. 2019;157:107843. doi:10.1016/j.diabres.2019.107843
2. Health IfP. National Health and Morbidity Survey 2019 (NHMS 2019). Vol I: Non-Communicable Diseases, Risk Factors & Other Health Problems. 2019.
3. Maislos M, Weisman D. Multidisciplinary approach to patients with poorly controlled type 2 diabetes mellitus: a prospective, randomized study. *Acta Diabetol*. 2004;41(2):44-48. doi:10.1007/s00592-004-0143-1
4. Malaysia MoH. Protocol Medication Therapy Adherence Clinic: Diabetes (2nd Edition). Malaysia. 2014.
5. Smith M. Pharmacists' role in improving diabetes medication management. *J Diabetes Sci Technol*. 2009;3(1):175-179. doi:10.1177/193229680900300120
6. Wallgren S, Berry-Cabán CS, Bowers L. Impact of clinical pharmacist intervention on diabetes-related outcomes in a military treatment facility. *Ann Pharmacother*. 2012;46(3):353-357. doi:10.1345/aph.1Q564
7. Erku DA, Ayele AA, Mekuria AB, Belachew SA, Hailemeskel B, Tegegn HG. The impact of pharmacist-led medication therapy management on medication adherence in patients with type 2 diabetes mellitus: a randomized controlled study. *Pharm Pract (Granada)*. 2017;15(3):1026. doi:10.18549/PharmPract.2017.03.1026

8. Lim PC, Lim K. Evaluation of a pharmacist-managed diabetes medication therapy adherence clinic. *Pharm Pract (Granada)*. 2010;8(4):250-254. doi:10.4321/s1886-36552010000400008

9. Lau BT, Ismail SZ, Ng SY, Mohmmad N. Impact of pharmacist-led diabetes program on glycated hemoglobin and diabetes-related hospitalizations in a district-level hospital: a pilot retrospective cohort study. *Int J Adv Life Sci Res*. 2018:26-36. doi:10.31632/ijalsr.2018v01i02.005

10. Pimazoni-Netto A, Rodbard D, Zanella MT; Diabetes Education and Control Group. Rapid improvement of glycemic control in type 2 diabetes using weekly intensive multifactorial interventions: structured glucose monitoring, patient education, and adjustment of therapy-a randomized controlled trial. *Diabetes Technol Ther*. 2011;13(10):997-1004. doi:10.1089/dia.2011.0054

11. Morrison F, Shubina M, Turchin A. Encounter frequency and serum glucose level, blood pressure, and cholesterol level control in patients with diabetes mellitus. *Arch Intern Med*. 2011;171(17):1542-1550. doi:10.1001/archinternmed.2011.400.

12. Wagner EH, Grothaus LC, Sandhu N, et al. Chronic care clinics for diabetes in primary care: a system-wide randomized trial. *Diabetes Care*. 2001;24(4):695-700. doi:10.2337/diacare.24.4.695

13. Malaysia MoH. Annual Report MOH. 2017.

14. You LX, Selvadurai S, Yee CK, Noh NB, Bao GC, Joyce T, et al. Impact of pharmacist-managed diabetes medication therapy adherence clinic (DMTAC) in government health clinics. *Malays J Pharm Sci*. 2015;13(1):43.

15. Pitlick JM, Brooks AD. Glycemic control in pharmacist-managed insulin titration versus standard care in an indigent population. *Diabetes Spectr*. 2011;24(4):211-7. doi:10.2337/diaspect.24.4.211

16. Malawana M, Kerry S, Mathur R, Robson J. HbA1c and hypoglycaemia in intensively treated type 2 diabetes: a retrospective cohort study in primary care. *JRSM Open*. 2018;9(7):2054270418773669. Published 2018 Jul 6. doi:10.1177/2054270418773669

17. Sherifali D, Nerenberg K, Pullenayegum E, Cheng JE, Gerstein HC. The effect of oral antidiabetic agents on A1C levels: a systematic review and meta-analysis. *Diabetes Care*. 2010;33(8):1859-1864. doi:10.2337/dc09-1727.

18. Stading J, Herrmann J, Walters R, Destache C, Chock A. Impact of pharmacist intervention on diabetes patients in an ambulatory setting. *Diabetes Spectr*. 2009;22(4):241-6. doi:10.2337/diaspect.22.4.241

19. Silva DD, Bosco AA. An educational program for insulin self-adjustment associated with structured self-monitoring of blood glucose significantly improves glycemic control in patients with type 2 diabetes mellitus after 12 weeks: a randomized, controlled pilot study. *Diabetol Metab Syndr*. 2015;7:2. Published 2015 Jan 15. doi:10.1186/1758-5996-7-2

20. Chew BH, Mastura I, Lee PY, Wahyu TS, Cheong AT, Zaiton A. Ethnic differences in glycaemic control and complications: the adult diabetes control and management (ADCM), Malaysia. *Med J Malaysia*. 2011;66(3):244-248.

21. Mancia G, Bombelli M, Lanzarotti A, et al. Systolic vs diastolic blood pressure control in the hypertensive patients of the PAMELA population. Pressioni Arteriose Monitorate E Loro Associazioni. *Arch Intern Med*. 2002;162(5):582-586. doi:10.1001/archinte.162.5.582

22. Erhun WO, Agbani EO, Bolaji EE. Positive benefits of a pharmacist-managed hypertension clinic in Nigeria. *Public Health*. 2005;119(9):792-798. doi:10.1016/j.puhe.2004.11.009

23. Turchin A, Goldberg SI, Shubina M, Einbinder JS, Conlin PR. Encounter frequency and blood pressure in hypertensive patients with diabetes mellitus. *Hypertension*. 2010;56(1):68-74. doi:10.1161/HYPERTENSIONAHA.109.148791

24. Guthmann R, Davis N, Brown M, Elizondo J. Visit frequency and hypertension. *J Clin Hypertens (Greenwich)*. 2005;7(6):327-332. doi:10.1111/j.1524-6175.2005.04371.x

25. Tsujimoto T, Kajio H. Intensive Blood Pressure Treatment for Resistant Hypertension. *Hypertension*. 2019;73(2):415-423. doi:10.1161/HYPERTENSIONAHA.118.12156

26. Upadhya B, Rocco M, Lewis CE, et al. Effect of Intensive Blood Pressure Treatment on Heart Failure Events in the Systolic Blood Pressure Reduction Intervention Trial. *Circ Heart Fail*. 2017;10(4):e003613. doi:10.1161/CIRCHEARTFAILURE.116.003613

27. Ditusa L, Luzier AB, Brady PG, Reinhardt RM, Snyder BD. A pharmacy-based approach to cholesterol management. *Am J Manag Care*. 2001;7(10):973-979.

28. Manigault KR, Lewis KA. Pharmacists role in cholesterol management: addressing challenges and barriers. *J Pharm Pract*. 2015;28(1):35-43. doi:10.1177/0897190014562384

29. Howard BV, Robbins DC, Sievers ML, et al. LDL cholesterol as a strong predictor of coronary heart disease in diabetic individuals with insulin resistance and low LDL: The Strong Heart Study. *Arterioscler Thromb Vasc Biol*. 2000;20(3):830-835. doi:10.1161/01.atv.20.3.830

30. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group [published correction appears in Lancet 1999 Aug 14;354(9178):602]. *Lancet*. 1998;352(9131):837-853.

APPENDIX

Table 5. Variables used in this study.

Variable	Operational definition	Measuring scale
Age	Age of patient in completed years obtained from medical records	Year
Sex	Sex of patient obtained from medical records	Male Female
Ethnicity	Category of people who share certain inherited physical characteristics obtained from medical records	Malay Chinese Indian Others
Weight	Weight of patient obtained in kilogrammes obtained by staff at the time of clinic visit using a weighing scale	Kilogramme
Height	Height of patient obtained in centimetres obtained by staff at the time of clinic visit using a Seca scale	Centimetre
Blood pressure	Systolic and diastolic blood pressures obtained on the recruitment day and on the eighth visit obtained from medical records	Millimetre of mercury
Fasting blood sugar level	Level of glucose in the blood after an 8-hour fast, measured within 6 months before recruitment and within 6 months after the eighth visit	Millimole/liter
HbA1c level	Glycosylated haemoglobin level showing the average level of blood sugar over the past 2–3 months, measured within 6 months before recruitment and within 6 months after the eighth visit	Percentage
Total cholesterol level	Total amount of cholesterol, measured within 6 months before recruitment and within 6 months after the eighth visit	Millimole/liter
Triglyceride level	Level of an ester formed from glycerol and three fatty acid groups, measured within 6 months before recruitment and within 6 months after the eighth visit	Millimole/liter
LDL level	Level of the principal transporter of cholesterol and fat in human blood, measured within 6 months before recruitment and within 6 months after the eighth visit	Millimole/liter
HDL level	Level of the transporter of cholesterol from the tissues to the liver for excretion, measured within 6 months before recruitment and within 6 months after the eighth visit	Millimole/liter
Creatinine level	Creatinine is a waste product from the normal breakdown of muscle tissue, measured within 6 months before recruitment and within 6 months after the eighth visit	Micromole/liter
Estimated glomerular filtration rate	A measure of the function of the kidneys, calculated on the basis of the amount of creatinine in the blood	Millilitre/minute
Co-morbidities	The presence of one or more additional diseases or disorders co-occurring with T2DM at recruitment and the eighth visit	Yes No
Number of OHA(s)	Number of oral hypoglycaemic agents used obtained on the recruitment day and the eighth visit obtained from medical records	1 2 >2
Types of insulin regimen	Type and combination of insulin used obtained on the recruitment day and on the eighth visit obtained from medical records	Basal Premixed Basal-bolus

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ORIGINAL ARTICLE

Prevalence and description of digital device use among preschool children: A cross-sectional study in Kota Setar District, Kedah

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Abstract

Introduction: Digital device helps children enhance academic, cognitive and psychomotor skills. However, prolonged use causes physical inactivity, poor interpersonal skills and communication problems. Information on digital device use among young children in Malaysia is currently limited. Hence, this study aimed to determine the prevalence of digital device utilisation among preschool children in Kota Setar District, Kedah.

Methods: A cross-sectional study at government preschools in Kota Setar District was conducted from February to April 2020. Selection of preschools and students was done using multistage simple randomisation. A self-administered questionnaire containing demographic and digital device use details was filled by parents.

Results: The prevalence of digital device use among preschool children was 95.9% and mostly used smartphones (94.2%). Most children (95%) did not own the device, and usage was under supervision (95.7%). The reason for supervision was to prevent exposure to inappropriate content (70.5%). The common reasons for allowing digital device use were for educational (37.4%) and entertainment purposes (36%) through videos (30.9%) and games (30.2%). Approximately 21.5% and 50.3% of the children spent more than 1 and 2 hours on digital devices during weekdays and weekends, respectively.

Conclusion: The prevalence of digital device use among the preschool children in Kota Setar District was very high. Most of them used digital devices for educational and entertainment purposes under parental supervision. However, some exceeded the recommended screen time on weekends. These findings could promote awareness of digital device use among young children and help design public health awareness programmes and future policies.

Introduction

Digital devices are physical units of digital equipment, which include smartphones, smart watches, tablets, desktops, laptops and computers.[1] These devices have become an essential necessity in daily living. Their use has permeated the daily activities of children, gaining importance in education, entertainment and communication, and has become every child's dream toy.[2,3] Approximately half of children (52%) have access to digital devices, such as smartphones (41%), video iPods (21%) or tablets (8%), with majority of parents (98%) allowing their children to use these devices.[4–6]

Digital device use has both positive and negative impacts in children.[7,8] Academically, digital device use has a positive impact on preschool children towards learning by increasing alphabet recognition and enhancing reading, early language and mathematical skills. Cognitively, it enhances visual intelligence skills and helps children develop psychomotor skills. Meanwhile, the negative impacts include physical inactivity leading to increased risks of musculoskeletal problems and obesity. Psychologically, there is a risk of developing addictive disorders, problems in differentiating fantasy from reality, depression, aggressive and violent behaviours, conduct problems, hyperactivity and inattention.[9] High digital device usage is also associated with social isolation, poor interpersonal skills, communication problems and decreased quality family time.[10] Apart from using digital devices for education, preschool children also use them for playing games and watching videos.[3,11]

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Globally, approximately one-third of preschool children have access to digital devices, and majority of them exceed the recommended screen time.[3,12,13] Excessive digital device utilisation among young children causes varying problems, including obesity, poor sleep, behavioural problems and lack of attention. Currently, there are limited data on digital device use among preschool children in Malaysia; most studies on digital device use among young children were conducted in developed countries. Hence, this study aimed to evaluate the prevalence and description of digital device use among preschool children locally to address this gap. This information could be used to plan awareness programmes and future policies.

Methods

A cross-sectional study was conducted from February to April 2020 among parents of preschool children aged 4–6 years in Kota Setar District, Kedah. Parents were defined as biological parents (either mothers or fathers) or main caregivers (e.g. step-parents, grandparents, uncles or aunts). The sample size was calculated using the Epi calculator based on an expected frequency of 50%, acceptable margin of error 5% and added possibility rate of incomplete or unreturned questionnaires of 20%. The sample size required was 145 individuals. The use of an expected frequency of 50% was based on an educated guess, as no previous local study has evaluated the prevalence of digital device use among preschool children.

A self-administered questionnaire was adopted and used with permission from two earlier studies.[3,6] This questionnaire contained information on parents' demographic profiles (10 items) and description of their children's digital device use (9 items). The main measures in the questionnaire were digital device use, common devices used, device use duration, reason for use, and use supervision. Adaptation and content validation were performed by two family medicine specialists (one with a PhD in community child and adolescent health) and a trainee in family medicine. Content validation was conducted by examining each item in the questionnaire to assess whether it fairly represented the measure it was intended for and whether it was suitable for local use. All items were accepted as suitable, and the final questionnaire was then translated (forwards and backwards) into the local language (Bahasa Malaysia) by two linguists and subjected to face validation. For face validation, the questionnaire was distributed to 20 parents from a different kindergarten over 1 week. They were given time to fill in the questionnaire in the presence of the researcher and instructed to provide feedback if there was any difficulty in answering the questionnaire. All 20 parents provided feedback that they easily understood the questionnaire and were able to answer all sections without difficulty; hence, no changes were made to the questionnaire. Smartphones, touch-screen tablets (e.g. iPad), laptops and desktop computers were considered digital devices. Televisions were excluded from the list to avoid duplication of information, as many households could view programmes screened on the television using digital devices.

The participants were selected using multistage simple randomisation. Initially, 15 preschools were randomly selected from 75 preschools registered under the Ministry of Education in Kota Setar District using the ballot method. From each preschool, 15 students were randomly selected using computer-generated numbers based on the student registry. These children then received an envelope for their parents containing the information sheet, consent form and questionnaire through their class teachers. They were requested to return the answered questionnaire within a week. The class teachers reminded the students who did not return the questionnaire. Thereafter, the questionnaires were collected from the teachers. The parents who answered that their child did not use any digital devices were instructed to skip the section on the description of digital device use and return the questionnaire. Those who were unable to understand the national language, Bahasa Melayu, or did not consent were excluded. Data were entered into SPSS version 26. (IBM Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp) and descriptive analysis was used to evaluate the prevalence and description of digital device use among the preschool children. This study was approved by the research ethics committee of Universiti Kebangsaan Malaysia (FF-2019-381) and Kota Setar District Education Office.

Results

All 145 parents completed the questionnaires, which were returned through their preschool children. The prevalence of digital device use among the children was 95.9% (n=139), with a mean age at exposure of 3.9 years (SD=1.25). Most respondents were mothers (66.2%, n=92), had tertiary education (54.7%, n=76),

had three or more children (64.6%, n=90) and belong to the middle- and higher-income groups (60.4%, n=90). All demographic features of the participants are shown in **Table 1**.

Table 1. Demographic characteristics of parents whose preschool children use digital devices (n=139).

Participant characteristics	n (%)
Ethnicity	
Malay	116 (83.5%)
Chinese	13 (9.4%)
Indian	9 (6.5%)
Others	1 (0.7%)
Relationship with the child	
Mother	92 (66.2%)
Father	43 (30.9%)
Others (legal guardians/grandparents)	4 (2.9%)
Total number of children	
≥3	90 (64.6%)
<3	49 (35.3%)
Educational level	
School	
With formal schooling	62 (44.6%)
Without formal schooling	1 (0.7%)
Tertiary	
Diploma	43 (30.9%)
Degree	24 (17.3%)
Postgraduate degree	9 (6.5%)
Educational level of the spouse	
School	
With formal schooling	84 (60.4%)
Without formal schooling	1 (0.7%)
Tertiary	
Diploma	33 (23.7%)
Degree	16 (11.5%)
Postgraduate degree	5 (3.6%)
Marital status	
Married	136 (97.8%)
Divorced	3 (2.2%)
Occupation	
Private/government employee	85 (61.2%)
Unemployed (homemaker)	34 (24.5%)
Self-employed	20 (14.4%)
Occupation of the spouse	
Private/government employee	86 (61.9%)
Self-employed	47 (33.8%)
Unemployed/homemaker	6 (4.3%)
Total income	
Less than RM 2500 (Low)	55 (39.6%)
RM 2500 to 10000 (Middle)	78 (56.1%)
More than RM 15000 (High)	6 (4.3%)

The most common type of digital device used by the children was smartphones (94.2%, n=131), followed by tablets (32.4%, n=45). Majority (95%, n=132) of them did not have their own device, and device use was under parental supervision (95.7%, n=133). Majority of the parents supervised the usage to ensure that their child was not exposed to inappropriate content (70.5%, n=98) and could benefit from it (54%, n=75) (**Table 2**).

Table 2. Description of digital device use among preschool children.

Device description and usage	n (%)
Own device	
No	132 (95.0%)
Yes	7 (5.0%)
Type of device used	
Smartphone	131 (94.2%)
Tablet	45 (32.4%)
Laptop	24 (17.3%)
Desktop computer	17 (12.2%)
Supervision	
Under supervision	133 (95.7%)
On their own	5 (3.6%)
Together with friends	5 (3.6%)
Reason for supervision	
To make sure he/she is not exposed to inappropriate content	98 (70.5%)
It helps him/her to benefit more from it	75 (54.0%)
He/she needs help to use it	48 (34.5%)
He/she asks me to use it together with him/her	38 (27.3%)
I happen to be in the same room with my child	37 (26.6%)
It is our time together	28 (20.1%)
I enjoy using it together	11 (7.9%)
Other reasons	4 (2.9%)
I do not use devices together with my child	3 (2.2%)

The digital device use duration during weekdays was mostly between 30 minutes and 1 hour. During weekdays, approximately 21.5% (n=30) of the children spent 1–2 hours on digital devices; this figure increased to 50.3% (n=70) on weekends. Approximately 29.4% (n=41, on weekdays) to 56.8% (n=79, on weekends) spent ≥1 hour on digital devices. Digital devices were often used at home and outdoors (**Table 3**).

Table 3. Duration and place of digital device use during weekdays and weekends.

Duration (n=139)	None n (%)	30 minutes to 1 hour n (%)	1 to 2 hours n (%)	More than 2 hours n (%)
Place and day of the week				
Weekdays				
Preschool	122 (87.8%)	14 (10.1%)	2 (1.4%)	1 (0.7%)
Babysitter	108 (77.7%)	24 (17.3%)	4 (2.9%)	3 (2.2%)
Home	67 (48.2%)	56 (40.3%)	10 (7.2%)	6 (4.3%)
Outdoors	74 (53.2%)	50 (36.0%)	14 (10.1%)	1 (0.7%)
Weekends				
Preschool	139 (100%)	0	0	0
Babysitter	117 (84.2%)	11 (7.9%)	7 (5.0%)	4 (2.9%)
Home	66 (47.5%)	35 (25.2%)	35 (25.2%)	3 (2.2%)
Outdoors	78 (56.1%)	31 (22.3%)	28 (20.1%)	2 (1.4%)

The common activities on digital devices were video watching (30.9%, n=43), game playing (30.2%, n=42) and educational learning (22.3%, n=31). Approximately 20% (n=28) used digital devices for reading (**Table 4**).

Table 4. Common activities of preschool children on digital devices.

Common activities on digital devices	Always n (%)	Occasionally n (%)	Rarely n (%)	Never n (%)
Watch movies/videos/shows	43 (30.9%)	52 (37.4%)	25 (18.0%)	19 (13.7%)
Play games for fun	42 (30.2%)	52 (37.4%)	32 (23.0%)	32 (23.0%)
Play games to learn	31 (22.3%)	64 (46.0%)	33 (23.7%)	11 (7.9%)
Read/look at books	28 (20.1%)	56 (40.3%)	26 (18.7%)	29 (20.9%)
Phone/video calls	21 (14.4%)	29 (20.9%)	51 (36.7%)	39 (28.1%)
Listen to music	19 (13.7%)	43 (30.9%)	36 (25.9%)	41 (29.5%)
Take photographs/videos	13 (9.4%)	49 (35.3%)	46 (33.1%)	31 (22.3%)

The common reasons for allowing digital device use were educational (37.4%, n=52) and entertainment purposes (36.0%, n=50) and boredom avoidance (29.5%, n=41). Approximately one-quarter of the parents allowed digital device use to keep their child safe and out of trouble (27%, n=38) (**Table 5**).

Table 5. Reasons for allowing digital device use among preschool children.

Use of digital device for the following situations	Always n (%)	Occasionally n (%)	Rarely n (%)	Never n (%)
To learn something	52 (37.4%)	67 (48.2%)	11 (7.9%)	9 (6.5%)
To be entertained	50 (36.0%)	53 (38.1%)	30 (21.6%)	6 (4.3%)
Because he/she is bored	41 (29.5%)	57 (41.0%)	31 (22.3%)	10 (7.2%)
So he/she can be active (e.g. dance)	26 (18.7%)	38 (27.3%)	52 (37.4%)	23 (16.5%)
So he/she stays safe and out of trouble	38 (27.3%)	67 (48.2%)	25 (18.0%)	9 (6.5%)
To connect with other family members	32 (23.0%)	54 (38.8%)	34 (24.5%)	19 (13.7%)
So I can get things done	20 (14.4%)	63 (45.3%)	37 (26.6%)	19 (13.7%)
To calm him/her down	18 (12.9%)	51 (36.7%)	46 (33.1%)	24 (17.3%)
To go to sleep	4 (2.9%)	16 (11.5%)	23 (16.5%)	96 (69.1%)

Discussion

The prevalence of digital device use among preschool children in advanced countries such as Russia and the United States of America (USA) is approximately 92%.[2,6] Our study found a similar prevalence of 95.9%, which indicates that majority of preschool children have access to and are using digital devices. In Singapore, a lower prevalence (25%) of smartphone and touch-screen tablet usage was observed among children;[7] however, this study was conducted in the year 2015 and the current figures may be higher. Herein, the average age at the initial exposure of the preschool children to digital devices was 3.9 years. Children in the USA and Korea mostly started using digital devices between the age of six months and five years.[3,14] Although the average age at initiation of digital device usage locally was more than six months, it remains within the same age range. This is probably because in the Malaysian school system, preschool starts at the age of three years and primary school at the age of seven years. Hence, the preschool population in previous studies was younger, as their preschool cut-off age was lower. This shows that digital devices are incorporated into the lives of children at a very young age. The fact that digital devices are becoming more affordable, better internet availability and the sociocultural background of young parents may contribute to the early age of initiation.[15,16] The American and Canadian Academy of Paediatrics recommends the avoidance of screen-based devices (except for video chats) for children aged <18 months. For those aged 18–24 months, high-quality programmes may be watched with parents, while for those aged 2–5 years, quality programmes are advised to be watched for only 1 hour daily. However, the guideline does not specify the device type but focuses on the screen time.[17,18]

Most parents had school education (both primary and secondary), while one-third had tertiary education. More than half of the families (56.1%) were within the middle-income bracket. Accordingly, digital devices and internet connections are becoming more affordable, promoting wider usage.[16] Smartphones were the most popular device used by the preschool children in our study, different from previous results which found that children and youth mostly had access to laptops (46.3%), personal computers (21%) and tablets (15.3%). Smartphones appear to have become more popular over time, as they are more user friendly, easily portable, and more affordable than laptops.[19]

Almost all children in our study used digital devices under supervision by their parents or caregivers for the prevention of exposure to inappropriate content and guidance. However, socially desirable bias on self-reporting of supervision could not be excluded. Other studies also showed that parents did not allow their children to use digital devices independently owing to concerns about inappropriate contents or because their children requested for their guidance.[6,10,20]

Although most preschool children used digital devices for approximately 30 minutes daily herein, half of them spent 1–2 hours on digital devices on weekends. This prolonged digital device use during weekends is a concern, as it exceeds the upper limit of the

recommended duration for this age group (less than 1 hour per day) by twofold.[18] The duration of digital device use on weekends in this study was higher than the average screen time of children in Hong Kong and America – 31 and 159 minutes, respectively.[3,10] This needs immediate intervention, as prolonged screen time of 1–2 hours daily may cause language, behavioural, inattention and health problems, such as obesity.[21–23] Since digital device use in this study was mostly supervised, the screen time could be moderated and replaced with involvement of parents in interactive family games and activities. Herein, the common reasons for allowing digital device use were educational and entertainment purposes. In the USA, parents allowed digital device use to keep their children out of trouble and safe, while in Greece, they allowed such as a reward for good behaviour or for learning.[6,24] Some benefits of digital device use among preschool children include the development of fine motor skills with the use of touch-screens and symbols along with improvement of their skills and creative imagination.[20]

The strength of this study was that the description of digital device usage among young children was evaluated in detail. Meanwhile, the limitations were that the data were collected from a single population; hence, the findings may not be generalisable to the general population. Recall and socially desirable biases may have caused under-reporting owing to perceived undesirable behaviour. The age for preschool children in Malaysia is 4–6 years, different from that in other countries. Further, the classification of preschool children was different; comparing the results among preschool children was thereby challenging. Some studies also included televisions as digital devices when measuring screen time, making it challenging to directly compare our results with previous data.

Conclusion

We found a high prevalence (95.9%) of digital device use among preschool children, with an average age at first exposure of 3.9 years. The most popular digital device was smartphones, which were mainly used for entertainment and educational purposes. A high percentage (95.7%) of digital device use was under parental supervision. Although the digital device usage duration in most children was <1 hour daily, approximately 20% and 50% of them spent more than the recommended screen time during weekdays and weekends, respectively. These findings could promote awareness on the high prevalence of digital device use among preschool children and on the exceeded recommended screen time during weekends. Accordingly, these could help design public health awareness programmes and future policies.

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Conflicts of interest

The authors declare no conflicts of interest.

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Ethical Approval

Approval to conduct this study was obtained from the ethic committee of authors' institution University Kebangsaan Malaysia Medical Centre (FF-2019-381) and Education Department of Kota Setar district.

How does this paper make a difference in general practice?

- The findings could promote awareness that the use of digital devices among preschool children in our locality is high and that the recommended screen time is exceeded especially on weekends. This information could help in designing public health awareness programmes and policies on exposure of young children to digital devices in the future.
- The local prevalence of digital device use is high, and the current recommended screen time is exceeded.
- The findings could guide physicians in counselling for the appropriate duration of exposure to digital devices.

References

1. What is digital device? IGI Global. Accessed April 2022. https://www.igi-global.com/dictionary/digital-device/76206

2. Zulfu Genc. Parents' Perceptions about the Mobile Technology Use of Preschool Aged Children. *Procedia Soc Behav Sci*. 2014;146: 55–60.

3. Kabali HK, Irigoyen MM, Nunez-Davis R, et al. Exposure and Use of Mobile Media Devices by Young Children. *Pediatrics*. 2015;136(6):1044-1050. doi:10.1542/peds.2015-2151

4. Common Sense Media. Zero to Eight Children's Media Use in America report. Common Sense Media. 2013. Accessed 6 June 2020. http://www.commonsensemedia.org/research/zero-to-eight-childrens-media-use-in-america-2013

5. Chiong C, Shuler C. Learning: Is there an app for that? Investigations of young children's usage and learning with mobile devices and apps. New York, NY: The Joan Ganz Cooney Center at Sesame Workshop. 2010. Accessed 27 June 2020. http:// www.joanganzcooneycenter.org/publication/learning-is-there-an-app-for-that/

6. McCloskey M, Johnson SL, Benz C, et al. Parent Perceptions of Mobile Device Use Among Preschool-Aged Children in Rural Head Start Centers. *J Nutr Educ Behav*. 2018;50(1):83-89.e1. doi:10.1016/j.jneb.2017.03.006

7. Ebbeck M, Yim HY, Chan YY, et al. Singaporean Parents' Views of Their Young Children's Access and Use of Technological Devices. *Early Child Educ J*. 2016; (44):127-134. doi: 10.1007/s10643-015-0695-4.

8. Karuppiah N. Computer habits and behaviours among young children in Singapore. *Early Child Dev Care*. 2014;185 (3) 393 - 408. doi:10.1080/03004430.2014.930451.

9. Hosokawa R, Katsura T. Association between mobile technology use and child adjustment in early elementary school age *PLoS One*. 2018;13(7):e0199959. Published 2018 Jul 25. doi:10.1371/journal.pone.0199959

10. Wu CS, Fowler C, Lam WY, Wong HT, Wong CH, Yuen Loke A. Parenting approaches and digital technology use of preschool age children in a Chinese community. *Ital J Pediatr*. 2014;40:44. Published 2014 May 7. doi:10.1186/1824-7288-40-44

11. Mobile devise use among young kids; A Southeast Asia study. 2014. Accessed 27 June 2020. https://s3-ap-southeast-1.amazonaws.com/tap-sg-media/theAsianparent+Insights+Device+Usage+A+Southeast+Asia+Study+November+2014.pdf

12. Ofcom: Children and parents: Media use and attitudes report 2019. Accessed 11 April 2022. https://www.ofcom.org.uk/__data/assets/pdf_file/0023/190616/children-media-use-attitudes-2019-report.pdf

13. Cadoret G, Bigras N, Lemay L, Lehrer J, Lemire J. Relationship between screen-time and motor proficiency in children: a longitudinal study. *Early Child Dev Care*. 2018: 188; 231-239. doi:10.1080/03004430.2016.1211123

14. Chang HY, Park EJ, Yoo HJ, Lee JW, Shin Y. Electronic Media Exposure and Use among Toddlers. *Psychiatry Investig*. 2018;15(6):568-573. doi:10.30773/pi.2017.11.30.2

15. Kumpulainen K, Sairanen H, Nordstrom A. Young children's digital literacy practices in the sociocultural contexts of their homes. *Journal of Early Childhood Literacy*. 2020: 20(3) 472–499. DOI:10.1177/1468798420925116

16. Rosoff M. Why is technology getting cheaper? World Economic Forum. 16 Oct 2015. Accessed 07 April 2022. https://www.weforum.org/agenda/2015/10/why-is-tech-getting-cheaper/

17. Digital guidelines: Promoting healthy technology use for children. American Psychological Association. 12 Dec 2019. Accessed 07 April 2022. https://www.apa.org/topics/social-media-internet/technology-use-children#:~:text=The%20current%20recommendations%20advise%3A,day%20of%20high%2Dquality%20programming

18. Canadian Paediatric Society, Digital Health Task Force, Ottawa, Ontario . Screen time and young children: Promoting health and development in a digital world [published correction appears in Paediatr Child Health. 2018 Feb;23 (1):83]. *Paediatr Child Health*. 2017;22(8):461-477. doi:10.1093/pch/pxx123

19. United Nations Children's Fund (UNICEF) Malaysia. Exploring the digital landscape in Malaysia. November 2014. Accessed 10 July 2020. https://www.skmm.gov.my/skmmgovmy/media/General/pdf/Digital_Landscape_in_Malaysia_3.pdf

20. Preradovic NM, Lesin G, Sagud M. Investigating Parents' Attitudes towards Digital Technology Use in Early Childhood: A Case Study from Croatia. *Informatics Educ*. 2016; 15(1):127-146. doi: 10.15388/infedu.2016.07

21. Xie G, Deng Q, Cao J, Chang Q. Digital screen time and its effect on preschoolers' behavior in China: results from a cross-sectional study. *Ital J Pediatr*. 2020;46(1):9. Published 2020 Jan 23. doi:10.1186/s13052-020-0776-x

22. Guerrero MD, Barnes JD, Chaput JP, Tremblay MS. Screen time and problem behaviors in children: exploring the mediating role of sleep duration. *Int J Behav Nutr Phys Act*. 2019;16(1):105. Published 2019 Nov 14. doi:10.1186/s12966-019-0862-x.

23. Reichel C. The health effects of screen time on children: A research roundup. *The Journalist's resource*. 14 May 2019. Accessed 26 April 2021. https://journalistsresource.org/education/screen-time-children-health-research/

24. Papadakis S, Alexandraki F, Zaranis N. Mobile device use among preschool-aged children in Greece. *Educ Inf Technol*. 2022;2717–2750. doi.org/10.1007/s10639-021-10718-6

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ORIGINAL ARTICLE

Prevalence and severity of Bertolotti's syndrome in Malaysia: A common under diagnosis

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Abstract

Introduction: Bertolotti's syndrome (BS) is defined as the presence of low back pain (LBP), radiculopathy or both with a dysplastic transverse process (TP) of the fifth lumbar vertebra that is articulated or fused with the sacral base or iliac crest. This study aimed to investigate the prevalence and severity of BS to promote awareness of this disease.

Methods: A retrospective review of anteroposterior lumbosacral plain radiographs was conducted between 1 January and 31 December 2017. Patients were recruited via systematic randomised sampling and were then interviewed and examined. The severity of BS was measured objectively using the numerical pain rating scale (NPRS) and Oswestry disability questionnaire (ODQ). Data were analysed using IBM SPSS for Windows version 22.

Results: The prevalence of BS was 9.6% (16/166). Age significantly affected the severity of BS. The older and younger groups had a mean ODQ score of 42.86% and 24.08%, respectively (P=0.006). There was no significant relationship found between the prevalence of BS and age (P=0.126). Only one patient was diagnosed with BS during medical consultation. The mean NPRS score was 5.5. The majority of the BS cases were of moderate severity (43.8%), followed by those of minimal severity (31.2%) and severe disability (25%).

Conclusion: Early diagnosis of BS and orthopaedic referral are crucial to halt its progression. BS should be considered in patients presenting with LBP during assessments of lumbosacral radiographs.

Introduction

Bertolotti's syndrome (BS) is named after Mario Bertolotti who described this condition in 1917. Lumbosacral transitional vertebrae (LSTV) are a congenitally morphological spinal variation that spans a spectrum from a dysplastic transverse process (TP) of the fifth (L5) lumbar vertebra to partial/complete fusion between the TP of L5 and sacral base or iliac crest.[1–5] LSTV associated with low back pain (LBP), radiculopathy or both is defined as BS.

The exact cause of LBP in patients with BS remains uncertain, although a few theories mainly attributed to arthritic changes and disc degeneration have been postulated.[1] Specifically, reference has been made to the fact that the disc above the transitional vertebra appears to be at risk of increased degenerative changes, while the disc below appears to be protected.[3,6] These findings are also supported by Aihara et al., who proposed that this pathophysiology is attributed to hypermobility and abnormal torque of the intervertebral disc space immediately above the transitional vertebra, which appears to be more concentrated than do other levels.[6] Once disc degeneration occurs, further mechanical irritation of the nerve root by the degenerated disc or pseudo-joint may lead to radicular symptoms.[7]

The prevalence of BS in the general population varies in the literature. It has been reported to be between 4.6% and 7% and reach up to 11.4% in patients under the age of 30 years.[2,3] Further, Castellvi et al. found a high prevalence of lumbosacral anomalies of 30%.[1] Although Tini et al. suggested that LSTV was not associated with LBP, other studies indicated an association of LSTV with LBP and buttock pain.[3–5,7–9]

Currently, data on the prevalence, severity and underdiagnosis rate of BS in Malaysia are scarce. In the country, LBP is a common presentation in daily clinical practice and commonly being assessed initially by local medical practitioners ranging from primary

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care to emergency doctors who subsequently offer orthopaedic referral. However, not many medical practitioners are aware of this condition, which leads to delay in its diagnosis and treatment. In Malaysia, Manmohan et al. reported the case of a 20-year-old lady who experienced marked back pain for 8 years for which she had visited general practitioners (GPs) regularly and underwent various advanced imaging studies, including lumbosacral magnetic resonance imaging (MRI) (thrice), cervical spine MRI (once), lumbar spine computed tomography (once), plain lumbosacral spine radiography (LSR; eight times) and nerve conduction study (once) prior to the diagnosis of BS.[10]

Accordingly, this study is expected to add to the existing body of literature information promoting the awareness of this disease, earlier diagnosis and orthopaedic referral if clinically indicated. This would consequently help reduce the economic burden by reducing unnecessary tests and multiple visits to GPs and emergency departments. Early diagnosis with timely management provides relief of acute pain and helps prevent chronic LBP along with its complications. Symptomatic patients whose conservative management failed may be initially treated with local steroid and anaesthetic agent injections.[2,4,5] Therefore, this study aimed to determine the prevalence, severity and underdiagnosis rate of BS in Malaysia.

Materials and methods

Study design and population

The study was performed in Hospital Serdang, Malaysia. Ethical approval was provided by the Medical Research and Ethics Committee, Ministry of Health Malaysia prior to the initiation of the study. Six hundred anteroposterior (AP) plain LSRs that were taken in 2017 were selected via purposive sampling from 1 January to 31 December 2017. We selected 50 LSRs of the patients for each month, which totalled up to 600 LSRs over 12 months.

In purposive sampling, the LSRs of the patients were arranged according to the date from the first day of the month until the end of the month between January and December 2017. Once arranged, the LSRs were selected and reviewed to select the first 50 radiographs for each month up to a total of 600 radiographs for 12 months. Only the LSRs of the patients who fulfilled the inclusion criteria were selected. Radiographs were reviewed using the Zero Footprint medical image viewer software, which is the default radiographic viewer in Hospital Serdang.

The inclusion criteria were Malaysian nationality, age between 18 and 60 years and true AP view of the LSR of the patients who visited Hospital Serdang in 2017. A true AP view of the lumbosacral radiograph was defined as the view showing all spinous processes in a straight line, in which the pedicle distance to the spinous process on each side was similar (**Figure 1**). Meanwhile, the exclusion criteria were pregnancy, known history of any lumbosacral spine fractures and spinal disc pathology, including degenerative disc disease and prolapse intervertebral disc, and plain radiographic evidence of the following: previous lumbosacral surgery, lumbosacral spine fracture, spinal tumours, other congenital lumbosacral malformation and spinal infections.

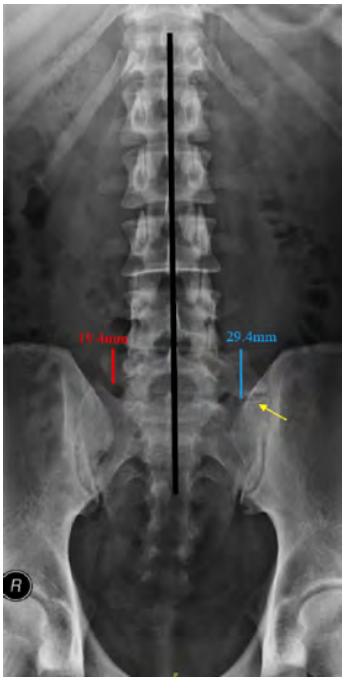

Figure 1. All spinous processes in the straight line and the pedicle distance to the spinous process on each side were similar, showing a true AP* view of the lumbosacral plain radiograph. L5 was set in a cephalad-to-caudal manner where the 12th rib was the marker and corresponded to T12. Type I LSTV was noted on the right transverse process of L5, measured 19.4 mm and dysplastic (red line). Type II LSTV was observed on the left side and measured 29.4 mm (blue line) with evidence of pseudo-arthrosis between the transverse process of L5 and sacrum (yellow arrow). *AP: Anteroposterior

Radiological assessment was performed using the AP-view LSRs to accurately determine the size of the TP of L5, which was measured between the uppermost and lowermost points (**Figure 1**). Subsequently, Castellvi classification was used to describe the morphologic appearance of LSTV (**Figure 2**).[1] The four types in this classification were then further subclassified into unilateral (a) or bilateral (b) involvement (**Figure 2**): Type I: Dysplastic TP (≥19 mm); Type II: Incomplete lumbarisation/sacralisation (pseudo-articulation); Type III: Complete lumbarisation/sacralisation (bony union) between the TP and sacrum; Type IV: Mixture of types II and III on each side. In our study, we used the simplified classification by Nardo et al. where the cases were not further classified into bilateral or unilateral to minimise the number of categories.[8]

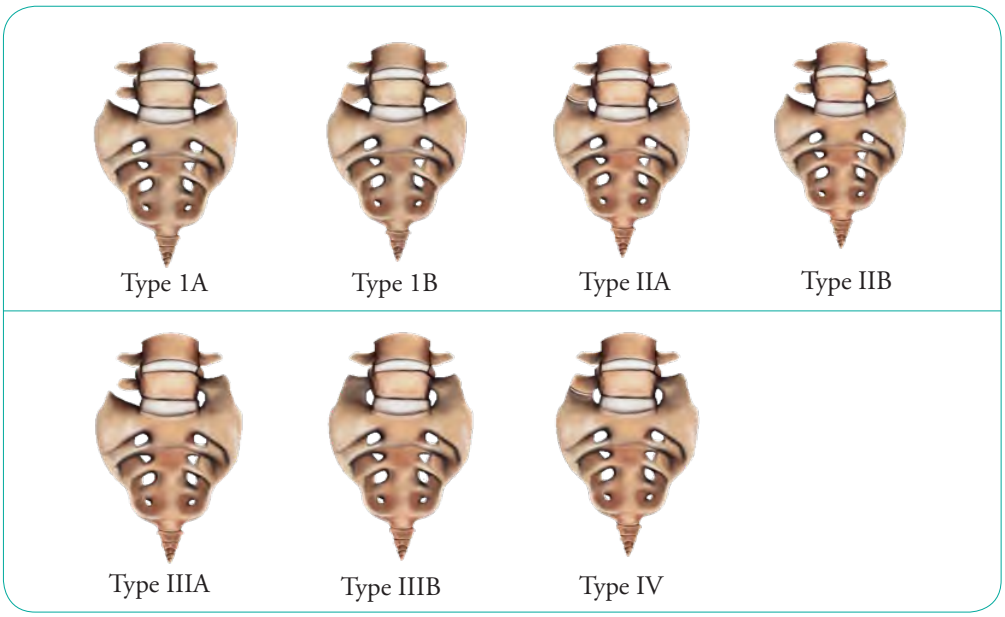

Figure 2. Illustration of the Castellvi classification

As no comparable previous local studies could be found, the most current study available on the prevalence of the BS in the general population by Jancuska et al., which reported a mean of 12.3%, was tailored for our use.[5] A minimum sample size of 166 patients was required for our study. The registration numbers of 600 patients were recorded in a Microsoft Office Excel spreadsheet, which was then used to generate unique identification numbers. Systematic randomised sampling was performed using Microsoft Office Excel according to the patients' unique identification number, which yielded 166 eligible patients for inclusion.

Of the 166 patients, only those who had LSTV were interviewed and examined. No appointments were made for those without LSTV. This was because a clinical history of LBP, radicular symptoms or both with the finding of LSTV must be present to establish a final diagnosis of BS.[1–4]

Study procedure

A retrospective review of electronic medical records (EMRs) was performed to collect the demographic data, including age, sex and ethnicity, of the 166 patients. We identified 16 patients with LSTV, who were then interviewed and examined. Informed consent was obtained, followed by focused history-taking, clinical examination and questionnaire completion. The examinations conducted included localisation of low back tenderness and routine neurological lower limb examination. Back tenderness localisation was divided into lumbar, buttock, radiculopathy and others where specification was required. Lower limb neurological examinations followed the American Spinal Injury Association chart of key muscles and key sensory points.[11]

The pain severity was measured using three scales, one for pain during the entire present episode, while the other two were for usual pain during the previous week and during the last episode (when there was no episode of back pain in the past week). In all cases, the pain scale used was the 11-point numerical pain rating scale (NPRS) anchored at one end by the label 'no pain' and at the opposite end

by 'worst pain possible'. The question asked was as follows: We realise that there have been 'good' and 'bad' days, but, on average, how would you rate the severity of your back pain: during the entire time you have had it, during the past week and during the last episode (if there was no episode of back pain in the past week)? This format of questioning has been successfully used in previous studies and is a well-validated method of measuring a patients' pain experience.[12–14]

The patients were then asked to answer the Oswestry disability questionnaire (ODQ) with our guidance to specifically assess the severity of LBP. This questionnaire comprises 10 questions. Each question has a total possible score of 5. When the first statement is marked, the score is 0; when the last statement is marked, then the score is 5. The final scores are obtained by dividing the total scores with the total possible scores and multiplying them by 100. This is also well validated in the literature.[12,15] The scores are interpreted as follows: 0%–20%: minimal disability, 21%–40%: moderate disability, 41%–60%: severe disability, 61%–80%: crippled and 81%–100%: either bed-bound status or exaggerated symptoms.

The weight and height were measured to calculate the body mass index (BMI) defined as weight in kilograms divided by height in metres squared. The BMI was measured and classified in accordance with the World Health Organization guidelines into underweight (<18.50 kg/m^2), normal (18.50–24.99 kg/m^2) and overweight (≥25.00 kg/m^2).[16]

Quality control

The measurements were conducted by two independent evaluators on the same occasion. Both evaluators had more than 5 years of experience as an orthopaedic surgeon and a radiologist. This was ensured to achieve an accurate measurement upon radiological assessment.

Data analysis

Standard descriptive data were expressed as frequencies (percentages) for all qualitative variables. The chi-square test or Yates continuity correction was used for categorical data analysis and Student's t-test for continuous data analysis. Statistical significance was set at P-values of <0.05. The IBM SPSS Statistics for Windows, Version 22.0 (Armonk, New York: IBM Corp) was used to conduct the analyses.

Results

A total of 166 patients (age: 18–60 years) who satisfied the inclusion criteria were selected on the basis of the reviewed LSRs of the 600 patients. Of them, 16 were diagnosed with BS (9.6%). Seven out of these sixteen patients had Castellvi type I (43.8%); six, type II (37.5%); and three, type III (18.7%). Fourteen patients presented with LBP, one patient with radiculopathy and one patient with both LBP and radiculopathy. The mean duration of symptoms was 6.81 years (standard deviation [SD]: 5.167), with no significant association to the severity of BS measured using the ODQ (P=0.690).

Fifteen patients had previous medical consultations with primary care and emergency doctors. The common diagnoses made were mechanical back pain (n=7), prolapsed intervertebral disc (n=5) and degenerative lumbar disease (n=2). Only one patient was offered orthopaedic referral, and appropriate treatment was then initiated. One patient did not seek any medical attention; the LSR was obtained owing to other reasons. No significant differences were found between BS and age, sex and ethnicity (**Table 1**).

Table 1. Relationship between the demographic data and BS.

Variable	Diagnosis†		Total no.	P-value (χ^2)	OR (95% CI)
	BS	Normal			
Age					
≤30 years	9 (14.1)	55 (85.9)	64	0.126 (2.341)	2.22 (0.783–6.296)
>30 years	7 (6.9)	95 (93.1)	102		
Sex					
Male	8 (9.3)	78 (90.7)	86	0.879 (0.023)	0.923 (0.329–2.588)
Female	8 (10)	72 (90)	80		
Ethnicity					
Malay	14 (11.3)	110 (88.7)	124	0.349* (0.877)	2.545 (0.554–11.698)
Non-Malay	2 (4.8)	40 (95.2)	42		

BS, Bertolotti's syndrome; OR, odds ratio; CI, confidence interval. *Derived using Yates continuity correction. †Data are presented as numbers (%).

The severity of BS was measured using the NPRS score, which ranged from 2 to 8, with a mean score of 5.5 (entire time and last episode). Based on the ODQ score, five patients had minimal back pain; seven, moderate; and four, severe. The mean BMI was 29.59 (SD: 4.975; range: 22.86–38.05) kg/m^2. Age was significantly associated with the severity of BS (Table 2).

Table 2. Relationship of the demographic data and BMI with the severity of Bertolotti's syndrome.

Variable	Mean ODQ score, % (SD)	Total no.	P-value*
Age			
≤30 years	24.078 (12.239)	4	0.006 (3.260)
>30 years	42.857 (10.254)	12	
Sex			
Male	30.863 (17.465)	8	0.710 (0.380)
Female	33.726 (12.246)	8	
Ethnicity			
Malay	31.336 (15.475)	14	0.508 (0.680)
Non-Malay	39 (1.414)	2	
BMI			
Normal	30.50 (14.640)	4	0.710 (0.380)
Overweight	32.892 (15.249)	12	
Mean NPRS score during the entire time (SD)			
Sex			
Male	5.250 (2.121)	8	0.544 (0.632)
Female	5.750 (0.707)	8	
Ethnicity			
Malay	5.357 (1.598)	14	0.346 (0.974)
Non-Malay	6.5 (0.707)	2	
BMI			
Normal	5.750 (0.957)	4	0.723 (0.362)
Overweight	5.417 (1.730)	12	
ODQ finding			
Minimal	4 (1.826)	4	0.019 (2.646)
Moderate to severe	6 (1.128)	12	
Mean NPRS score during the last episode (SD)			
Sex			
Male	5.375 (2.387)	8	0.703 (0.392)
Female	5.750 (1.282)	8	
Ethnicity			
Malay	5.357 (1.865)	14	0.256 (1.183)
Non-Malay	7.0 (1.414)	2	
BMI			
Normal	5.250 (1.259)	4	0.712 (0.377)
Overweight	5.667 (2.060)	12	
ODQ finding			
Minimal	3.75 (2.062)	4	0.018 (2.670)
Moderate to severe	6.17 (1.403)	12	

ODQ, Oswestry disability questionnaire; NPRS, numerical pain rating scale; BMI, Body Mass Index; SD, standard deviation. *Derived from Student's t-test

Discussion

In the literature, the prevalence of BS ranges between 4.0% and 37%.[1,3,4,6–8] The variability and wide range in the prevalence may be attributed to varying factors, including narrow age span, inclusion of patients without back pain but with other diseases or biased selection of patients.[5] As previously described, the prevalence of BS was higher in studies that included patients with LBP and lower in community-based studies.[8] Although our patients were from a single hospital, the prevalence of BS in this study (9.6%) was within the range of previous reports. Additionally, no significant difference was observed between the male (9.3%) and female (10%) groups, which is comparable to earlier findings, although some showed a higher prevalence of BS in men.[7,17] The prevalence of BS was not significantly associated with age (P=0.126), also similar to previous findings.[3] To our knowledge, this is the first study of its

kind in Malaysia; it showed similar results with the study by Nardo et al. that there was no significant relationship between BS and ethnic groups (P=0.363).[8]

The simple NPRS used in this study could represent the severity and disability of LBP, as it was significantly related to the detailed ODQ score. This indicates that this simple, more rapid and accurate method should be utilised by local medical practitioners in assessing the severity of LBP. Age was also found to be significantly associated with the severity of BS. In this study, the patients aged >30 years had a higher mean ODQ score (42.9%) than those aged <30 years (24.1%) (P=0.006). This finding is also similar with the findings by Peterson et al. that older patients reported more disability than did younger patients.[12]

To the best of our knowledge, no study has shown underdiagnoses of patients with BS in Malaysia. In this study, 14 of 15 patients were not diagnosed with BS during their medical consultations. This shows the importance of early detection of BS, so that timely intervention of the condition could be provided. Early detection can also help prevent worsening of LBP, which was significantly observed in the older patients in this study. It can be achieved by having a high index of suspicion upon clinical assessment of patients with LBP inclusive of clinical history, physical examination and appropriate LSR assessment to identify any radiological anomalies, including LSTV. In addition, LBP is one of the main reasons for needing medical assistance, and 80% of adults seek help at some stage in life. In the USA, approximately 15%–20% of the population is affected by LBP, and an estimated USD 50 billion is the annual cost for diagnosing and treating LBP.[3] A proper radiological assessment of plain LSRs can prevent medical practitioners from performing unwanted advanced imaging studies, which may subsequently reduce the economic burden.

Herein, all patients with LSTV were diagnosed with BS. This finding is contradicted by a previous literature where only 57.6% of patients with LSTV were diagnosed with BS.[8] One possible explanation may be the difference in the sample size used. Nevertheless, our study also has some limitations. It was conducted in a single health care centre and included a relatively small number of patients. We used systematic randomised sampling to lessen the effect of this limitation and to ascertain that this study may represent our local community.

Conclusion

The prevalence of BS among patients in Malaysia was 9.6%. The older patients were more likely to present moderate-to-severe symptoms than the younger patients. All patients with LSTV were diagnosed with BS. Of the 15 patients with BS, 14 were undiagnosed upon medical consultation, making it an utmost necessity to include BS as part of the differential diagnosis of LBP.

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Author contributions

Faiz N, Anuar S, Khairuddin K, Ashraf AH, Hezery H, Abbas MR, Fahrudin CH and Ezamin AR had the same contributions to this study. Faiz N is the principal writer of this manuscript assisted by all other authors. All authors have read and approved the final manuscript.

Ethical approval

This study was approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia [NMRR-18-2977-44714 (IIR)].

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All authors have none to declare.

Conflicts of interest

All authors declare no conflicts of interest.

How does this paper make a difference in general practice?

- This study provides local data of the prevalence and severity of Bertolotti's syndrome.
- The findings promote practical understanding and awareness among primary care and emergency doctors in the clinical assessment of Bertolotti's syndrome.
- Earlier diagnosis and orthopaedic referral should be implemented to prevent the progression of Bertolotti's syndrome and consequently reduce the economic burden by reducing unnecessary visits to primary care doctors and improve patients' quality of life.

References

1. Castellvi AE, Goldstein LA, Chan DP. Lumbosacral transitional vertebrae and their relationship with lumbar extradural defects. *Spine (Phila Pa 1976)*. 1984;9(5):493-495. doi:10.1097/00007632-198407000-00014

2. Holm EK, Bünger C, Foldager CB. Symptomatic lumbosacral transitional vertebra: a review of the current literature and clinical outcomes following steroid injection or surgical intervention. *SICOT* J. 2017;3:71. doi:10.1051/sicotj/2017055

3. Quinlan JF, Duke D, Eustace S. Bertolotti's syndrome. A cause of back pain in young people. *J Bone Joint Surg Br*. 2006;88(9):1183-1186. doi:10.1302/0301-620X.88B9.17211

4. Almeida DB, Mattei TA, Sória MG, et al. Transitional lumbosacral vertebrae and low back pain: diagnostic pitfalls and management of Bertolotti's syndrome. *Arq Neuropsiquiatr*. 2009;67(2A):268-272. doi:10.1590/s0004-282x2009000200018

5. Jancuska JM, Spivak JM, Bendo JA. A Review of Symptomatic Lumbosacral Transitional Vertebrae: Bertolotti's Syndrome. *Int J Spine Surg*. 2015;9:42. Published 2015 Jul 29. doi:10.14444/2042

6. Aihara T, Takahashi K, Ogasawara A, Itadera E, Ono Y, Moriya H. Intervertebral disc degeneration associated with lumbosacral transitional vertebrae: a clinical and anatomical study. *J Bone Joint Surg Br.* 2005;87(5):687-691. doi:10.1302/0301-620X.87B5.15727

7. Tang M, Yang XF, Yang SW, et al. Lumbosacral transitional vertebra in a population-based study of 5860 individuals: prevalence and relationship to low back pain. *Eur J Radiol*. 2014;83(9):1679-1682. doi:10.1016/j.ejrad.2014.05.036

8. Nardo L, Alizai H, Virayavanich W, et al. Lumbosacral transitional vertebrae: association with low back pain. *Radiology*. 2012;265(2):497-503. doi:10.1148/radiol.12112747

9. Tini PG, Wieser C, Zinn WM. The transitional vertebra of the lumbosacral spine: its radiological classification, incidence, prevalence, and clinical significance. *Rheumatol Rehabil*. 1977;16(3):180-185. doi:10.1093/rheumatology/16.3.180

10. Manmohan S, Dzulkarnain A, Nor Azlin ZA, Fazir M. Bertolotti's syndrome: A commonly missed cause of back pain in young patients. *Malays Fam Physician*. 2015;10(2):55-58. Published 2015 Aug 31.

11. Roberts TT, Leonard GR, Cepela DJ. Classifications In Brief: American Spinal Injury Association (ASIA) Impairment Scale. *Clin Orthop Relat Res*. 2017;475(5):1499-1504. doi:10.1007/s11999-016-5133-4

12. Peterson CK, Bolton J, Hsu W, Wood A. A cross-sectional study comparing pain and disability levels in patients with low back pain with and without transitional lumbosacral vertebrae. *J Manipulative Physiol Ther*. 2005;28(8):570-574. doi:10.1016/j.jmpt.2005.08.011

13. Bolton JE. Accuracy of recall of usual pain intensity in back pain patients. *Pain.* 1999;83(3):533-539. doi:10.1016/S0304-3959(99)00161-X

14. Haefeli M, Elfering A. Pain assessment. Eur Spine J. 2006;15 Suppl 1(Suppl 1):S17-S24. doi:10.1007/s00586-005-1044-x

15. Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine (Phila Pa 1976)*. 2000;25(22):2940-2952. doi:10.1097/00007632-200011150-00017

16. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser*. 2000;894:i-253.

17. Uçar B, Uçar D, Bulut M, et al. Lumbosacral transitional vertebrae in low back pain population. *J Spine*. 2013;2(125):2. doi: 10.4172/2165-7939.1000125

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ORIGINAL ARTICLE

Prevalence and determinants of medications non-adherence among patients with uncontrolled hypertension in primary care setting in Sarawak, Malaysia: A cross-sectional study

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Thew HZ, Ching SM, Lim HM, et al. Prevalence and determinants of medications non-adherence among patients with uncontrolled hypertension in primary care setting in Sarawak, Malaysia: A cross-sectional study. *Malays Fam Physician.* 2022;17(3):128–136. https://doi.org/10.51866/oa.182

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Patient compliance, Hypertension, Primary health care, Malaysia

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Abstract

Introduction: Non-adherence to antihypertensive medications is a leading cause of uncontrolled hypertension and its complications. However, data on the factors associated with non-adherence to antihypertensive medications in the communities of Sarawak, Malaysia, are limited. This study aimed to examine the prevalence and determinants of medication non-adherence among patients with uncontrolled hypertension.

Methods: A cross-sectional study was conducted using the systematic sampling method in four government primary healthcare clinics in Sarawak. A self-administered questionnaire was used to obtain socio-demographic data and evaluate non-adherence. Blood pressure was measured, and relevant clinical variables were collected from medical records. Multivariate logistic regression was used to determine the determinants of medication non-adherence.

Results: A total of 488 patients with uncontrolled hypertension were enrolled in this study. The prevalence of medication non-adherence was 39.3%. There were four predictors of medication non-adherence among the patients with uncontrolled hypertension: tertiary educational level (odds ratio [OR]=4.21, 95% confidence interval [CI]=1.67–10.61, P=0.010), complementary alternative medication (OR=2.03, 95% CI=1.12–3.69, P=0.020), non-usage of calcium channel blockers (OR=1.57, 95% CI=1.02–2.41, P=0.039) and 1 mmHg increase in the systolic blood pressure (OR=1.03, 95% CI=1.00–1.05, P=0.006).

Conclusion: Because of the high prevalence of medication non-adherence among patients with uncontrolled hypertension, primary care physicians should be more vigilant in identifying those at risk of being non-adherent. Early intervention should be conducted to address non-adherence for blood pressure control.

Introduction

Hypertension is the most common health condition seen in primary healthcare settings, which can lead to myocardial infarction, stroke, renal failure and death if not detected early and treated appropriately.[1] It is an increasing global health problem in developed and developing countries, including Malaysia. Globally, 30.8% of adults have hypertension, and the estimated prevalence of hypertension among men and women is 32.1% and 29.5%, respectively.[2] In Malaysia, the prevalence of hypertension plateaued at 30%,[3,4] which is higher than that in other countries, including China and Singapore.[5] The prevalence trend in Malaysia is more similar to that in developed countries than in developing countries.[6] Hypertension is the greatest contributor to the overall mortality in Malaysia in terms of disability-adjusted life-years, with mortality rates of 19.4% in men and 22.8% in women.[7] Hypertension, especially uncontrolled and untreated hypertension, is associated with an increased risk of total and cardiovascular mortalities among the general population with hypertension.[8] The main goal of hypertension management is to prevent end-organ damage and delay the complication progression. This could be achieved mainly through blood pressure control and cardiovascular risk stratification.[9] The complications indirectly increase healthcare costs to both the patient and the community.[10,11] The causes of uncontrolled hypertension can be classified into three main factors: patient-, physician- and healthcare system-related causes.[12–14] Among all these

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factors, poor medication adherence is the top contributor to uncontrolled blood pressure.[12] The causes of non-adherence can also be classified into patient-, physician- and healthcare system-related factors.[13,15] Patient forgetfulness, lack of information related to hypertension and its complications, emotional factors, fear of addiction to medications or side effects of antihypertensive medications, complexity of treatment, missed appointments and lack of belief in the benefit of medications are among the patient-related factors of non-adherence.[15–17]

Changes in lifestyle and a demographic shift in Sarawak, Malaysia, have contributed to the increased prevalence of hypertension. A national survey conducted in 2004 in Malaysia showed that the prevalence of hypertension in respondents aged 30 years and above was 40.5% (39.3%–41.8%).[3,18] Malays and the indigenous people from the state of Sabah had the highest prevalence of hypertension at 41.3%, followed by the indigenous people of Sarawak (40.4%), Chinese (40.0%) and Indians (37.7%).[18] However, only one study was conducted among elderly populations with hypertension in Miri, Sarawak, to evaluate medication adherence.[15] This shows that studies examining medication non-adherence among patients with uncontrolled blood pressure in a community such as Sarawak, where the main ethnicity is an indigenous group in Malaysia, are limited.[15] Thus, the present study aimed to examine the prevalence and determinants of medication non-adherence among patients with uncontrolled blood pressure.

Methods

Setting

A cross-sectional study was conducted from August to September 2019 among patients who attended four government primary care clinics in Sarawak (Klinik Kesihatan Oya, Klinik Kesihatan Miri, Klinik Kesihatan Jalan Masjid and Klinik Kesihatan Batu Kawa). All these four clinics are located in the city centre, and each clinic accommodates an estimated 600 to 800 patients per day.

Inclusion criteria

The following patients were eligible for inclusion to the study: patients with uncontrolled hypertension diagnosed in accordance with the Malaysian Clinical Practice Guidelines for Hypertension (blood pressure of ≥140/90 mmHg for patients with hypertension, ≥140/80 mmHg for patients with diabetes, ≥130/80 mmHg for patients with ischaemic heart disease/cerebrovascular disease and renal impairment and ≥150/90 mmHg for patients aged >80 years)[9]; those aged 30 years and above; those taking one or more antihypertensive medications; and those with a minimum follow-up period of 6 months at Klinik Kesihatan Oya, Klinik Kesihatan Miri, Klinik Kesihatan Jalan Masjid and Klinik Kesihatan Batu Kawa.

Exclusion criteria

Patients who refused to provide consent, pregnant mothers, acutely ill or unstable patients, and those who were diagnosed with secondary hypertension were excluded.

Sample size calculation

The sample size was calculated using Epi Info version 7.0 based on the local study by Ramli et al. in which the prevalence of medication non-adherence was 46.6%.[16] The calculated sample size was 381, with 95% power, 95% confidence interval (CI) and 5% α value. The final sample size was 457 after considering a 20% dropout rate.

Sampling method

Systematic random sampling was used for recruitment. Twelve patients with uncontrolled blood pressure were estimated to visit each clinic in a day. Hence, 480 patients with uncontrolled hypertension were estimated to visit each clinic within 8 weeks. With the required sample size of 114 (457/4) in each clinic, the sampling interval of four was used, with the starting number being picked randomly from number one to four using the lottery method from the registration counter. Patients were recruited directly inside the hypertension room after registration with a designated hypertension clinic. Meanwhile, nurses at the registration counter sent the patients to the investigation room on the day of data collection at the clinic.

Pilot study

The study questionnaire was pre-tested among 50 patients to check its comprehensibility and test the data collection process. Minor revisions, especially the questionnaire's alignment, were made following the pilot study. The Cronbach's α was not evaluated after the study, as the questionnaire has been previously validated locally (Cronbach's α of 0.782).

Data collection instrument

A self-administered questionnaire was used for data collection. The questionnaire has four parts. Part one contains questions regarding demographic characteristics. Part two contains items on hypertension characteristics and was filled out by the patients and researchers. For blood pressure measurement, the patients were instructed to sit upright without crossing their legs and rest for 5 minutes. They were instructed refrain from exercising, drinking caffeinated beverages, eating or smoking 30 minutes before the measurement. An appropriate-sized cuff that encircled at least 80% of the arm, with the bladder covering at least 40% of the arm circumference, placed 2 cm above the brachial artery and aligned with the index marker, was used. A sphygmomanometer was placed at the same level as the patients' heart, and the systolic and diastolic measurements were recorded.

Part three contains the modified Medication Adherence Scale, while part four contains questions regarding healthcare systems. The modified Medication Adherence Scale was developed by Ramli et al.[16] based on two different adherence questionnaires: the Hill–Bone Adherence to Blood Pressure Therapy Scale and Morisky Medication Adherence Scale. The modified Medication Adherence Scale has been validated locally with Cronbach's α of 0.782 and had good internal consistency and reliability.[16] There are seven items in this questionnaire, and each question has a four-point Likert-type response format. Each response carried a score: none of the time=4, some of the time=3, most of the time=2 and all the time=1. The total score for each patient could range from 7 to 28. A score of 26 was used as a cut-off because adherence was defined when the score was 27 or 28 (owing to deduction of 1 point from either of the 'unintentional adherence' questions – questions 1 or 6). Therefore, a score of 26 and below was considered to indicate non-adherence.[16]

Operational definition

Uncontrolled hypertension was defined using an average of two office blood pressure readings according to the following cut-off points9:

a) 140/90 mmHg for patients with hypertension
b) 140/80 mmHg for patients with diabetes
c) 130/80 mmHg for patients with ischaemic heart disease/cerebrovascular disease and renal impairment
d) 150/90 mmHg for patients aged >80 years

Complementary alternative medication (CAM) was defined as herbal and dietary supplement consumption to control hypertension.

Data analysis

All data obtained were analysed using the SPSS software version 21. We described the findings as frequencies, percentages, means, medians or standard deviations. Continuous data were described as means when data distribution was normal or medians when it was not. The chi-square test was used to determine the association between categorical data. An independent t-test or the Mann–Whitney test was used to determine the association between continuous and two categorical variables. Multivariate logistic regression (MLR) was performed to identify the determinants of medication non-adherence. The backward likelihood ratio model was selected over the forward method for the data analysis. This is because the forward method has a higher risk of type II errors due to suppressor effects; the likelihood ratio is less intense; and the Wald statistic can be unreliable in certain circumstances. In the backward likelihood ratio model, all variables were initially entered into the baseline model. Insignificant variables were then dropped, one at a time, until all the variables that remained in the model were statistically significant. This was conducted to identify the predictors of adherence in the final model after adjusting for confounders.

The assumptions for MLR were met in this study. First, the dependent variable was a dichotomous variable (yes/no for adherence). Second, there was no data duplication, while there was a separation of sample group outcomes. Third, there was no multicollinearity in the form of tolerance test (all independent variables, >0.1) and variance inflation factor (all independent variables, <5) detected among the independent variables. Fourth, the goodness of fit of the model was tested using the Hosmer and Lemeshow test. The P-value was 0.9, indicating that the model had a good fit. Last, our sample size (n=488) exceeded the calculated sample size of 457.

The independent variables with P-values of <0.25 in the univariate analyses were entered into the MLR to identify the determinants of the dependent variables. A P-value of <0.25 was adopted instead of a P-value of <0.05 to allow more significant variables to be included in the MLR. P-values of <0.05 were considered statistically significant.

Results

A total of 501 patients with uncontrolled blood pressure were enrolled in the study. Thirteen patients were excluded from the analysis because of incomplete data. Thus, 488 patients were finally included in the data analysis. The prevalence of medication non-adherence was 39.3%. **Table 1** shows the socio-demographic characteristics of the study population. The mean patient age was 58.3±11.9 years. More than half of the patients were women (57.4%) and married (76.2%). The most common patient ethnicity was Chinese (39.1%), followed by Iban, Bidayuh, Melanau and Orang Ulu (35.5%), Malay (25.2%) and Indian (0.2%). Only 12.9% of the patients never had formal education. Approximately 42.4% were employed or had their own business. Approximately 82.4% had a monthly household income below RM 3,000 (USD 675), which is the median income for the bottom 40% of the income household group according to the Household Income and Basic Amenities Survey conducted in 2016 by the Department of Statistics.[19]

Table 1 also shows the association between medication non-adherence and socio-demographic data among the respondents with uncontrolled hypertension in the univariate analysis. Younger patients and patients with a higher educational level were more likely to be non-adherent to antihypertensive medications. Meanwhile, retired or pensioners were more adherent to antihypertensive medications. However, no significant association was found between medication non-adherence and sex, ethnicity, monthly household income and marital status.

Table 1. Comparison of the adherence status towards antihypertensive medications in relation to the socio-demographic data among patients with uncontrolled blood pressure (n=488).

Variables	All	Adherence	Non-adherence	P-value
Age (year), mean±SD	58.3±11.9	59.8±11.5	56.0±12.2	0.001
Sex				0.248
Male	208 (42.6)	120 (57.7)	88 (42.3)	
Female	280 (57.4)	176 (62.9)	104 (37.1)	
Ethnicity				0.631
Malay	123 (25.2)	75 (61.0)	48 (39.0)	
Chinese	191 (39.1)	114 (59.7)	77 (40.3)	
Indian	1 (0.2)	0 (0.0)	1 (100.0)	
Others	173 (35.5)	107 (61.8)	66 (38.2)	
Educational level				0.001
Primary school	151 (30.9)	87 (57.6)	64 (42.4)	
Secondary school	229 (46.9)	136 (59.4)	93 (40.6)	
College/university	45 (9.2)	21 (46.7)	24 (53.3)	
No formal education	63 (12.9)	52 (82.5)	11 (17.5)	
Marital status				0.887
Single	39 (8.0)	25 (64.1)	14 (35.9)	
Married	372 (76.2)	222 (59.7)	150 (40.3)	
Divorced	16 (3.3)	10 (62.5)	6 (37.5)	
Widowed	61 (12.5)	39 (63.9)	22 (36.1)	
Employment status				0.045
Employed/own business	207	115 (55.6)	92 (44.4)	
Unemployed	183	112 (61.2)	71 (38.8)	
Retired/pensioner	98	69 (70.4)	29 (29.6)	
Monthly household income (MRY)				0.823
<3,000 (USD <675)	402	246 (61.2)	156 (38.8)	
3,000–6,500 (USD 675–1,462)	68	41 (60.3)	27 (39.7)	
6,501–16,000 (USD 1,463–3,600)	14	7 (50.0)	7 (50.0)	
>16,000 (USD >3,600)	4	2 (50.0)	2 (50.0)	
Time to a clinic visit (minute), median (IQR)	15.0 (10)	15.0 (10)	15.0 (10)	0.534

SD, standard deviation; IQR, interquartile range. Analysis was performed using the Mann–Whitney test, independent t-test or chi-square test.

Table 2 shows the clinical characteristics of the study population. The mean systolic blood pressure was 151.1±11.0 mmHg, while the mean diastolic blood pressure was 87.4±9.9 mmHg. Approximately 71.5% of the patients had underlying dyslipidaemia. Only 33.4% had practiced home blood pressure monitoring. Calcium channel blockers were the most frequently prescribed antihypertensive agent (72.1%), followed by angiotensin-converting enzyme inhibitors (49.4%) and beta-blockers (37.1%). Approximately 10.9% of the patients had taken CAM. Table 2 also illustrates the association between medication non-adherence and clinical variables among the respondents with uncontrolled hypertension in the univariate analysis. Higher systolic and diastolic blood pressures and traditional CAM use were significantly associated with non-adherence. The patients who took angiotensin II receptor blockers (ARBs) and those with underlying ischaemic heart disease were more likely to adhere to antihypertensive medications.

Table 2. Comparison of the adherence status towards antihypertensive agents in relation to the clinical profiles among patients with uncontrolled blood pressure (n=488).

Variables	All	Adherence	Non-adherence	P-value
SBP (mmHg), mean±SD	151±11	150.3±10.9	152.3±11.2	0.047
DBP (mmHg), mean±SD	87±10	86.5±9.5	88.7±10.4	0.016
BMI (kg/m2), mean±SD	28.4±5.6	28.1±5.7	28.7±5.4	0.298
Duration of hypertension (year), median (IQR)	6.0 (10)	6.0 (11.0)	6.0 (8.0)	0.232
Antihypertensive agent, median (IQR)	2.0 (2.0)	2.0 (2.0)	2.0 (2.0)	0.994
Type of antihypertensive medication (n, %)				
Calcium channel blocker	352	221 (62.8)	131 (37.2)	0.122
ACEI	241	136 (56.4)	105 (43.6)	0.059
Beta-blocker	181	112 (61.9)	69 (38.1)	0.671
Diuretics	99	57 (57.6)	42 (42.4)	0.482
ARB	64	46 (71.9)	18 (28.1)	0.049
Alpha-blocker	9	6 (66.7)	3 (33.3)	0.709
Co-morbidities (n, %)				
Dyslipidaemia	349	216 (61.9)	133 (38.1)	0.376
Diabetes mellitus	184	104 (56.5)	80 (43.5)	0.146
Ischaemic heart disease	38	29 (76.3)	9 (23.7)	-0.04
Chronic kidney disease	31	16 (51.6)	15 (48.4)	0.287
Stroke	7	5 (71.4)	2 (28.6)	0.557
Home blood pressure monitoring (n, %)	163	99 (60.7)	64 (39.3)	0.979
Complementary alternative medication (n, %)	53	25 (47.2)	28 (52.8)	0.033
Satisfaction with clinic service, very poor to fair (n, %)	60 (12.3)	32 (53.3)	28 (46.7)	0.302
good to very good (n, %)	428 (87.7)	264 (61.7)	164 (38.3)	

SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; SD, standard deviation; IQR, interquartile range. Analysis was performed using the Mann–Whitney test, independent t-test or chi-square test. Complementary alternative medication was defined as the consumption of herbal and dietary supplements to control hypertension.

Table 3 shows the determinants of medication non-adherence in the MLR. The patients with tertiary educational level were more likely to be non-adherent than those without formal education (odds ratio [OR]=4.21, 95% CI=1.67–10.61, P=0.010). The patients who consumed CAM were more likely to be non-adherent (OR=2.03, 95% CI=1.12–3.69, P=0.020) than those who did not. Non-usage of calcium channel blockers (OR=1.57, 95% CI=1.02–2.41, P=0.039) and 1 mmHg increase in the systolic blood pressure were associated with higher odds of medication non-adherence (OR=1.03, 95% CI=1.00–1.05, P=0.006).

There was no significant association found between medication non-adherence and age, employment status, diastolic blood pressure, duration of hypertension, presence of diabetes mellitus, presence of ischaemic heart disease and usage of angiotensin-converting enzyme inhibitors or ARBs.

Table 3. Determinants of non-adherence towards antihypertensive agents among patients with uncontrolled blood pressure in the multivariate logistic regression (n=488).

Variables	Odds ratio	95% CI		P-value
		Lower	Upper	
Age	0.973	0.955	0.99	0.003
Education				0.01
Primary school	3.095	1.472	6.505	0.003
Secondary school	2.52	1.206	5.266	0.014
College/university	4.213	1.672	10.614	0.002
No formal education	1			
Employment				0.539
Employed/own business (1)	1.295	0.689	2.435	0.421
Unemployed	1.422	0.765	2.646	0.266
Retired/pensioner	1			
Mean SBP	1.026	1.007	1.045	0.006
Mean DBP	1.006	0.983	1.029	0.624
Duration of hypertension	0.997	0.968	1.027	0.866
Use of ACEI, yes	1.022	0.658	1.586	0.924
no	1			
Use of calcium channel blocker, no	1.571	1.024	2.409	0.039
yes	1			
Use of ARB, no	1.593	0.863	2.94	0.137
yes	1			
Presence of diabetes mellitus, yes	1.378	0.924	2.054	0.116
no	1			
Presence of ischaemic heart disease, no	2.236	0.992	5.038	0.052
yes	1			
Use of complementary alternative medication, yes	2.029	1.115	3.69	0.02
no	1			
Clinic satisfaction, very poor to fair	1.152	0.64	2.073	0.637
good to very good	1			

SBP, systolic blood pressure; DBP, diastolic blood pressure; ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; CI, confidence interval; Exp (B), exponentiation of the B coefficient. Complementary alternative medication was defined as the consumption of herbal and dietary supplements to control hypertension. *P<0.05

Discussion

Herein, the prevalence of medication non-adherence was 39.3%. Surprisingly, this prevalence is low compared with previous reports. In a previous meta-analysis, a higher prevalence of non-adherence towards medications of 83.7% (95% CI=59.9–117.0) was noted in patients with uncontrolled hypertension.[20] A high prevalence was also found in Portugal, whereby 51.8% were non-adherent to antihypertensive medications, and 67% had uncontrolled hypertension.[21] Such differences between studies could be attributed to the differences in the settings and locations used.[21]

One-third of our study population was Chinese, and all of them adhered to the antihypertensive medications. We share similar results with Ramli et al., as their Chinese populations were also shown to have better adherence to antihypertensive medications.[16] Thus, the prevalence in our study is lower. Three major factors affect uncontrolled hypertension: patient-, clinician- and healthcare system-related factors.[11,12] In this study, medication non-adherence is mainly referred to patient-related factors.[11,12]

Nonetheless, clinician-related factors might have also affected the number of patients with uncontrolled hypertension in our study. This is supported by a local study in Negeri Sembilan, which found no relationship between adherence level and blood pressure control.[22] The clinician's failure to initiate or intensify therapy might have affected the results.[11,12,22] This could also explain the lower non-adherence prevalence in our study. Further, only patients who visited the clinic for medication review and follow-up were recruited in this study.

Patients who defaulted on their follow-ups are likely to be non-compliant with medications and treatment advice.[23] As defaulters were not included in our study, such selection bias might reduce the prevalence of non-adherence medication in patients with uncontrolled hypertension. According to the National Health and Morbidity Survey in 2019, 3 of 10 people in Malaysia have hypertension, and 50% remain undiagnosed. Approximately 90% of patients diagnosed with hypertension are on medication. However, only 45% have their blood pressure under control at <140/90 mmHg.[2]

Our study showed that patients with higher formal educational levels were more likely to be non-adherent with antihypertensive medications than those who did not receive any formal education. This finding is consistent with other studies.[6,24] Boima et al. reported that patients who had received any form of education were more likely to show medication non-adherence than those who had not.[24] Similarly, a Ghanaian study showed a significant negative association between educational status and medication.[6] This may be explained by the fact that educated patients are more sceptical towards using antihypertensive medications.[6,24]

Herein, most patients on traditional CAM were not compliant with antihypertensive medications. Tan et al. showed similar findings that patients with hypertension who consumed CAM were less compliant than those who did not.[25] Two other studies demonstrated similar findings. Both showed that those who took traditional medications were non-adherent to their antihypertensive medication regimen.[26,27] The possible reasons were the belief that traditional medications must not be taken together with prescribed antihypertensives and lack of awareness about the danger of uncontrolled hypertension.[25] The concern about western drug side effects and the belief that traditional CAM has fewer negative side effects may also contribute towards the higher level of non-adherence to antihypertensives among CAM users.[27] This study also showed that higher systolic blood pressures were associated with non-adherence to antihypertensive medications. This is supported by the findings of Ramli et al., in which a poor adherence rate was found to negatively affect blood pressure control.[12] Similarly, patients who were not adherent to antihypertensive agents were not put on calcium channel blockers. Calcium channel blockers have been reported to be effective, safe and well tolerated in lowering blood pressure.[28]

Strengths and limitations

The strength of this study was that it provides a better understanding of medication non-adherence among rural communities and primary care clinics in Sarawak, as data on this population are limited. However, the limitation of the study was its design. As this was a cross-sectional study, only an association and not a causation could be inferred. There was also selection bias whereby defaulters were not recruited in this study, as they were found to be non-adherent. In addition, the blood pressure readings taken during the sampling day might not represent the usual or actual blood pressure of the participants; their blood pressure could be higher owing to insufficient rest, anxiety or concurrent infections.

Conclusion

Medication non-adherence is present in nearly 40% of patients with uncontrolled blood pressure in Sarawak. Higher educational level, CAM usage and higher systolic blood pressure were associated with an increased risk of medication non-adherence. Hence, primary care physicians should be more vigilant in identifying patients at risk of non-adherence for further intervention of uncontrolled blood pressure.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical Approval

This study was registered with the National Medical Research Registry (NMRR-19-763-46336) and approved by the Medical Research and Ethics Committee (MREC).

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How does this paper make a difference in general practice?

- Use of CAM in controlling blood pressure was found to be the main culprit of uncontrolled blood pressure. This could be due to the widespread popularity of CAM and the effect that has been overclaimed, to the extent it is believed it could totally replace the pharmacological regime for treating hypertension.
- Those received higher education are associated with non-adherence to pharmacological treatment. The reasons behind the finding are unknown and has to be studied in future study. Based on our experience, it could be because they are fully aware of their health condition, and had tried conventional pharmacological treatment however the results were not that good therefore they may seek other alternative therapies to replace the pharmacological regimes.

References

1. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C et al. Evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8) *JAMA*. 2014; 311(5): 507-520. doi:10.1001/jama.2013.284427

2. Non-Communicable Disease, Healthcare Demand, and Health Literacy. National Health and Morbidity Survey 2019.

3. Soo MJ, Chow ZY, Ching SM, Tan CH, Lee KW et al. Prevalence, awareness and control of hypertension in Malaysia from 1980-2018: A systematic review and meta-analysis. *World J Meta-Anal*. 2020; 8(4): 320-344. doi: 10.13105/wjma.v8.i4.320

4. Chin CY, VLKCS M. Antihypertensive prescribing pattern and blood pressure control among hypertensive patients over a ten year period in a primary care setting in Malaysia. *Int J Life Sci Res*. 2013; 10(1): 2031-2035. doi: 10.1177/1010539513480232

5. Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. *J hypertens*. 2004; 22(1): 11-19. doi: 10.1097/00004872200401000-00003

6. Harries TH, Abosi V, Rhule J, Cappuccio FP. Hypertension management in Kumasi: barriers and prejudice? *J human hypertens*. 2005; 19(12): 975-977. doi.org/10.1038/sj.jhh.1001920

7. Venketasubramanian N, Yoon BW, Pandian J, Navarro JC. Stroke epidemiology in south, east, and south-east Asia: a review. *J stroke*. 2017; 19(3):286-294. doi: 10.5853/jos.2017.00234

8. Gu Q, Dillon CF, Burt VL, Gillum RF. Association of hypertension treatment and control with all-cause and cardiovascular disease mortality among US adults with hypertension. *Am J Hypertens*. 2010; 23(1): 38-45. doi:10.1038/ajh.2009.191

9. Clinical Practice Guidelines: Management of Hypertension 5th Edition Putrajaya. Ministry of Health Malaysia 2018.

10. Ogedegbe G. Barriers to optimal hypertension control. *J Clin Hypertens*. 2008; 10(8): 644646. doi: 10.1111/j.1751-7176.2008.08329.x

11. Rizzo JA, Simons WR. Variations in compliance among hypertensive patients by drug class: implications for health care costs. *Clin Ther*. 1997; 19(6): 1446-1457. doi: org/10.1016/S0149-2918(97)80018-5

12. Osterberg L, Blaschke T. Adherence to medication. *NEJM*. 2005; 353(5): 487-497. doi: 10.1056/nejm200511033531819

13. Nayeri ND, Dehghan M, Iranmanesh S. Being as an iceberg: hypertensive treatment adherence experiences in southeast of Iran. *Glob Health Action*. 2015; 8(1): 28814. doi: 10.3402/gha.v8.28814

14. Khanam MA, Lindeboom W, Koehlmoos TL, Alam DS, Niessen L et al. Hypertension: adherence to treatment in rural Bangladesh–findings from a population-based study. *Glob Health Action*. 2014; 7(1): 25028. doi: 10.3402/gha.v7.25028

15. Weng WL, Hui GL, Ahmad KB. Evaluation of Medication Adherence in Elderly Patients Taking Anti-hypertensive Medications. *Sarawak Journal of Pharm*. 2017; 19-32. doi: 10.1161/HYP.0000000000000084.

16. Ramli AA, Ahmad NS, Paraidathathu T. Medication Adherence among Hypertensive Patients of Primary Health Clinics in Malaysia. *Patient Prefer Adherence*. 2012; 6: 613–622. doi: 10.2147/PPA.S34704

17. Abbas H, Kurdi M, de Vries F, van Onzenoort HA, Driessen JH, et al. Factors associated with antihypertensive medication Non-Adherence: a cross-sectional study among Lebanese hypertensive adults. *Patient Prefer Adherence*.2020; 14: 663–673. doi: 10.2147/PPA.S238751.

18. Rampal L, Rampal S, Azhar MZ, Rahman AR. Prevalence, awareness, treatment and control of hypertension in Malaysia: a national study of 16,440 subjects. *Public health*. 2008; 122(1): 11-18 doi.org/10.1016/j.puhe.2007.05.008.

19. Report on Household Expenditure Survey DOSM, Department of Statistics, Malaysia 2016. doi:10.3390/economies8040083

20. Abegaz TM, Shehab A, Gebreyohannes EA, Bhagavathula AS, Elnour AA. Nonadherence to antihypertensive drugs: a systematic review and meta-analysis. *Medicine* 2017; 96(4). e5641. doi: 10.1097/MD.0000000000005641

21. Macedo AF, Morgado M, Castelo-Branco M, Rolo S, Pereira L. Predictors of uncontrolled hypertension and antihypertensive medication non adherence. *J Cardiovasc Dis Res*. 2010; 1(4): 196-202. doi.org/10.4103/0975-3583.74263

22. Chan CW, Wang J, Bouniu JJ, Singh P, Teng CL. Discordance between medication adherence and blood pressure control in primary care clinics in Negeri Sembilan, Malaysia: the problem of therapeutic inertia. *Int J Med Educ*. 2015; 9(3): 27-32. doi: 10.2147/PPA.S34704

23. Osamor PE, Owumi BE. Factors associated with treatment compliance in hypertension in southwest Nigeria. *J Health Popul Nutr*. 2011; 29(6): 619-628. doi: 10.3329/jhpn.v29i6.9899

24. Boima V, Ademola AD, Odusola AO, Agyekum F, Nwafor CE, et al. Factors associated with medication nonadherence among hypertensives in Ghana and Nigeria. *Int J Hypertens*. 2015. doi.org/10.1155/2015/205716

25. Yew TS, Salleh H, Mohd WM, Sundram ER, Hassan NB. Factors associated with medication adherence among patients with hypertension in USM Hospital. *Int J Public Health*. 2017; (6): 132-140. doi: 10.1177/0193945916651824

26. Boratas S, Kilic HF. Evaluation of medication adherence in hypertensive patients and influential factors. *Pak J Med Sci*. 2018; 34(4): 959. doi: 10.12669/pjms.344.14994

27. Li X, Peng M, Li Y, Kang Z, Hao Y, et al. Chinese herbal therapy and western drug use, belief and adherence for hypertension management in the rural areas of Heilongjiang province, China. *PloS one*. 2015; 10(4): e0123508. doi: 10.1371/journal.pone.0123508.

28. Tocci G, Desideri G, Roca E, et al. How to Improve Effectiveness and Adherence to Antihypertensive Drug Therapy: Central Role of Dihydropyridinic Calcium Channel Blockers in Hypertension. *High Blood Press Cardiovasc Prev*. Mar 2018;25(1):25-34. doi:10.1007/s40292-017-0242-z.

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ORIGINAL ARTICLE

Retrospective review of the prevalence and risk factors of anaemia among antenatal mothers attending health clinics in Alor Gajah, Melaka

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Abstract

Introduction: Anaemia is common during pregnancy and can lead to miscarriage, intrauterine growth retardation, premature labour and antepartum haemorrhage. Anaemia in pregnancy is defined as a haemoglobin (Hb) level of <11 g/dL.

Methods: This retrospective review included 407 antenatal mothers diagnosed with anaemia at 36±1 weeks of gestation at all 10 health clinics in Alor Gajah between January and December 2018.

Results: According to the district annual returns, 2,407 antenatal mothers (36 weeks of gestation) were registered in the health clinics in Alor Gajah in 2018. Among them, the prevalence of anaemia was 18.6% (n=448). However, there were only 407 cards found. Most participants were Malays (89.4%), aged 20–40 years (93.6%) and married (96.3%). Almost all anaemia cases (96.5%) were mild (Hb level of 9–10.9 g/dL). Approximately 34.4% of the mothers were already anaemic at booking; 77.6% belonged to the B40 income group; and 31.6% had poor pregnancy spacing of <2 years. Iron deficiency anaemia was the most common type of anaemia (51.0%), followed by dilutional anaemia (34.0%), which did not normalise at 36 weeks of gestation. Anaemia was associated with lower educational ($P<0.05$) and Hb levels at booking ($P<0.001$).

Conclusion: Having normal maternal Hb levels in early pregnancy especially at booking is crucial, as it may reduce the possibility of anaemia during pregnancy. Early screening and supplementation of at-risk pregnancies may be applied as a preventive strategy. Suitable methods of iron treatment and investigation need further exploration.

Introduction

Anaemia in pregnancy remains a public health threat with major health consequences in Malaysia. Earlier research has shown that severe anaemia increases perinatal mortality and morbidity as a result of preterm delivery and intrauterine growth retardation.[1,2] Approximately 38% (32 million) and 48% of pregnant women are anaemic globally and in South East Asia, respectively.[3] A local study in Kelantan revealed that 34.6% of pregnant women had anaemia, which is comparable with the global prevalence.[4]

The aetiology of anaemia in pregnancy is multifactorial, and in developing countries such as Malaysia, the most common nutrition-related cause of anaemia is iron deficiency.[5,6] An earlier review showed that up to 50–80% of women in their reproductive age had anaemia secondary to iron deficiency.[7] Other causes of maternal anaemia include other micronutrient deficiencies, haemoglobinopathies, parasitic infections and chronic infections.[8,9]

Despite the relatively high documented prevalence of anaemia among antenatal mothers, related data in the local setting remain sparsely available. This study aimed to determine the prevalence of anaemia among antenatal mothers attending health clinics in Alor Gajah, Melaka, and identify the associated risk factors and predictors. The findings are expected to help improve antenatal care in our area.

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Objective

The general objective of the study was to evaluate the prevalence and associated factors of anaemia during pregnancy in Alor Gajah. The specific objectives were to identify the sociodemographic characteristics, possible risk factors of anaemia and possible causes of anaemia among antenatal mothers.

Methods

Study setting and design

A retrospective chart review was conducted among all antenatal mothers registered in all 10 health clinics in Alor Gajah in 2018.

Study population

Antenatal mothers with a haemoglobin (Hb) level of <11.0 g/dL at 36±1 weeks of gestation from 1 January 2018 to 31 December 2018 were included in the study.

Study criteria

Pregnant mothers who reached 36/52 weeks of gestation (35–38/52 weeks of gestation) at any date in 2018 and were registered in our health clinics were included. Antenatal mothers who attended our clinics for check-up but did not register under our care and antenatal mothers who did not attend our clinics for check-up at 35–38/52 weeks of gestation owing to various reasons were excluded.

Study instrument

A set of checklist was designed for this study. This checklist consisted of sociodemographic data, pregnancy-related and obstetric risk factors of anaemia, history of chronic diseases and infections that could cause anaemia, history of iron deficiency anaemia (IDA), psychiatric disorders, substance abuse and smoking status.

Data analysis

Data were analysed using the Statistical Package for the Social Sciences version 23.0.

Laboratory investigation

The following laboratory parameters were evaluated: Hb level at booking and 36 weeks of gestation; full blood count (FBC) at booking and 36 weeks of gestation; FBP level; BFMP; serum iron level/TIBC; outcomes of ova and cyst in the stool; presence of occult blood in the stool and DNA.

Results

Prevalence of anaemia

According to the district annual returns, there were 2,407 antenatal mothers registered in the health clinics in Alor Gajah in 2018. Of them, 448 were identified to have anaemia at 36 weeks gestation, yielding a prevalence of 18.6%. However, only 407 cards were found (90.8%) as in **Table 1**.

Sociodemographic data

The age of the 407 participants varied from <20 to ≥40 years. Anaemia was more common in the age groups of 20–30 and 30–40 years than in the other age groups. Most women were Malays, were married, completed at least secondary school and were working with a monthly household income ranging from RM 2,113.04 to RM 3,381.35.

There was a significant difference (P<0.05) in the Hb level at 36 weeks of gestation across the different educational level groups. The mean group rank suggested that the participants with a higher educational level had a higher Hb level than those with a lower educational level. Meanwhile, there was no significant difference in the Hb level at 36 weeks of gestation across the different income groups.

Table1. Sociodemographic background of the participants.

Variable	Mean±SD/n (%)
Household income	RM 3,381.35±2,113.04
Age; n=407	
<20 years	13 (3.2)
20–30 years	187 (45.9)
30–40 years	194 (47.7)
≥40 years	13 (3.2)
Ethnicity; n=407	
Malay	364 (89.4)
Chinese	12 (2.9)
Indian	23 (5.7)
Others	8 (2.0)

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Table1. Continued

Variable	Mean±SD/n (%)
Occupation; n=407	
Employed	219 (53.8)
Unemployed/housewife	188 (46.2)
Household income; n=370	
B40	287 (77.6)
M40	82 (22.1)
T20	1 (0.3)
Educational level; n=392	
None	1 (0.3)
Primary school	15 (3.8)
Secondary school	220 (56.1)
College/university	156 (39.8)
Marital status; n=404	
Married	389 (96.3)
Unmarried	15 (3.7)

*SD: Standard deviation

Risk factors

Table 2 shows various pregnancy-related parameters. Among the known risk factors for anaemia in pregnancy, 31.6% of the pregnant mothers had their last child birth <2 years ago, and only 65.6% showed a normal Hb level at booking. At 36 weeks of gestation, up to 96.5% had mild anaemia at an Hb level between 9 and 11 g/dL.

There was a significant difference (P<0.001) in the Hb level at 36 weeks of gestation across the different Hb level groups at booking. The mean group rank suggested that the participants with a higher Hb level at booking had a higher Hb level at 36 weeks of gestation.

Meanwhile, there was no significant difference (P>0.05) in the Hb level at 36 weeks of gestation across the different categories of age, income and child spacing. The relationship between the Hb levels at 36 weeks of gestation and booking was investigated using Spearman's rank order correlation (rho). A weak positive correlation was found between the two variables (r=0.26, n=391, P<0.001), with a high Hb level at 36 weeks of gestation associated with a high Hb level at booking. However, the Hb level at 36 weeks of gestation was not associated with age, income and number of gravida.

Table 2. Anaemia and pregnancy-related parameters.

Variable	Mean±SD/n (%)
Gravida	2.9±1.7
Hb level at booking	11.4±1.3
WBC at booking	9.1±2.2
RDWSD at booking	11.0±6.8
RDWCV at booking	45.2±5.6
MCH at booking	26.9±4.1
MCV at booking	81.1±12.7
MCHC at booking	32.3±2.2
Hb level at 36±1 weeks of gestation	10.2±0.6
WBC at 36±1 weeks of gestation	9.7±2.2
RDWSD at 36±1 weeks of gestation	12.2±6.4
RDWCV at 36±1 weeks of gestation	47.2±9.8
MCH at 36±1 weeks of gestation	26.3±4.5
MCV at 36±1 weeks of gestation	80.8±12.5

Table2. Continued

Variable	Mean±SD/n (%)
MCHC at 36±1 weeks of gestation	31.1±2.8
Serum iron level	14.2±12.9
Serum TIBC	73.1±14.8
Tagging colour code; n=407	
Green	330 (81.1)
Yellow	71 (17.4)
Red	6 (1.5)
Booking time; n=368	
≤12 weeks	269 (73.1)
>12 weeks	99 (26.9)
Last child birth status; n=407	
<2 years	129 (31.6)
2–5 years	196 (48.1)
>5 years	30 (7.3)
Primid	52 (12.7)
Thalassemia trait; n=407	
Yes	39 (9.6)
No	368 (90.4)
Hb level at booking; n=393	
<7 g/dL	1 (0.3)
7–9 g/dL	19 (4.8)
9–11 g/dL	115 (29.3)
≥11 g/dL	258 (65.6)
Hb level at 36±1 weeks of gestation; n=399	
<7 g/dL	1 (0.3)
7–9 g/dL	13 (3.3)
9–11 g/dL	385 (96.5)
Stool occult blood; n=7	
Positive	1 (14.3)
Negative	6 (85.7)
Stool ova and cyst; n=22	
Normal	21 (95.5)
Abnormal	1 (4.5)
BFMP; n=38	
Positive	0 (0.0)
Negative	38 (100)

Possible causes

Of the 407 pregnant mothers, only 100 (24.6%) were investigated with peripheral blood films. There were 51% with IDA, 34% with dilutional anaemia due to pregnancy, 6% with thalassemia trait and 3% with South East Asian ovalocytosis. The diagnoses are shown in **Table 3**.

Table 3. Diagnosis.

Variable	Mean±SD/n (%)
Peripheral blood film	
Performed	100 (24.6)
Not performed	307 (75.4)
Peripheral blood film diagnosis; n=100	
Dilutional effect of pregnancy	34 (34.0)
Iron deficiency anaemia	51 (51.0)
South East Asian ovalocytosis	3 (3.0)
Thalassemia trait	6 (6.0)
Others	6 (6.0)

Discussion

Sociodemographic data related to anaemia

This study determined the prevalence of anaemia and its association with various sociodemographic and maternal risk factors among the antenatal mothers in Alor Gajah. It also identified the causes of anaemia among the antenatal mothers to implement early and appropriate anaemia intervention.

The prevalence of anaemia was 18.6% (n=448) among the 2,407 antenatal mothers registered in the health clinics in Alor Gajah in 2018. The level projected was substantially low compared with the national prevalence of anaemia of 35%.[10] In comparison, a cross-sectional study in Singapore showed a prevalence of anaemia of 15.3% at the time of delivery.[11] Approximately 89.4% (n=364) of the antenatal mothers with anaemia in Alor Gajah were Malays, while 5.7% (n=23) were Indians. This could be attributed to the racial distribution in Alor Gajah, which is dominated by Malays. The finding is supported by the reports of Soh et al. and Hanif et al. in Selangor, demonstrating that the prevalence of anaemia was higher among Malays and Indians.[10,12]

Approximately 93.6% (n=381) of the antenatal mothers who had anaemia were aged between 20 and 40 years, which falls under the reproductive age group. According to a survey conducted by the WHO in 2011, around 30% of women of reproductive age in Malaysia (corresponding to approximately 2 million women) had anaemia.[3] In contrast, Soh et al. revealed no significant relationship between age and a low Hb level among pregnant mothers in Malaysia.[12]

The majority of our participants had secondary education (56.1%, n=220); only 39.8% (n=156) completed tertiary education. This explicitly shows that antenatal mothers with a higher educational level have higher awareness about the danger of anaemia to their pregnancy than those with a lower educational level; hence, the proportion of affected mothers with a high educational level was small. Soh et al. also reported a similar outcome.[12]

Up to 53.8% (n=219) of our participants were employed compared with 46.2% (n=188) who were housewives. This contradicts an earlier report that working mothers had relatively higher Hb levels, which could be attributed to their higher household income that facilitated better nutrition.[1] Following this, another study could be conducted to determine the contributing factors of anaemia among working mothers in Alor Gajah.

This study also revealed that the mothers with anaemia had a relatively lower family income. The majority of them had a household income between RM 2,000 and RM 4,000. This is again supported by the report of Soh et al., demonstrating the same association between a low Hb level and low family income.[12] Mothers from lower-income families are then postulated to have less access to better nutrition and supplementation throughout their pregnancy. Another study further supports the finding that a higher family income was significantly associated with a higher Hb level.[13]

Pregnancy-related factors associated with anaemia

This study demonstrated that the mean Hb level of the antenatal mothers at booking was 11.4 g/dL. Anaemia was documented towards the late trimester at a mean Hb level of 10.2 g/dL at 36 weeks of gestation. Haniff et al. showed a similar trend in the Hb level as pregnancy progressed.[10] These findings may well be explained by the physiological expansion of the maternal plasma volume, causing a drop in the Hb level as the gestational age increases.

Most antenatal mothers in this study had their booking at <12 weeks of gestation. Accordingly, the incidence of anaemia remained significant. This could be a result of poor compliance with oral supplementation or inadequate intervention by healthcare providers. An earlier study showed that the rate of compliance with supplementation among antenatal mothers in Malaysia was only 49% as opposed to 80% in a Danish population.[7,14] The higher rate of compliance among the Danish was attributed to the educational programme of healthcare personnel initiated by their Board of Health.[8]

Other factors contributing to maternal anaemia include parity and spacing between pregnancies. Most patients with anaemia in this study had more than two children and had their last child birth >2 years ago. An African study showed that parous women were more likely to have anaemia than nulliparous women.[15] The presence of anaemia also increased with gravidity; multigravida women were more likely to be anaemic than primigravida women.

Only a few antenatal mothers were investigated for stool occult blood, stool study for helminths and malaria studies. The numbers of investigated samples were 7, 22 and 38, respectively. Of the samples, one was positive for occult blood and stool study for helminths, while two were positive for malaria infection. Although there were few mothers who had positive results, parasitic infections such as helminths during pregnancy have been reported to be associated with an increased risk of maternal anaemia.[16]

Diagnosis

Of the 407 antenatal mothers reviewed herein, only 100 had their peripheral blood film sent for investigation. This could be attributed to the lack of awareness among medical officers regarding proper investigation of anaemia in antenatal mothers. Another possible contributing factor could be the perception that iron deficiency is commonly seen as the likely diagnosis, and treatment with iron is often successful without further investigation.

Approximately 51% of our participants were diagnosed with IDA. A study by the University Malaya Medical Centre, Kuala Lumpur, also reported a prevalence of anaemia of 42.5% among their antenatal mothers.[17] Approximately 65.3% of anaemia cases were classified as IDA with a serum ferritin level of <12 μg/L. In a retrospective study of women from 102 health clinics in Kelantan, the prevalence of anaemia and iron deficiency at booking was as high as 47.5%.[18] These previous studies showed that both urban and rural areas in Malaysia had a high prevalence of IDA in pregnancy. In addition to the marked increase in the demand of iron, the dilutional effect of pregnancy is also commonly seen in the second trimester when the increment of plasma volume is disproportionate to the production of the red blood corpuscle. This study revealed that up to 34% of antenatal mothers had anaemia due to haemodilution as a result of its physiological adaptation. An earlier study in Nigeria showing that the prevalence of anaemia at booking increases from 26.5% during the first trimester to 56% during the third trimester supports this finding.[19] Similarly, the study attributed the increased prevalence of mild anaemia to the physiologic haemodilution during pregnancy.

The present study has its limitations, including the incomplete anaemia investigation among the entire studied population. This might have underestimated the possible aetiology of anaemia among the antenatal mothers. In view of the involvement of different clinics, the use of non-standardised machines could also lead to discrepancies in the results. This limitation could be eliminated if the study is performed prospectively in a controlled environment or setting using a standardised machine.

In conclusion, anaemia in pregnancy remains a major concern in Alor Gajah, Melaka. Effort should be geared to early detection of anaemia and prompt treatment prior to delivery to improve the provision of care among antenatal mothers. Medical officers should investigate antenatal mothers timely to identify the aetiology of anaemia apart from initiating routine iron supplementation. Advocacy towards compliance with supplementation and related dietary education should also be included as part of the management plan. The involvement of family members in the routine discussion may offer a better outcome, as mothers would be well supported. These collective efforts could ultimately result in a better management of antenatal mothers and prevent anaemia in future pregnancies.

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Author contributions

All authors contributed in data collection. Nurses mainly contributed in data collection and others contributed on technical input in this writing.

Ethical approval

Permission to conduct this study was obtained from Pejabat Kesihatan Daerah Alor Gajah.

Conflicts of interest

The authors declare no conflicts of interest.

Funding

This study was not funded.

Data sharing statement

Data are uploaded in publicly available databases.

How does this paper make a difference in general practice?

- This study focused on the associated factors of anaemia among antenatal mothers in Alor Gajah. The findings may help improve the management of antenatal mothers not only in Alor Gajah but also in other places.

References

1. Lone FW, Qureshi RN, Emanuel F. Maternal anaemia and its impact on perinatal outcome. *Trop Med Int Health*. 2004;9(4):486-490. doi:10.1111/j.1365-3156.2004.01222.x

2. Lone FW, Qureshi RN, Emmanuel F. Maternal anaemia and its impact on perinatal outcome in a tertiary care hospital in Pakistan. *East Mediterr Health J*. 2004;10(6):801-807.

3. WHO (2011). The global prevalence of anaemia in 2011. Geneva: World Health Organization; 2015.

4. Hassan R, Abdullah WZ, Nik Hussain NH. Anemia and iron status of Malay women attending an antenatal clinic in Kubang Kerian, Kelantan, Malaysia. Southeast Asian *J Trop Med Public Health*. 2005;36(5):1304-1307.

5. Olatunbosun OA, Abasiattai AM, Bassey EA, James RS, Ibanga G, Morgan A. Prevalence of anaemia among pregnant women at booking in the University of Uyo Teaching Hospital, Uyo, Nigeria. *Biomed Res Int*. 2014;2014:849080. doi:10.1155/2014/849080

6. WHO and UNICEF. (2004). Focusing on Anaemia: Towards an Integrated Approach for Effective Anaemia Control, WHO, Geneva, Switzerland.

7. Milman N. Iron Deficiency and Anaemia in Pregnant Women in Malaysia – Still a Significant and Challenging Health Problem. *J Preg Child Health*. 2015; 2:168. doi: 10.4172/2376-127X.1000168

8. Tolentino K, Friedman JF. An update on anemia in less developed countries. *Am J Trop Med Hyg*. 2007;77(1):44-51.

9. Ouédraogo S, Koura GK, Accrombessi MM, Bodeau-Livinec F, Massougbodji A, Cot M. Maternal anemia at first antenatal visit: prevalence and risk factors in a malaria-endemic area in Benin. *Am J Trop Med Hyg*. 2012;87(3):418-424. doi:10.4269/ajtmh.2012.11-0706

10. Haniff J, Das A, Onn LT, et al. Anemia in pregnancy in Malaysia: a cross-sectional survey. *Asia Pac J Clin Nutr*. 2007;16(3):527-536.

11. Singh K, Fong YF, Arulkumaran S. Anaemia in pregnancy--a cross-sectional study in Singapore. *Eur J Clin Nutr*. 1998;52(1):65-70. doi:10.1038/sj.ejcn.1600517

12. Soh KL, Tohit ER, Japar S, Geok SK, Rahman NB, Raman RA. Anemia among antenatal mothers in urban Malaysia. *J Biosci Med*. 2014; 03: 6-11

13. Frith-Terhune AL, Cogswell ME, Khan LK, Will JC, Ramakrishnan U. Iron deficiency anemia: higher prevalence in Mexican American than in non-Hispanic white females in the third National Health and Nutrition Examination Survey, 1988-1994. *Am J Clin Nutr*. 2000;72(4):963-968. doi:10.1093/ajcn/72.4.963

14. Thirukkanesh S and Zahara AM. Compliance to vitamin and mineral supplementation among pregnant women in urban and rural areas in Malaysia. *Pac J Nutr*. 2010; 9: 744-750.

15. Uche-Nwachi EO, Odekunle A, Jacinto S, et al. Anaemia in pregnancy: associations with parity, abortions and child spacing in primary healthcare clinic attendees in Trinidad and Tobago. *Afr Health Sci*. 2010;10(1):66-70.

16. Mahande AM, Mahande MJ. Prevalence of parasitic infections and associations with pregnancy complications and outcomes in northern Tanzania: a registry-based cross-sectional study. *BMC Infect Dis*. 2016;16:78. Published 2016 Feb 13. doi:10.1186/s12879-016-1413-6

17. Thaneemali J, Jamiyah H. Incidence of anemia in pregnancy-University Malaya Medical Centre. *Mal J Obestet Gynaecol*. 2005; 8: 74-75

18. Ahmad Z Jr, Jaafar R, Mohd Hassan M, Othman M, Hashim A. Anaemia during pregnancy in rural Kelantan. *Malays J Nutr*. 1997;3(1):83-90.

19. Dim CC, Onah HE. The prevalence of anemia among pregnant women at booking in Enugu, South Eastern Nigeria. *MedGenMed*. 2007;9(3):11. Published 2007 Jul 11.

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CASE REPORT

Covid-19, not your normal flu: A case report on Covid-19 psychosis and mania in a Malaysian hospital

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Wong RPY, George P. Covid-19, not your normal flu: A case report on Covid-19 psychosis and mania in a Malaysian hospital. *Malays Fam Physician.* 2022;17(3):144–148. https://doi.org/10.51866/cr1369

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Abstract
Evidence suggests that acute severe coronavirus disease 2019 (COVID-19) may be associated with neuropsychiatric symptoms. This is a case report of a patient who had recently been infected with COVID-19 and had no history of psychiatric disorders presenting a few days after inpatient discharge from COVID-19 treatment with acute onset of psychosis and manic symptoms. This case illustrates the psychiatric presentation, possible causes, and management of post-COVID-19 psychosis.

Introduction
Coronavirus disease 2019 (COVID-19) is an acute respiratory infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] It was the isolated cause of a pneumonia outbreak in Hubei Province, China, in December 2019 and spread globally. To date, COVID-19 is responsible for over 162 million confirmed cases and 3.3 million deaths worldwide.[2,3] SARS-CoV-2 is part of the orthocoronavirus subfamily and is the seventh coronavirus known to infect humans.[4]

Multiple presentations of COVID-19 have been identified, from flu-like presentations to neurovascular symptoms and psychiatric manifestations.[5] We report on a case of post-COVID-19 psychosis and mania in a patient admitted to a local State Hospital in Malaysia.

Case Presentation
Mr. K, a 54-year-old married, employed man was admitted from January 6, 2021, to January 29, 2021, for COVID-19 infection presenting with intermittent dizziness, a 'floating feeling', dyspnoea, chest tightness, dry cough, anosmia, generalised headaches, and myalgia. He was confirmed positive for COVID-19 infection via reverse transcription-polymerase chain reaction (PCR) test and required assisted ventilation (nasal prongs, high-flow performance devices) and high-dose dexamethasone tablets.

Table 1. Summary of Mr. K's COVID-19 dexamethasone therapy.

Date range	Dexamethasone dose (mg)
6/1/2021-9/1/2021	16
9/1/2021-16/1/2021	24
17/1/2021-20/1/2021	20
21/1/2021-23/1/2021	16
24/1/2021-26/1/2021	12
27/1/2021-31/1/2021	8
1/2/2021-5/2/2021	4
6/2/2021-16/2/2021	8
17/2/2021-23/2/2021	4

His dexamethasone dose was tapered over the period of admission and was completed at home upon discharge. Mr. K was subsequently brought back to the hospital by his wife on March 2, 2021, with collateral history of gradual onset of abnormal manic-like, aggressive behaviour, such as throwing objects, disrupted sleep patterns over the previous 10 days, and psychosis for 3 days prior to admission.

Mr. K believed that God had sent him on a mission with the author of this case report and another friend to fight paranormal beings. He unrelentingly spoke on a series of topics including paranormal activities, spiritual strength, charities for blessings, and God. Other psychotic manifestations included persecutory delusions that ghosts and traditional healers wished to kill him and that spirits had been directing the hospital he attended for many years. He also claimed to see spirits in the hospital who took the

form of dying people. He had second person auditory hallucinations described as terrifying and scary and refused to elaborate on them. There were no fluctuations of consciousness, and Mr. K was attentive throughout the interview. There were no symptoms or signs to suggest pre-existing dementia or delirium.

He had no prior psychiatric history or family history. Mr. K had a past medical history of hypertension, dyslipidaemia, and gout, and was on T. Aspirin 100 mg OM, T. amlodipine 5 mg OD, T. telmisartan 80 mg OD, T. allopurinol 300 mg OD, T. gemfibrozil 300 mg BD, and other unspecified supplements.

His mental state examination revealed a well-groomed, verbose, middle-aged man. He was quick to establish rapport and displayed overfamiliarity. He was restless, easily distracted, and uncooperative at times. He exhibited pressure of speech, flight of ideas, clang associations, neologisms, and tangential and circumstantial speech. As examples of neologisms, he claimed to have businesses called 'project band' and 'kontelektor'. He laughed inappropriately; however, his mood was labile and congruent with his affect. He had no suicidal thoughts or plans. He had poor short-term memory, but his remote memory was intact. He was oriented to time, place, and person, with good judgement but poor insight. On physical examination, his lungs had reduced air entry bilaterally. ECG demonstrated T1 inversion in lead III. Lumbar puncture was normal and negative for viral meningitis. His chest radiograph showed left lower zone haziness, and a brain MRI with contrast showed bifrontal lobe lacunar infarcts. He was treated with an intravenous antibiotic, antiviral, oral sedative, and low-dose antipsychotics and made a good recovery.

Table 2. Patient's blood panel, including complete blood count, electrolytes, D-dimer, C-reactive protein, serum cortisol, and liver and renal function tests.
Legend: H: high; L: low

Parameters	2/3/21	5/3/21	8/3/21	Normal range
White blood cell, $\times 10^3$/uL	15.7 (H)	10.4 (H)	9.9	4.0–10.0
Haemoglobin, g/dL	11.1 (L)	10.6 (L)	10.4 (L)	13.0–17.1
Platelets, $\times 10^3$/uL	312	492	200	150–410
C-reactive protein, mg/L	158.3 (H)	39.7 (H)	10.1 (H)	<3.0
D-dimer, ug/mL		0.9 (H)		<0.5
Serum cortisol (morning), nmol/L		760.4		140–690
Sodium, mmol/L	141	136	139	135–152
Potassium, mmol/L	3.7	3.5	3.7	3.5–5.4
Urea, mmol/L	5.8	4.9	4.5	1.7–6.4
Creatinine, mmol/L	101	68	69	40–170
Calcium, mmol/L	2.42			2.00–2.50
Magnesium, mmol/L	0.98			0.10–3.40
Phosphorous, mmol/L	1.09			0.50–3.00
Total protein, g/L	75			57–82
Albumin, g/L	47			32–48
Globulin, g/L	28			25–44
Bilirubin, umol/L	12			5–21
A/G ratio	1.7			0.9–1.8
Alkaline phosphatase, IU/L	106			46–116
Alanine aminotransferase, U/L	22			10–49

A urine toxicology panel was not requested. The patient's leucocytosis suggested an infection or an underlying post-COVID-19 hyperinflammatory state, while his low haemoglobin was suspected to be due to his loss of appetite during COVID-19 infection. His D-dimer and C-reactive protein levels were elevated, which is not uncommon in patients infected with COVID-19, as these are nonspecific markers of inflammation. Depression and mania are common psychiatric symptoms seen in patients treated with corticosteroids. Therefore, morning serum cortisol was obtained and was elevated, which most likely suggested an iatrogenic cause of hypercortisolism as he had been prescribed high doses of steroids for his COVID-19 infection. His liver function tests, renal function tests, and electrolytes were not deranged. A chest radiograph taken on 3/3/21 revealed bilateral ground-glass opacities (GGOs), which suggested a

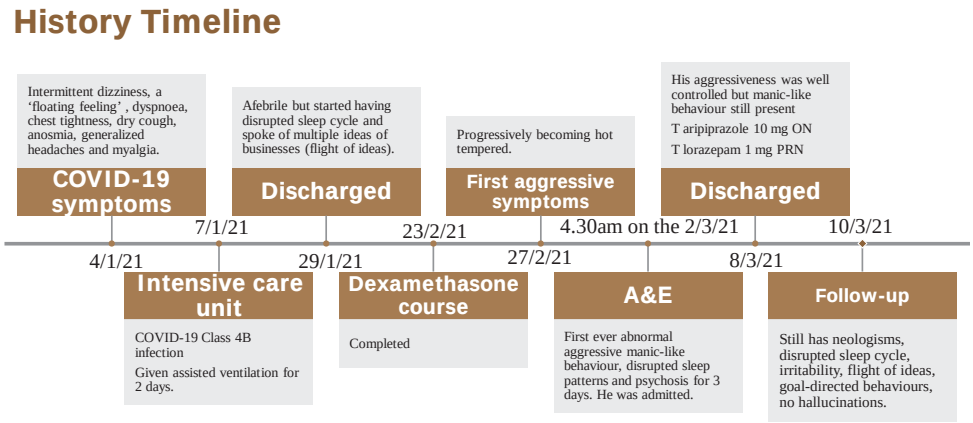
widespread inflammatory or infiltrative lung disorder secondary to COVID-19 infection and ventilator-induced lung injury despite adequate saturation on room air. A computed tomography pulmonary angiogram revealed no pulmonary embolism. These pulmonary changes and blood results represented emerging evidence of an overexuberant inflammatory response that is seen in patients with severe COVID-19 infection.

The patient was treated at the emergency department with IV midazolam 5 mg OD PRN for his aggression. He was then admitted as an inpatient under liaison psychiatry for continued care and given T lorazepam 1 mg stat, IM haloperidol 2.5 mg stat, T risperidone 0.5 mg ON for his psychosis and abnormal behaviour, IV ceftriaxone 2g OD, IV acyclovir 500 mg TDS for any underlying occult infection, and T Aspirin 150 mg OD and T allopurinol 300 mg OD to control his comorbidities throughout his admission. He improved gradually over the following 7 days, and the antipsychotic medications were tapered off. At discharge, Mr. K was no longer aggressive but continued to show residual manic-like behaviour and was prescribed T aripiprazole 10 mg ON and T lorazepam 1 mg PRN.

Table 3. Progression of the patient's behaviour in the ward.

Date	Observation
2/3/21	• No abnormal aggressive behaviour but manic-like behaviour present. • Slept well.
3/3/21	• The patient stood at window and recited the Quran. • He felt and appeared restless. • He tried to harm his wife. • Walked around ward with no intention. • IM haloperidol 2.5 mg was given, and the patient's behaviour settled.
4/3/21	• Patient went to the toilet with wife to bathe, but he took the hot water and attempted to pour it on himself. • After calming the patient, he was able to sleep.
5/3/21	No abnormal aggressive behaviour, but residual manic-like behaviour present.
6/3/21	No abnormal aggressive behaviour, but residual manic-like behaviour present.
7/3/21	No abnormal aggressive behaviour, but residual manic-like behaviour present.
8/3/21	No abnormal aggressive behaviour, but residual manic-like behaviour present.

Figure 1. Timeline from the patient's first COVID-19 symptoms to his first liaison psychiatry follow-up.



Discussion

The 2019 novel coronavirus, once thought to be a 'normal flu', proved to be more, with evidence of neurological, cognitive, and psychological effects, even in patients who did not develop severe lung, heart, or circulatory problems.[6]

Our patient was admitted for COVID-19 infection treatment and was well upon discharge but returned with acute onset of psychiatric symptoms, including mania, delusions, and hallucinations. All investigations suggested no medical cause, and delirium was excluded. He was started on antipsychotics at low doses and recovered rapidly.

In June 2020, Lancet Psychiatry released a study on neurological and psychiatric complications in 153 people who were hospitalised with COVID-19 in the U.K. It reported that 39 people had altered mental status, 10 of whom had new-onset psychosis.[7] Altered mental status is not uncommon in patients needing intensive care, but it predominates in the elderly, who often already have multiple medical comorbidities and polypharmacy. The authors observed a disproportionate number of neuropsychiatric signs in the young and cerebrovascular complications in the old. This might reflect the vulnerability of the central nervous system to COVID-19 infection or the increased accessibility of psychiatric aid to younger patients, whereas the elderly are often assumed to have delirium.[7] A publication in Neuroscience Letters that reviewed 42 cases of psychosis reported in COVID-19-infected patients suggested that patients could exhibit a range of neuropsychiatric symptoms. However, the underlying pathological mechanisms have not yet been fully established.[8]

Much of the literature remains conceptual and conclusions are extrapolated from small studies conducted in the current pandemic and studies from previous epidemic viral infections.[7] More research is needed to identify which pathogenic biomechanisms are driving neuropsychiatric associations. For now, this association is thought to be due to: 1) direct neuronal viral infection; 2) post-infectious neuronal autoimmunity; 3) vasculopathies, including those resulting from impaired coagulation; and 4) systemic (e.g., inflammatory) effects of a pervasive, severe pathogen and/or critical illness.[7,9] Since 2010, research has focussed on the influence of inflammation and immunity in the onset of schizophrenia; therefore, a renewing interest in the idea that viruses can cause 'insanity' or, more specifically, psychoses, is not unusual.[10] Meanwhile, a study on new-onset psychosis in people with COVID-19 in Spain reported that the time needed for an episode to develop, the length of the episode, and rapid recovery on low-dose antipsychotics helped to distinguish primary psychotic cases from secondary psychosis.[11]

Although steroids have been reported to trigger psychoses, the pathophysiology remains unclear. It is hypothesised that the synthetic steroids disrupt the cortisol pathway of the hypothalamic-pituitary-adrenal axis, resulting in mood disorders. Therefore, they create an imbalance between glucocorticoid and mineralocorticoid receptor stimulation, leading to cognitive impairment and emotional disturbances.[12]

A hypothesised pathophysiology of COVID-19 precipitating a manic episode is the hyperinflammatory cascade activating the kynurenine pathway and neurotropism, which causes a range of psychiatric presentations, including psychosis, bipolar disorder, depression, and suicide.[13,14] A recent study discovered that inflammatory changes coincide with acute episodes of mania in patients with bipolar disorder.[15]

A lacunar infarct occurs due to an occlusion of a single penetrating artery and is responsible for one-quarter of cerebral infarctions. Interestingly, silent lacunar infarcts are more common because of their small size; they are often asymptomatic and only discovered on imaging as incidental findings. Depending on the area of brain involvement and the number of lacunar infarctions, they can lead to significant disabilities. However, cortical findings, such as behavioural changes, are absent as the infarction occurs only in subcortical areas of the brain.[16,17] Therefore, in our patient's case, his lacunar infarct may not have significantly contributed to his abnormal behaviour as this type of infarct is not associated with psychotic and manic-like symptoms. Moreover, his condition settled more rapidly than post-stroke psychosis, which would likely have had a longer duration of manifestation.

Conclusion

COVID-19 has a significant impact on patients who are infected, even after physical recovery. As evidenced in other viral infections, COVID-19 can trigger psychiatric conditions, including psychoses and mania. Follow-up of patients in recovery after COVID-19 infection should include screening for psychiatric sequelae and appropriate investigations to rule out other causes, such as delirium. Early identification and treatment of this condition are likely to produce more favourable outcomes.

Conflicts of interest

The authors report no conflicts of interest.

Patients' consent for the use of images and content for publication

Informed consent obtained and given via verbal means from patient for this case report.

What is new in this case report compared to the previous literature?

- It reports mania-like symptoms present in post-COVID-19 psychosis.
- It highlights that this condition is something to be aware of, especially in the immediate recovery phase.
- It highlights COVID-19 pathophysiology in mania and psychosis.
- The patient had no prior mental disorder or evidence of delirium.
- Is there a certain undiscovered viral strain or a predisposition for COVID-19 psychosis?

What is the implication to patients?

- Increasing awareness among medical staff that post-COVID-19 psychosis can present with mania.
- Raising awareness that serious post-COVID-19 psychiatric morbidity can occur in previously mentally healthy individuals.
- It describes how to manage post-COVID-19 psychosis with mania in a case that responded well to antipsychotics.
- It warrants further studies on the long-term psychiatric effects of COVID-19 infection.

References

1. Xu Z, Shi L, Wang Y, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome [published correction appears in Lancet Respir Med. 2020 Feb 25;:]. *Lancet Respir Med*. 2020;8(4):420-422. doi:10.1016/S2213-2600(20)30076-X

2. 1st known case of coronavirus traced back to November in China | Live Science. Updated March 13 2020. Accessed 2 May 2021. https://www.livescience.com/first-case-coronavirus-found.html

3. WHO Coronavirus (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data. Updated May 16 2021. Accessed May 17 2021. https://covid19.who.int/

4. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun*. 2020;109:102433. doi:10.1016/j.jaut.2020.102433

5. Smith CM, Komisar JR, Mourad A, et al. COVID-19-associated brief psychotic disorder. *BMJ Case Rep*. 2020;13(8):e236940. Published 2020 Aug 11. doi:10.1136/bcr-2020-236940

6. P. Belluck. Small Number of Covid Patients Develop Severe Psychotic Symptoms - The New York Times. 28 December 2020. Accessed 15 March 2021. https://www.nytimes.com/2020/12/28/health/covid-psychosis-mental.html

7. Varatharaj A, Thomas N, Ellul MA, et al. Neurological and neuropsychiatric complications of COVID-19 in 153 patients: a UK-wide surveillance study [published correction appears in Lancet Psychiatry. 2020 Jul 14;:]. *Lancet Psychiatry*. 2020;7(10):875-882. doi:10.1016/S2215-0366(20)30287-X

8. Watson CJ, Thomas RH, Solomon T, et al. COVID-19 and psychosis risk: Real or delusional concern?. *Neurosci Lett*. 2021;741:135491. doi:10.1016/j.neulet.2020.135491

9. Ferrando SJ, Klepacz L, Lynch S, et al. COVID-19 Psychosis: A Potential New Neuropsychiatric Condition Triggered by Novel Coronavirus Infection and the Inflammatory Response?. *Psychosomatics*. 2020;61(5):551-555. doi:10.1016/j.psym.2020.05.012

10. Khandaker GM, Cousins L, Deakin J, et al. Inflammation and immunity in schizophrenia: implications for pathophysiology and treatment. *Lancet Psychiatry*. 2015;2(3):258-270. doi:10.1016/S2215-0366(14)00122-9

11. Rentero D, Juanes A, Losada CP, et al. New-onset psychosis in COVID-19 pandemic: a case series in Madrid. *Psychiatry Res*. 2020;290:113097. doi:10.1016/j.psychres.2020.113097

12. Janes M, Kuster S, Goldson TM, et al. Steroid-induced psychosis. *Proc* (Bayl Univ Med Cent). 2019;32(4):614-615. Published 2019 Jul 22. doi:10.1080/08998280.2019.1629223

13. Noone R, Cabassa JA, Gardner L, et al. Letter to the Editor: New onset psychosis and mania following COVID-19 infection. *J Psychiatr Res*. 2020;130:177-179. doi:10.1016/j.jpsychires.2020.07.042

14. Mawhinney JA, Wilcock C, Haboubi H, et al. Neurotropism of SARS-CoV-2: COVID-19 presenting with an acute manic episode. *BMJ Case Reports CP*. 2020;13(6):e236123. doi:10.1136/BCR-2020-236123

15. Lu S, Wei N, Jiang J, et al. First report of manic-like symptoms in a COVID-19 patient with no previous history of a psychiatric disorder. *J Affect Disord*. 2020;277:337-340. doi:10.1016/j.jad.2020.08.031

16. Gore M, Bansal K, Asuncion RMD. Lacunar Stroke. *StatPearls*. September 28, 2021. Accessed December 13, 2021. https://www.ncbi.nlm.nih.gov/books/NBK563216/

17. Arboix A. Retinal microvasculature in acute lacunar stroke. *The Lancet Neurology*. 2009;8(7):596-598. doi:10.1016/s1474-4422(09)70137-1

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CASE REPORT

Severe hypertension in pediatric diabetic ketoacidosis – a case report and review of literature

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Zaki SA, Shaikh MG, Rashid A. Severe hypertension in pediatric diabetic ketoacidosis – a case report and review of literature. *Malays Fam Physician.* 2022;17(3):149–152. https://doi.org/10.51866/cr.93

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Diabetic ketoacidosis, Hypertension, Dehydration, Hypovolaemia, Children

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Abstract

Diabetic ketoacidosis (DKA) is a life-threatening complication of type 1 diabetes mellitus in children. Despite the presence of dehydration, hypertension occurs in a significant proportion of children with DKA. There is a lack of clarity in the literature regarding the management of hypertension in patients with paediatric DKA. Herein, we report the case of an adolescent boy who presented with DKA and severe hypertension. His neurological status was closely monitored. There was a gradual decline in his blood pressure with an improvement in the pH over the next 72 hours. The combination of severe DKA and hypertension can be a challenging clinical dilemma, especially regarding fluid management. Studies on severe DKA in children are exacting, given the rarity of this condition. A multi-centre study is suggested to provide a meaningful analysis of this aspect of DKA.

Introduction

Although preventable, diabetic ketoacidosis (DKA) remains the most severe complication in children with type 1 diabetes mellitus (DM).[1,2] Fluid losses from osmotic diuresis, vomiting and hyperventilation in patients with DKA can lead to hypovolaemia and dehydration.[3] Additionally, insulin deficiency increases the production of vasodilative prostaglandins.[4] Thus, the expected haemodynamic response is tachycardia with a normal or low blood pressure (BP). In contrast, despite the presence of hypovolaemia and insulinopaenia, paradoxical hypertension in patients with severe paediatric DKA has been scatteredly reported.[2,5–7] To date, data on severe hypertension secondary to paediatric DKA remain limited. We report the case of a child who presented with DKA and severe hypertension and present the findings of a review of the literature.

Case presentation

A 14-year-old boy of Arab descent presented to our emergency department with a history of vomiting, abdominal pain, decreased oral intake for 3 days and breathlessness for 2 days. He was diagnosed with type 1 DM 3 years prior and was on basal–bolus subcutaneous insulin regimen (regular and long-acting injections). His HbA1c level assessed 3 months prior was 12.6%. On arrival at the emergency department, he was dehydrated (approximately 9%) with Kussmaul breathing. He was mildly agitated with a Glasgow Coma Scale (GCS) score of 15/15. His vital signs were as follows: heart rate, 152 beats/min; BP, 202/103 mmHg; respiratory rate, 32 cycles/min; and oxygen saturation level, 99% on room air. On examination, he had tenderness in the epigastric area. The other examination findings were normal. The bedside glucose level was high, with severe metabolic acidosis in venous blood gas analysis (Table 1). He was started on local DKA protocol and subsequently moved to the paediatric intensive care unit. His BP was recorded using an oscillometric device in the supine position with an appropriately sized arm cuff. The laboratory findings were suggestive of severe DKA (Table 1).

The renal Doppler ultrasound and 12-lead echocardiogram findings and cardiac enzyme levels were normal. Generally, children with DKA have poor peripheral perfusion, and cerebral perfusion depends on a high peripheral vascular resistance. Thus, antihypertensive medications may precipitate hypotension, thereby worsening the neurological status. Owing to a lack of clarity in the literature regarding the pathophysiological process of DKA-associated hypertension and the risk of cerebral oedema

(CE), a policy of close neurological monitoring without active treatment of hypertension was instituted. The neurological status was strictly monitored in accordance with the ISPAD Clinical Practice Consensus Guidelines 2018 for paediatric DKA management.[1] The hydration status was assessed on the basis of the heart rate, peripheral perfusion, BUN level and haematocrit level. Intake and output were also strictly monitored. With the initiation of fluid resuscitation in the emergency department, there was a gradual reduction in his BP. The simultaneous improvement in the BP and pH continued over the next 72 hours. The boy was mildly agitated 4 hours after admission and remained somnolent for the next 24 hours. His GCS score remained 15/15 throughout the hospital course. His BP returned to normal after 72 hours, and he was discharged after 4 days of hospital stay. On follow-up visits, there were no clinical concerns regarding his neurological state and BP.

Table 1. Laboratory findings during hospital stay.

Day	1	1	1	1	2	2	3
Time after admission (h)	0	2	12	24	36	48	72
Urea level (mmol/L)	9.17	-	-	6.2	3.5	-	1.79
Serum creatinine level (mmol/L)	106.1	-	-	64	56	-	50
Serum sodium level (mmol/L)	127	-	136	141	142	140	142
Serum potassium level (mmol/L)	6.7	-	3.46	3.6	3.7	3.8	3.6
Chloride level (mmol/L)	98.8		110	107	114	112	110
Venous pH	6.755	6.9	7.005	7.209	7.215	7.27	7.32
pCO_2 level (mmHg)	19	24	24	28.8	31	34	36
HCO_3 level (mmol/L)	2.7	4	5.4	11.2	13.5	15.2	19
Base excess level	−32.6	−29	−27.8	−15.2	−14.2	−10.4	−8.4
Urinary ketone	4+	4+	-	1+	-	nil	-
Blood pressure (mmHg)	202/103	184/94	155/89	147/83	139/74	127/68	132/74
Glucose level (mmol/L)	32		21	12.5	10.8	9.7	8
Renal ultrasound findings	Normal						
Cardiac enzyme levels	Normal						

Discussion

Deeter et al. found that despite the presence of severe dehydration, no children with DKA had hypotension. On the contrary, 48% were found to have hypertension on admission, and 82% developed such within 6 hours of admission.[6] Similarly, DePiero et al. reported hypertension in 12.2% of patients, with an additional 15.6% of patients developing such during treatment. They found that the presence of severe acidosis, a lower pCO_2 level and a lower GCS score were significantly associated with hypertension.[7] Other risk factors were present in our patient, except for the low GCS score. Although the international guidelines for paediatric DKA mentions hypertension, guidance for its management is lacking.[1] Further, the available literature on DKA-associated hypertension in children is limited.[6,7] Thus, clinicians must rely on their clinical experience in managing hypertension in patients with paediatric DKA. Despite the presence of dehydration, hypertension likely reflects complex systemic pathophysiological processes that may be unique to DKA. Various theories have been put forth to explain paradoxical hypertension in individuals with DKA. These include overactivity of the renin–angiotensin–aldosterone system (RAAS), sympathetic nervous system and vasopressin system.[2,5–7] Low plasma levels of atrial natriuretic peptide (ANP) are seen in patients with severe DKA due to hypovolaemia. ANP inhibits the vasoconstrictor action of norepinephrine and decreases the secretion of vasopressin, renin and aldosterone. Thus, low levels of ANP can result in an unopposed action of these hormones, leading to hypertension.[2,5–7] Antidiuretic hormone (ADH) release due to hyperosmolality and volume depletion may also increase the BP via V2 receptors and increase the peripheral vascular resistance.[6] Hypovolaemia is responsible for the initial activation of the RAAS, ANP and ADH. In addition, the associated severe acidosis stimulates stress reactions, thereby activating the compensatory mechanisms. This increases the production of counter-regulatory hormones (e.g. glucagon, cortisol and growth hormone) and proinflammatory cytokines in patients with DKA, which can lead to hypertension.[2,5–7] Restoring the fluid status and correcting acidosis will ameliorate some of these mechanisms and help in reducing the BP.

Studies have also documented abnormalities in cerebral blood flow during DKA, resulting in altered brainstem perfusion, which may interfere with the autoregulatory control mechanisms of the BP.[8] We hypothesised that one or more of the above-indicated mechanisms may have resulted in hypertension in our patient. Further prospective studies are needed to confirm or refute this hypothesis. Owing to financial constraints, we could not evaluate the plasma levels of all above-mentioned hormones. Another possibility underlying the development of hypertension in patients with paediatric DKA is CE. It occurs in 0.2–1% of patients and is a potentially severe complication with high morbidity and mortality.[1,9] However, early detection of CE is notoriously difficult. Severe CE can increase the intracranial pressure, leading to systemic hypertension. Additionally, the stress response to CE may lead to increased catecholamine levels, resulting in hypertension.[5] The pathophysiological understanding of CE in patients with DKA remains controversial. Various theories include rapid fluid administration, abrupt changes in serum osmolality, dehydration and cerebral hypoperfusion.[1,9] Thus, deciding to intervene is challenging yet crucial, as early treatment can prevent adverse neurological outcomes. There can be reluctance to volume expansion in children with DKA and hypertension for fear of worsening hypertension. Further, it is not prudent to use antihypertensives, as these patients have poor peripheral perfusion.[1] Additionally, cerebral perfusion may be dependent on a high peripheral vascular resistance. Thus, antihypertensive medications may precipitate hypotension, thereby worsening the neurological status. Until the pathophysiology of DKA-associated hypertension is fully understood, a conservative approach and adherence to the ISPAD fluid guidelines are suggested. A gradual decrease in the BP with an improvement in pH and dehydration, as in our case, would indicate that the treatment is appropriate. We believe such a strategy minimises the risk of complications and could ameliorate hypertension, as seen in our patient. However, during this period of fluid resuscitation, close monitoring of the neurological status is of utmost importance.[1] Muir et al. suggested an evidence-based protocol for early detection of CE at the bedside, which permits timely intervention to prevent permanent brain damage. Neuroimaging is not required for the diagnosis of CE.[1,9]

Conclusion

Hypertensive crises can occur in patients with severe paediatric DKA and complicate the fluid resuscitation strategy. The BP should not be used as a marker to assess the degree of dehydration in individuals with DKA. Close monitoring of the neurological status during treatment is essential. A multi-centre study is suggested to provide a meaningful analysis of the pathophysiology of hypertension in patients with severe DKA. Finally, international guidelines should provide direction on the management of hypertension in these patients.

Acknowledgements

None

Conflicts of interest

None

Patients' consent for the use of images and content for publication

Written consent was obtained from the patient, and the consent form was signed.

What is new in this case report compared to the previous literature?

- This case report emphasises the fact that children with DKA can have high blood pressure
- High blood pressure in DKA can complicate fluid resuscitation strategy and physicians should close monitor neurological status.

What is the implication to patients?

- Blood pressure is not a reliable marker for assessing the degree of dehydration in children with diabetic ketoacidosis.

References

1. Wolfsdorf JI, Glaser N, Agus M, Fritsch M, Hanas R, Rewers A, et al. ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatr Diabetes*. 2018;19 Suppl 27:155-177. doi:10.1111/pedi.12701

2. Onyiriuka AN, Monday P, Oguejiofor CA. Hypertension Despite Dehydration in an Adolescent with Diabetic Ketoacidosis. *Acta Med Indones*. 2018;50(4):328-331.

3. Singh D, Cantu M, Marx MH, Akingbola O. Diabetic Ketoacidosis and Fluid Refractory Hypotension. *Clin Pediatr (Phila)*. 2016;55(2):182-184. doi:10.1177/0009922815584549.

4. Axelrod L. Insulin, prostaglandins, and the pathogenesis of hypertension. *Diabetes*. 1991;40(10):1223-1227. doi:10.2337/diab.40.10.1223.

5. Bin Salleh H, Mujawar QM. Hypertension in severe pediatric diabetic ketoacidosis: case report and review of literature. *Pediatr Emerg Care*. 2013;29(1):82-83. doi:10.1097/PEC.0b013e31827b564e.

6. Deeter KH, Roberts JS, Bradford H, Richards T, Shaw D, Marro K, et al. Hypertension despite dehydration during severe pediatric diabetic ketoacidosis. *Pediatr Diabetes*. 2011;12(4 Pt 1):295-301. doi:10.1111/j.1399-5448.2010.00695.x.

7. DePiero A, Kuppermann N, Brown KM, Schunk JE, McManemy JK, Rewers A, et al; Hypertension during Diabetic Ketoacidosis in Children. *J Pediatr*. 2020;223:156-163.e5. doi:10.1016/j.jpeds.2020.04.066.

8. Glaser NS, Wootton-Gorges SL, Kim I, Tancredi DJ, Marcin JP, Muir A,et al. Regional Brain Water Content and Distribution During Diabetic Ketoacidosis. *J Pediatr*. 2017;180:170-176. doi:10.1016/j.jpeds.2016.09.003.

9. Muir AB, Quisling RG, Yang MC, Rosenbloom AL. Cerebral edema in childhood diabetic ketoacidosis: natural history, radiographic findings, and early identification. *Diabetes Care*. 2004;27(7):1541-1546. doi:10.2337/diacare.27.7.1541

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TEST YOUR KNOWLEDGE

An adult with a finger mass – is it benign or malignant?

Jazlan Jamaluddin, Yeow Siong Lee

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Abstract

We described the case of a 42-year-old man who presented with left index finger mass persisting for 6 months. The mass was small and, painless and had gradually increased in size with limited finger flexion. Physical examination showed a firm mass over the volar surface of the left index finger. There was no tenderness, redness, warmth or punctum. The overlying skin was normal, and the mass did not transilluminate. Further examination of the head and neck, chest, upper limbs and neurovascular system revealed normal findings. No similar masses were found elsewhere in the body. Bedside ultrasound with further investigation and management confirmed the suspected diagnosis.

Case summary

A 42-year-old man presented with left index finger mass persisting for 6 months. The mass was small and painless and had gradually increased in size with limited finger flexion. No skin changes or neurological symptoms were noted. The mass was not preceded by trauma or fever. There was no other joint swelling, lymph node enlargement, cough, dysphagia or neck swelling. He had a medical history of hypertension managed with telmisartan 40 mg and felodipine 5 mg daily.

Physical examination showed a firm, non-fluctuance, non-mobile mass measuring around 0.5×1.0 cm over the volar surface of the left index finger (**Figure 1**). There was no tenderness, redness, warmth or punctum. The overlying skin was normal, and the mass did not transilluminate. The range of movement of both interphalangeal joints especially upon flexion was limited owing to the mass. No effusions were felt. Further examination of the head and neck, chest, upper limbs and neurovascular system revealed normal findings. No similar masses were found elsewhere in the body. Haematological findings, including the full blood count, renal profile, liver function, serum uric acid level, fasting sugar level and lipid level, were within the normal ranges. Plain hand radiography showed a soft tissue shadow with no bony involvement (**Figure 2**).

Figure 1. Left index finger showing a mass with no skin changes

Figure 2. Plain left hand radiograph showing a soft tissue shadow over the index finger with no bony involvement

Questions

1. What is the most likely diagnosis?
2. What other initial radiological investigation can be performed?
3. What is the management plan?
4. What are the complications that may arise from this condition?

Answers

1. The most likely diagnosis is a giant cell tumour (GCT). This is supported by the non-fluctuance, non-mobile nature of the mass. Further, the mass did not transilluminate, which would make the diagnosis of a cyst unlikely. The differential diagnosis for a finger mass includes ganglion cysts, lipomas, accessory muscles, venous or arteriovenous malformations and foreign body granulomas.[1]

2. Bedside ultrasound can be conducted for characterisation of the lesion and demonstration of the relationship with the adjacent tendon.[1] On ultrasound, GCT usually presents as a nodular tumour-like structure arising against a flexor or extensor tendon. A cyst is typically anechogenic with posterior echo enhancement and no Doppler flow within. Chest radiography can also be performed to identify any lung metastasis.[2]

3. The patient should be referred for cross-sectional imaging, such as magnetic resonance imaging (MRI), and further workup to confirm the diagnosis of GCT. Once diagnosis is confirmed, surgical excision is the standard of care for the treatment of GCT.[3]

4. The potential complications include tumour recurrence, neuropathy or limited range of motion and skin necrosis of the finger.[3]

Case progress

The patient was referred to a hand surgeon. Bedside ultrasound of the left index finger mass showed a mixed fluid and solid lesion. Subsequent MRI of the left hand revealed a solid soft tissue lesion sized 0.6×1.2×2.6 cm (**Figure 3**). The diagnosis of GCT of the flexor tendon sheath was highly suspected. Excision of the mass was performed under local anaesthesia. The histopathology examination showed a well-circumscribed lesion composed of mononuclear cells with scattered osteoclast-like multinucleated giant cells. Mitotic activity was rare. This confirmed the diagnosis of GCT of the tendon sheath and its benign nature.

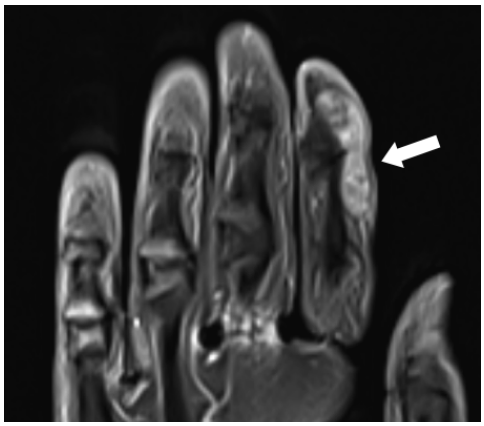

Figure 3. Magnetic resonance image of the left hand showing a solid soft tissue lesion with moderate enhancement post-contrast

Discussion

GCT of the tendon sheath is the most common form of GCTs. It is also the second most common soft tissue tumour of the hand after ganglion cysts.[3] GCT accounts for 5% of all primary bone tumours and mostly occurs in women and at the age of 20–40 years.[3] It mainly affects the meta-epiphyseal area of long bones, although it can also affect the tibia, radius and humerus.[2] GCTs are usually benign but can be aggressive locally. Bone disruption, especially around the joints, can affect the joint function and mobility.

Diagnostic workup includes a detailed history-taking and physical examination. Plain radiography is beneficial, since GCT can cause erosions in the cortical bone and even invade the medullary space.[3] Ultrasound can be used to differentiate it from common causes, such as ganglion cysts.[1] It also offers better spatial resolution than does MRI and is able to identify adhesions and analyse interactions with surrounding tissues using dynamic information about tendon motions and probe pressures. However, MRI is recognised as the most useful diagnostic tool, as it would help with further classification and surgical planning. The treatment of choice for GCT of the tendon sheath is simple excision. However, local benign recurrence of GCT has been reported to occur in 15%–45% of patients.[3]

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We would like to thank the patient who provided the clinical information and permission to publish his image.

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Ethical Approval
Written informed consent for this paper (including images, case history and data) were obtained from the patient for the publication of this paper.

Conflicts of interest
None

How does this paper make a difference to general practice?

- A hand mass in adults is seen regularly in primary care settings and can often be perplexing.
- It is important to consider giant cell tumours as a differential diagnosis for adults with a firm finger mass that is otherwise asymptomatic.
- This paper details several tests available in primary care settings that can be used in the diagnosis and assessment of potential complications stemming from giant cell tumours.
- Timely diagnosis and treatment of giant cell tumours are important to reduce the risks of complications.

References

1. Guerini H, Morvan G, Vuillemin V, et al. Ultrasound of wrist and hand masses. *Diagn Interv Imaging*. 2015;96(12):1247-1260. doi:10.1016/j.diii.2015.10.007
2. Scotto di Carlo F, Whyte MP, Gianfrancesco F. The two faces of giant cell tumor of bone. *Cancer Lett*. 2020;489(June):1-8. doi:10.1016/j.canlet.2020.05.031
3. Ozben H, Coskun T. Giant cell tumor of tendon sheath in the hand: Analysis of risk factors for recurrence in 50 cases. *BMC Musculoskelet Disord*. 2019;20(1):1-8. doi:10.1186/s12891-019-2866-8

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LETTER TO EDITOR

Reply letter to: Is there any importance of Migraine with Aura amongst medical students?

Anuradha Thiagarajan, Noor Azimah Muhammad, Chai-Eng Tan

Thiagarajan A, NA Muhammad, Tan CE. Reply letter to: Is there any importance of Migraine with Aura amongst medical students?. *Malays Fam Physician.* 2022;17(3):156–157. https://doi.org/10.51866/lte.249r

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Dear Editor,

We have read the letter to the editor entitled 'Is there any importance of migraine with aura amongst medical students?'[1] and appreciate the interest in our article. The author has requested for some clarification regarding the epidemiology and clinical profile of migraine amongst medical students.

In our study, the prevalence of migraine and non-migraine headache did not significantly differ according to the year of study. At the time of data collection, the medical school had 296 first-year students, 142 second-year students, 45 fourth-year students and 31 fifth-year students. The majority of the respondents who experienced headache were first- and second-year students. The prevalence of migraine headache was 60.7% (n=51/84) among the first-year students, 64.2% (n=34/53) among the second-year students, 40.0% (n=4/10) among the fourth-year students and 80.0% (n=8/10) among the fifth-year students. Third-year students were not in the campus during data collection. However, there was no significant association found between age and the prevalence of migraine.[2] Generally, the prevalence of migraine has a bimodal distribution, which peaks in late adolescence to the early 20s and around 50 years of age.[3] Since our respondents' age range was narrow (from 18 to 26 years), it was not surprising that age was not significantly associated with the prevalence of migraine.

Regretfully, we did not collect data on the duration of headache and family history of migraine, as it was not within the scope of our research objectives. We used the International Headache Society criteria for migraine as a checklist. The respondents only responded 'yes' or 'no' to each criterion. Therefore, the duration of headache was not assessed. We also did not specifically ask whether the respondents had a family history of migraine. In future research, these factors could be addressed.

Approximately 66.0% (n=64/97) of our respondents with migraine had aura. Unfortunately, since data were collected in 2013, we were unable to retrieve the descriptive data on the aura symptoms experienced by the respondents. A recent epidemiological study in Korea found that visual aura was present in 24.3% to 29.5% of people with migraine.[4] Interestingly, the prevalence of visual aura among neurologists with migraine was 51.2%.[5] This suggests that many individuals with migraine could be unaware of aura symptoms. The higher prevalence among neurologists may be attributed to the fact that they were knowledgeable about visual aura symptoms. Other forms of aura were not well studied.

Taken together, we agree that more local studies on the clinical profile of migraine among Malaysians are needed, although this condition is common.

References

1. Taksande A. Is there any importance of Migraine with Aura amongst medical students? *Malays Fam Physician*. 2022;17(3). In press.

2. Thiagarajan A, Aziz NA, Tan CE, Muhammad NA. The profile of headaches and migraine amongst medical students and its association to stress level, disability and self-management practices. *Malays Fam Physician*. 2022;17(2):81-88. Published 2022 May 25. doi:10.51866/oa1370

3. Victor TW, Hu X, Campbell JC, Buse DC, Lipton RB. Migraine prevalence by age and sex in the United States: a life-span study. *Cephalalgia*. 2010;30(9):1065-1072. doi:10.1177/0333102409355601

4. Kim KM, Kim BK, Lee W, Hwang H, Heo K, Chu MK. Prevalence and impact of visual aura in migraine and probable migraine: a population study. *Sci Rep*. 2022;12(1):426. Published 2022 Jan 10. doi:10.1038/s41598-021-04250-3

5. Yeh WZ, Blizzard L, Taylor BV. What is the actual prevalence of migraine?. *Brain Behav*. 2018;8(6):e00950. doi:10.1002/brb3.950

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LETTER TO EDITOR

Is there any importance of Migraine with Aura amongst medical students?

Amar Taksande

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Dear Editor,

I have read the article by Thiagarajan et al. which is highly informative and describes the profile of headache and migraine amongst medical students. However, there are a few points that require clarification.[1]

First, medical students aged ≥18 years who experienced headache in the previous 3 months were included in the study. According to Galinovi et al.,[2] the prevalence of migraine was 8.86% in first-year students and 10.90% in sixth-year students, while the prevalence of tension headache was 60.13% and 57.69%, respectively. In the study, whether the prevalence of migraine and non-migraine headache differs according to the year of study was unclear.

Second, a migraine can last between 4 and 72 hours. It can be difficult to predict how long a migraine will last; however, tracking its progress may be beneficial. Xie et al. recorded the duration of headache as the average number of hours for a typical headache attack and found that the average duration of a migraine attack was 3 (interquartile range: 1–4) hours.[3] In the study, the authors did not indicate how long headache lasted amongst the medical students (2022).

Third, the most potent and consistent risk factor for migraine is a family history of this condition itself. Birkie et al. discovered that the risk of migraine increased by more than 3.83 times (adjusted odds ratio=3.83, 95% confidence interval=2.313–6.366) in the presence of a family history of headache compared with that in the absence of a family history of migraine.[4] In the study, whether there was any correlation between a family history and the prevalence of migraine amongst the medical students was not reported.

Fourth, migraine aura symptoms include brief visual or auditory disturbances that occur prior to other migraine symptoms, such as severe headache, nausea and sensitivity to light and sound. The International Classification of Headache Disorders (ICHD) systematised the diagnosis of migraine with aura and migraine with typical aura for the first time in 1988, with updated criteria published in the second edition in 2004 and the third edition in 2018.[5] In the cross-sectional study conducted in 2013, the authors used the ICHD diagnostic criteria to diagnose a possible migraine. However, they did not describe the migraine aura symptoms amongst the medical students.

References

1. Thiagarajan A, Aziz NA, Tan CE, Muhammad NA. The profile of headaches and migraine amongst medical students and its associationto stress level, disability, and self-management practices. *Malays Fam Physician*. 2022;17(2):81-88.
2. Galinović I, Vuković V, Troselj M, Antić S, Demarin V. Migraine and tension-type headache in medical students: a questionnaire study. *Coll Antropol*. 2009;33(1):169-173.
3. Xie YJ, Lin M, Wong YT, Yan L, Zhang D, Gao Y. Migraine Attacks and Relevant Trigger Factors in Undergraduate Nursing Students in Hong Kong: A Cross-Sectional Study. *J Pain Res*. 2022;15:701-713. Published 2022 Mar 10. doi:10.2147/JPR.S337465
4. Birkie M, Endris M, Asnakew S. Determinants of migraine headache among regular undergraduate students, of Wollo University, Dessie, Ethiopia: cross-sectional study. *BMC Neurol*. 2021;21(1):443. Published 2021 Nov 10. doi:10.1186/s12883-021-02466-4
5. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalalgia*. 2018;38(1):1-211.

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A MOMENT IN THE LIFE OF A FAMILY PHYSICIAN

Notes by a Family Physician Shootling

Suzane Chin Shiyun

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Preface

This article was written at leisure for the World Family Doctor Day, which fell on 19 May 2022, but the author fell victim to busy weeks and finished the article late.

The author is a young family physician currently approaching the end of her gazettement and has a love for writing cultivated from her long-gone schooldays.

A (very belated) Happy World Family Doctor Day to all comrades fighting the good fight for the betterment of our patients every day.

Quotes courtesy of Sir William Osler and Robert Greene.

'A doctor is a student till he dies, once he considers himself not a student anymore, the doctor inside him dies'.
Over a table of catch-up tea, my non-medical friends would ask me what I specialise in as a doctor. I would say 'family medicine', and 90% of the time, they would draw a blank. The common conclusion my friends would incorrectly jump to, much to my amusement, would be the reproductive and infertility subspecialty owing to the word 'family'.

I would laugh and begin the long story.

Family medicine is currently not as well known a specialty to the public in Malaysia as surgery and general medicine. In countries like Australia and the United Kingdom, family medicine is arguably the most important specialty, given their universal healthcare access and the requirement of an accreditation in the form of a specialist or fellowship training to be able to practice as a general practitioner.

I was not particularly inspired by any figure or incident to undertake the pathway – but the need for constant learning pushed me to pursue a fellowship, and a meddlesome attitude of wanting to know enough across multiple fields motivated me to choose family medicine.

Medicine is a forever-changing landscape, and clinical guidelines are constantly evolving as new therapies are being discovered. As a doctor, one has to learn to keep up – or else, stagnate and compromise patient care.

And in my humble opinion, family medicine, which spans care across various disciplines, is the most enriching knowledge vault of all.

'A jack of all trades is a master of none, but oftentimes better than a master of one'.
Family medicine specialists are whom I consider specialists of integration. It is essential to learn enough knowledge from various fields and bring these disciplines together to manage patients in a holistic manner.

I once had a memorable pregnant patient whom I saw safely all the way to delivery. She had bronchial asthma, gestational diabetes and anaemia brought about by poor spacing. Following her delivery, we had to work together around the financial implications, family planning and her worries. I continued to see her youngest child on follow-ups, with my care extending from when he was in the womb all the way to being an active 3-year-old.

The care of patients in primary care does not end upon discharge unlike that in hospital inpatient care. The management continues for a long time, and in a majority of that time, it extends to other family members as well.

This comprehensive management is what encompasses family medicine and where it derives its name from.

'It is much more important to know what sort of a patient has a disease than what sort of a disease a patient has'.
Family medicine is likely the only unique discipline that equally targets patients' psychosocial aspects alongside disease pathophysiology. Other than the duties of a treating physician, the family physician becomes a form of confidante and advisor to his or her patient.

Tackling this aspect has been one of the most challenging yet fulfilling aspects in my trade. I learned that there is never a one-size-fits-all method to approach and communicate with patients. The perception of an 80-year-old retiree and that of a 30-year-old lecturer are rarely similar.

There will be patients' fears that will need addressing, misconceptions that will require careful information-sharing and awareness of diseases that will need to be instilled.

There will be patients whose personal outlooks may impede and worsen their clinical profile, and there may be ones we will fail to empower; we do not stop trying, regardless.

We are privileged to be a part of our patients' journeys.

'One of the first duties of the physician is to educate the masses not to take medicine'.
There is no practice in the medical field where the slogan 'Prevention is better than cure' applies more heavily than in family medicine.

Diseases and complications are already present in most patients presenting to the hospital. In primary care, both the sick and healthy are seen. Health education and screening are an integral part of family medicine, and the activities are wonderfully diverse – from vaccination and cancer screening to preconception care.

I used to joke to my hospital colleagues that in place of 24-hour on-calls, we do door calls. Another distinguishing feature of this specialty is community work, whereby doctors go out into the field and actively involve the public in health education and screening.

'Proud to be a family physician'
Not one patient who walks through my door at any time of the day is the same. Each case is constantly evolving much like a puzzle that changes with each consultation. That is what I love about practicing family medicine.

Whether a patient with diabetes ends up to be admitted for a target-organ complication years down the road or ends up aging well with great metabolic control largely lies on what we strive to do for him or her today.

Family medicine is a beautiful and wholesome branch of specialty – one that I am proud to be a shootling of, amongst many.

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OBITUARY

Prof. Datuk Dr. Daniel Mahendran Thuraiappah (10 October 1939 to 21 October 2022)

Kaviyarasan Sailin

Sailin K. Prof. Datuk Dr. Daniel Mahendran Thuraiappah (10 October 1939 to 21 October 2022). *Malays Fam Physician.* 2022;17(3):161–162.
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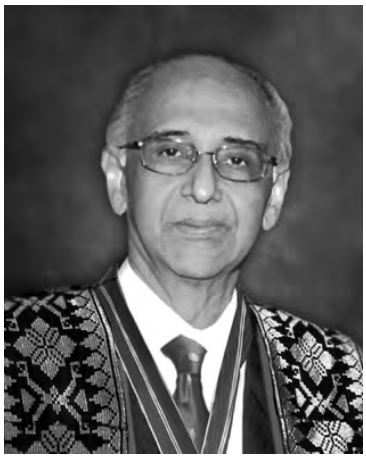

On 21 October 2022, Prof. Datuk Dr Daniel Mahendran Thuraiappah, a loving husband, father of two, grandfather and visionary leader passed away at the age of 83 years. He was a great family physician who kept in touch with his patients for five decades and continued to serve the community even after his retirement. It is touching to note that on the eve of his demise, he visited his clinic not knowing that it was going to be his last visit.

He was a doyen of family medicine, keen teacher and pillar with exemplary qualities who rendered endless support to the Academy of Family Physicians of Malaysia (AFPM), the Malaysian Medical Association and general practitioners both locally and internationally.

Prof. Thuraiappah, a Malaysian of Ceylonese Tamil origin, studied at Victoria Institution, Kuala Lumpur, and graduated from Queen's University Belfast with a BSc (Hon) in Anatomy on a bursary award in 1962 and MBBCh BAO in 1965. After his house officer tenure in Belfast, he returned to Malaysia and continued as a medical officer at General Hospital, Kuala Lumpur, until 1969. He also served as a lecturer at the University Malaya Medical Faculty for 2 years.

After serving the government, he opened his clinic, Klinik Thurai, at Sungai Besi, Kuala Lumpur, in 1970 and had been a general practitioner serving the community until his retirement. During his years as a general practitioner, he actively held various posts in the Malaysian Medical Association and later became the chairman of the MMA-PPS. Prof. Thuraiappah also held various posts in Koperasi Doktor Malaysia, where he played a key role in setting up the Info Centre of FOMEMA. He was one of the early general practitioners who embraced digital technology and initiated online continuing medical education.

A passionate teacher, who never stopped learning, enrolled in the Vocational Training Program in Family Medicine. In 1995, he passed the membership examination and was made a member of the AFPM. In 1996, he became a Fellow of the Australian College of General Practitioners. In 1998, he was appointed an adjunct associate professor in family medicine at the University of Putra Malaysia. Prof. Thuraiappah was then awarded Fellowship of the AFPM in 2000 and Honorary Fellowship of the Royal Australian College of General Physicians in 2006. He was also an Honorary Fellow of the College of General Practitioners of Sri Lanka, a Fellow of the Academy of Medicine Malaysia and a Fellow of the Royal College of Physicians, Edinburgh.

Prof. Thuraiappah served the AFPM with great enthusiasm and worked incessantly with the founding fathers to train general practitioners throughout the country. He served as the treasurer, secretary, chairman and finally, president of the academy. He was amongst a few like-minded persons who fearlessly walked the corridors of power at the inception to present the academy's academic programme to the authorities and was persistent until he gained recognition during his tenure as the chairman of the council. He was at the forefront with a team of committed fellow doctors, working towards recognition of family medicine as a specialty to achieve specialist status, which he eventually succeeded in after many attempts. Prof. Thuraiappah also served as the chairman of the quality improvement committee, promoting quality in general practice/primary care.

He served as the director of Medibase Sdn Bhd, the e-learning education and training arm of the AFPM. He was instrumental in developing the Diploma in Family Medicine, a 2-year programme aiming to facilitate the qualification of all general practitioners for entry into general practice. He was a long-serving board member of the Faculty of the Diploma in Family Medicine and was instrumental in the development of many short courses of interest for general practice, such as primary care cardiology and ultrasound.

Prof. Thuraiappah enthusiastically promoted the AFPM in various international fora, especially at the World Organization of Family Doctors (WONCA). He served as the vice president of the WONCA Asia Pacific Region, the chairman of the WONCA Working Party on Quality and Safety in Family Medicine, the honorary secretary of the WONCA Asia Pacific Region, a member of the Medical Informatics Group WONCA, a member of the WONCA Bye-Laws Committee and a member of the World Informatics Classification Committee. He was commended for his committed service in the development and promotion of general practice education and quality improvement programmes. Further, he was instrumental in setting up the Asian Regional Primary Care Coalition.

He was the vice chairman of the Joint Land Development Committee of the Academy of Medicine and the AFPM from 2000 to 2010 and a member of the Board of Management of the Building owned by the Academy of Medicine Malaysia and AFPM from 2010 to 2017. After a long development period of 27 years, he, along with the team from the Academy of Medicine of Malaysia and the AFPM, jointly built the Academies Building on the Joint Colleges Land next to the Istana Budaya and the National Library in Jalan Tun Razak, Kuala Lumpur.

Prof. Thuraiappah retired from full-time general practice in 2011 and was appointed an associate professor in family medicine at MAHSA University, Malaysia. In 2013, he was promoted to full professor of family medicine. He had numerous research papers and publications along with many other achievements.

He served as a member of the International Advisory Board of the British Journal of General Practice from 2010 to 2016, a board member of Koperasi Doktor Malaysia and the president and an advisor of the Federation of Malaysian Sri Lankan Organisations for the Malaysian Ceylonese community.

He was a great philanthropist and a community leader who contributed immensely to the redevelopment of the Green Memorial Hospital in Manipay, Sri Lanka.

Prof. Thuraiappah received the following awards for his exemplary public service: Darjah Kebesaran Setia-Sultan Salahuddin Abdul Aziz Shah in 1988, Ahli Mangku Negara in 1989, Kebesaran Dato' Paduka Setia Mahkota in 2000, Pingkat Jasa Negara-Datuk in 2004, Sri Lankan Excellence Medal in 2007 and Malaysian Medical Association Wilayah Long Service Award in 2022.

He loved music, arts, gardening and his three dogs and one cat.

Prof. Thuraiappah was best known for his kindness, smile, inspiration and generosity. He was a soft-spoken, humble gentleman with an excellent command of the English language, was a person of faith and lived a life serving others. He is survived by his wife Datin Prof. Dr Gnanasothie Duraisamy and their daughter Sothie Naomi and son Daniel Amarasingam.

He will be missed but not forgotten.

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