Prevalence of falls among community-dwelling elderly and its associated factors: A cross-sectional study in Perak, Malaysia

Yeong UY, Tan SY, Yap JF, Choo WY

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Authors:

Yeong Uen Yea
(Corresponding author)
MBBS
Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia.
Email: yea0531@hotmail.com

Tan Soon Yee
MBBS
Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.
Email: tansoonyee@hotmail.com

Yap Jun Fai
MBBS
Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.
Email: junfai90@hotmail.comm

Choo Wan Yuen
PhD
Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.
Email: ccwy@ummc.edu.my

Abstract

Introduction: Fall is a major cause of injuries and can increase the risk of early mortality among elderly. The objective of this study was to determine the prevalence of falls among community-dwelling elderly in rural Malaysia and its associated factors.

Methods: Data were obtained from a cross-sectional survey in five randomly selected districts in the state of Perak, Malaysia. A total of 250 households were randomly selected. A total of 811 individuals aged 60 years or more were recruited and interviewed using a structured questionnaire. Information about socio-demographic, history of falls in the past 1 year, medical history, drug history and physical activity level were enquired.

Results: The prevalence of falls in the past 1 year among community-dwelling elderly was reported to be 4.07%. Indigenous elderly (Adjusted odd ratio, AOR = 6.06, 95% CI = 1.10–33.55, p = 0.039) and living alone (AOR = 2.60, 95% CI = 1.04–6.50, p = 0.042) were shown to be factors associated with falls. Physical activity level, number of co-morbidities and number of medications used were not associated with falls.

Conclusion: Elderly of indigenous ethnicity and living alone are the main factors associated with falls in this population. Indigenous people may be at higher risk, which warrant further investigation with a larger sample to improve the precision of estimates.

Introduction

Malaysia is facing an aging population, as experienced by many high- and middle-income countries. An aging population poses a real challenge to society and healthcare systems, as the disease burden increases. Besides chronic diseases, fall-related injuries are common among the elderly, frequently resulting in disability, institutionalisation and even premature death.

Although estimates of fall rates vary widely based on the region, age and living arrangements of the elderly population, it is estimated that 28%–35% of people aged 65 years or more were found to experience fall each year. This estimate increases to 50% for those aged 85 years or more.[1] Falls are the underlying cause of 10%–15% of all emergency department visits and 31.6% of those who fall are admitted.[2] The high incidence of fall and its complications is an unnecessary healthcare burden, as it can be prevented.

Current evidence[3] has suggested that biological factors such as age and gender are risk factors for falls. Older adults are prone to falls largely due to the decline of physical, cognitive and affective capacities, and co-morbidities associated with chronic illnesses. Women are more likely than men to experience falls but fall-related mortality is higher in men.[3] The relationship between falls and ethnicity is still unclear.[3] The rate of falls and hospitalisations for fall-related injuries has been reported to be more than two times higher for Caucasians as compared to their Hispanics, Asians/Pacific Islanders and African counterparts.[4] However, more recent findings[5] suggest that the annual fall rate in Chinese older people is only approximately half of that found in white older people.

Despite the extensive epidemiological research on risk factors associated with falls, findings regarding several behavioural, environmental

and socio-economic factors associated with falls appear to be mixed. For example, behavioural factors such as physical activity and adequate dietary intake were found to have a protective effect against falls.[3] Studies have shown that fall risk is associated with the number of medications used, but only when at least one established fall risk-increasing drug was part of the daily regimen.[6] Association between environmental factors and falls have also been explored. A large-scale community study in Thailand reported that elderly who lived alone had a higher incidence of falls as compared with those who lived with others.[7] As literature on the association of living alone with risk of falls in Asia is limited, this study will contribute to the topic.

There is a scarcity of epidemiological research on falls in Asian populations. In Malaysia, only a limited number of large-scale community-based studies to find out the actual public health burden of falls have been carried out.[8,9] In a study among elderly seeking medical care in a primary care setting, it was reported that the prevalence of falls was 47%.[9] The prevalence was considerably higher compared to the 28% to 42% reported by other countries.[3] The present study was carried out to estimate the actual prevalence of falls among elderly living in a community setting and identify its associated factors. It is important to determine the magnitude, associated factors, and circumstances of falls so that appropriate falls prevention programmes could be formulated and implemented to suit the local setting and needs.

Methods

Study design

Data were collected from a cross-sectional study conducted in Perak, Malaysia in March 2011. Perak is the second largest state in Peninsular Malaysia. Located in the northern region, it borders Kedah to the north, Penang to the northwest, Pahang to the east and Selangor to the south. In 2010, the population in Perak was 8.3% (2.35 million) of the total Malaysian population with an ethnic composition of Malay (54.2%), Chinese (30.4%), Indian (12.3%) and others (3.1%). The socio-demographic background of the state population is similar to that of the whole country.[10] In this study, 50% of the districts located in the state of Perak (5 out of 10 districts namely Kampar, Kuala Kangsar, Parit Buntar, Gerik and Taiping) were randomly chosen. In each district, four villages were randomly selected from a list of villages provided by the State Department of Health. For each selected village, the Village Head provided a sampling frame consisting of the lists of available houses within their village. Each house was assigned a number and a total of 250 households were randomly selected based on the list of random numbers generated using the computer. The number of houses chosen from each village was proportional to the size of its population. The following analysis was performed based on a subset of a larger rural community health survey conducted. In total, 811 residents aged 60 years and above were included in the study. All residents were interviewed face-to-face in their respective houses during household visits by medically trained candidates and research assistants using a structured questionnaire to record information about socio-demographic details, history of falls, medical history, drug history and physical activity level. This study was approved by the Medical Ethics Committee of the University of Malaya Medical Centre. Written informed consent was obtained from the head of villages, as well as from all respondents.

Questionnaire

Each participant was required to complete a structured questionnaire based on the face-to-face interview. The questionnaire was based on the following:

Falls: Residents were asked if they had experienced falls in the past 1 year, irrespective of the number of falls. Fall was defined as an unexpected event in which the individual comes to rest on the ground, floor or lower level.[3] Those resulting from outside events, such as a motor vehicle accident or violence were excluded.

Socio-demographic variables: Demographic data include age, gender, race, religion, number of children and total income.

Physical activity: The level of physical activity of the participants was obtained using the International Physical Activity Questionnaire (IPAQ).[11] The items in IPAQ were structured to provide separate scores on walking; moderate-intensity; and vigorous-intensity activity, as well as a combined total score to describe overall level of activity. Computation of the

total score requires summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities. The levels of physical activity were then classified into three levels: low, moderate and high.

Number of co-morbidities: The diseases included were diabetes mellitus, hypertension, heart disease, stroke, hypercholesterolaemia, hearing impairment, urinary incontinence and obesity. Participants were asked if they had ever been informed by a doctor as having a diagnosis of diabetes mellitus, hypertension, heart disease, stroke and hypercholesterolaemia. Hearing impairment and urinary incontinence were self-reported.

Number of medications used: This includes medications for diabetes mellitus, hypertension, heart disease, stroke, hypercholesterolaemia and drugs that cause dizziness and sleepiness. Consumption of medications was self-reported and counter-checked by the interviewers during the house visit. They scored one point for consuming medication for a particular disease, regardless of the number of medications consumed for the same disease.

Living conditions: Information regarding participants' family structure (living alone or with spouse, children, family members), and number of family members living in the house were collected. Those living alone were defined as living by him/herself at home and independently able to carry out activities of daily living.

Statistical analysis

Prevalence was computed based on the self-reported falls in the past 1 year. Univariate logistic regression was used to compute crude odds ratios for all categorical variables. Adjusted odds ratio was computed using multivariate logistic regression models, including gender, age, ethnicity, total income, physical activity level, living alone, number of co-morbidities and number of medications used. The final model to determine the independent effect on falls was performed by adjusting for confounders. The associations were expressed as odds ratio and its 95% confidence interval. P-values were based on two-sided tests and were considered statistically significant at $p < 0.05$. All analyses were conducted using SPSS software (SPSS Inc, version 22.0).

Results

Prevalence of falls

A total of 811 elderly were included in the study. Table 1 shows the basic characteristics of the elderly population. The mean age of the participants was 70.21 ± 7.24 years. There were 10.4% more female participants compared to male. The distribution of the participants according to ethnic groups was comparable to the national census. Approximately 4.07% of the participants experienced a fall in the past 1 year. The majority of them (75.8%) fell in indoor settings. In the house, most of the fall incidents occurred at an outside compound (28%), followed by the bathroom (20%) and kitchen (20%) (Table 2).

Table 1: Basic socio-demographic characteristics of study participants

Variables	Number	Percentage
Gender		
Male	363	44.8
Female	448	55.2
Age (years)		
60–64	286	35.3
65–69	165	20.3
70–74	162	20.0
≥75	198	24.4
Ethnicity		
Malay	631	77.8
Chinese	140	17.3
Indian	28	34
Indigenous	12	1.5

Table 1: Basic socio-demographic characteristics of study participants (Continued)

Variables	Number	Percentage
Religion		
Islam	631	77.8
Christian	12	1.5
Buddhism	144	17.8
Hindu	14	1.7
Others	10	1.2
[a]No. of children		
≤5	406	50.4
6–10	363	45.1
>10	36	4.5
Total income (RM)		
≤ 300	462	57.0
301–500	104	12.8
501–1000	139	17.1
> 1000	106	13.1
Physical activity level		
High	263	32.4
Moderate	243	30.0
Low	305	37.6
**Living alone*		
Living alone	131	18.6
Not living alone	572	81.4

*Data with missing values.

Table 2: Location of falls in the house

Location	Frequency	Percentage
Bathroom	5	20
Kitchen	5	20
Living room	4	16
Bedroom	2	8
On the stairs	2	8
Outside compound	7	28

Factors associated with falls among elderly

Table 3 shows the crude odds ratio (COR) and adjusted odds ratio (AOR) of factors associated with falls. At bivariate level, there was no association between age and gender with the risk of falls among elderly. No significant increased risk of falls was found in elderly who have low physical activity level, multiple co-morbidities or consuming multiple medications.

Table 3: Correlates of falls among community-dwelling elderly

Variables	Percentage	Crude odds ratio (COR)	95% CI		[a]Adjusted odds ratio (AOR)	95% CI		*p-value
			Lower	Upper		Lower	Upper	
Gender								
Male	45.5	1.00	–	–	1.00	–	–	0.253
Female	54.5	0.97	0.48	1.96	0.60	0.25	1.44	
Age category (years)								
60–64	24.2	1.00	–	–	1.00	–	–	0.232
65–69	30.3	2.24	0.87	5.80	2.18	0.78	6.10	0.139
70–74	15.2	1.11	0.36	3.44	0.61	0.15	2.51	0.492
≥75	30.3	1.85	0.72	4.77	1.23	0.41	3.66	0.716
Ethnicity								
Malay	78.8	1.00	–	–	1.00	–	–	0.145
Chinese	12.1	0.68	0.24	1.99	0.61	0.20	1.86	0.386
Indian	3.0	0.86	0.11	6.59	0.77	0.10	6.16	0.808
Indigenous	6.1	4.65	0.97	22.33	**6.06**	**1.10**	**33.55**	**0.039**
Total income (RM)								
≤ 300	63.6	1.00	–	–	1.00	–	–	0.866
301–500	15.2	1.06	0.39	2.88	1.11	0.37	3.27	0.857
501–1000	12.1	0.62	0.21	1.84	0.68	0.21	2.21	0.525
>1000	9.1	0.61	0.18	2.09	0.70	0.18	2.66	0.597
Physical activity level								
High	24.2	1.00	–	–	1.00	–	–	0.623
Moderate	33.3	1.51	0.60	3.82	1.62	0.55	4.76	0.377
Low	42.4	1.53	0.63	3.72	1.58	0.57	4.38	0.383
Living alone	27.3	2.15	0.95	4.86	**2.60**	**1.04**	**6.50**	**0.042**
Number of co-morbidities	–	1.06	0.82	1.37	0.84	0.48	1.47	0.531
Number of medications used	–	1.17	0.90	1.53	1.25	0.68	2.32	0.472

[a] Final model from multiple logistic regression analysis including gender, age, ethnicity, total income, physical activity level, living alone, number of co-morbidities, number of medication used as shown in the table.

* *p*-value for adjusted odds ratio

In the multiple logistic regressions, the final model was simultaneously adjusted for gender, age, ethnicity, total income, physical activity level, living alone, number of co-morbidities and number of medications used. Living alone and ethnicity were found to be significant correlates for falls among the elderly. Elderly who lived alone had more than two-fold increase odds in the risk for falls (AOR = 2.60, 95% CI = 1.04–6.50, p = 0.042) compared with those living with family members/ relatives. Interestingly, indigenous elderly was found to have six times (AOR = 6.06, 95% CI = 1.10–33.55, p = 0.039) higher odds of experiencing falls.

Discussion

The prevalence of falls among the elderly in Malaysia's community setting, as determined by this study was 4.07%. This estimate appears to be fairly stable as the Third Malaysian National Health and Morbidity Survey in 2006 also reported a similar prevalence of 4%.[8] The prevalence of falls reported in Malaysia appeared to be lower when compared with other Asian countries such as Japan (15.8%),[12] Hong Kong (19.3%)[13] and China (11.1%).[14] The prevalence of falls is generally lower in this study, possibly reflecting a 'younger' elderly population in Malaysia

compared to these countries. More than half of the recruited participants (53.1%) in this study were aged 60–69 years. Falls occurred more commonly in indoor settings than outdoors. Location of falls was similar to those found in other studies.[7,8]

Living alone is a major factor associated with falls in this study. This finding has been reported by other recent studies, which suggested that the elderly who lives alone have twice or higher risk of falls and/or multiple falls compared to those who did not live alone.[7,15] The elderly who lives alone are likely to have lesser social support and fewer resources in time of needs. In addition, loneliness and social isolation are commonly experienced by elderly who lives alone, which may further exacerbate existing physical, cognitive and sensory limitations, and increase their risk of falls.[3] Another possible explanations of this increased risk of falls are psychological factors such as fear of falling. Older adults who live alone tend to have greater fear of falling compared to those who live with others.[15] Interestingly, Delbaere et al. reported that among elderly with excessive levels of perceived fall risk, 40% of them experienced multiple or injurious falls during the 1 year follow-up despite having low physiological fall risk.[16] The underlying mechanisms behind this relationship remains to be established, although the elderly with excessive levels of perceived fall risk in their study tend to show higher levels of depressive symptoms and decreased executive functioning, both of which are known risk factors for falls.[16] Psychological issues should also be considered managing for fall persons besides evaluating the physiological risk.

Another major factor associated with falls that deserves attention is the higher risk of falls found among the elderly of indigenous group. One in three indigenous people aged more than 65 years was reported to fall at least once per year.[17] There are a number of conditions that predispose indigenous elderly to higher risk of falling compared to other ethnic groups. Chronic diseases are more prevalent among indigenous people worldwide. These medical diseases increase the risk for fall by their complications such as diabetic retinopathy (which affects vision and predisposes to falls) and peripheral neuropathy (which leads to poor joint position sense and subsequently falls); poor nutrition; poor cardiovascular health and physical activity.[18] The economic and health status of the indigenous Malaysian population still lacks far behind that of other ethnic groups. This lack of parity covers life expectancy, childhood nutrition, and other well-being indicators.[19] It is therefore not surprising that minority indigenous elderly are more prone to falls due to interaction of these many risk factors. Furthermore, the majority of the indigenous Malaysian population lives in remote areas. As a result, access to healthcare services is limited.[19]

Both high and low levels of physical activity have been associated with increased fall risk in Caucasian older adults. A meta-analysis finding indicated that evidence increased or decreased physical activity in seniors as a major risk factor for falls and injurious falls is still inconclusive.[20] It is presumed that older adults with lower physical activity levels tend to be more frail due to muscle atrophy.[21] This directly restricts exposure to activities demanding higher neuromuscular and balance control and may lead to falls. Active older adults are more likely to fall outdoors due to a frequent exposure to risky environmental hazards (slippery floors, degraded pavements) or acute fatigue in daily life activities.[5] In a study conducted by a neighbouring country, the rate of falls among Singaporean elderly who practice Qigong (a form of physical activity engaged by the Chinese community) was lower compared to those who did not practice Qigong.[22] In this current study, there was no direct association between physical activity and risk of falls. The reason for this non-significant finding remains to be investigated. Possible explanations include underreporting of physical activity or fear of falling among elderly that may indirectly restrict elderly's activity. Clearly, more research is needed in this area to determine the various types and intensities of physical activity engaged by the elderly as they may serve as protective factors to falls.

Although there is evidence that medications are as risk factor for falls in Western elderly populations, this was not seen by this study. Fall risk has been found to be associated with the use of multiple medications, but only when at least one established fall risk-increasing drug (notably central nervous system drugs, psychotropic drugs and diuretics) was part of the daily regimen.[6] However, no respondent in this study (in the questionnaire) reported any usage of central nervous system drug or psychotropic drugs. A

larger sample is needed to address this issue. Similarly, no association was found between the number of co-morbidities and falls. The assessment of co-morbidities was dependent on the accuracy of the participants reporting their medical history – there may have been under-reporting. Future research should attempt to corroborate the self-reporting of diseases with medical records or caregivers' report.

There were some limitations in this study. Firstly, this study was cross-sectional in design and hence unable to determine the causal-effect relationship between falls and possible factors. Secondly, since screening for memory or cognitive testing was not performed among the participants, there was a possibility of recall bias, especially for the elders who tend to have poorer recall. Finally, the data collected did not ask the specific name of medications; hence fall risk-increasing drugs could not be defined. Other possible risk factors such as nutritional status, fall-related risk-taking behaviour and housing conditions could be included in future research to allow a more holistic assessment of risk factors associated with falls.

Conclusion

In conclusion, one in every 25 Malaysian elderly living in community setting experienced falls in the past 1 year. Living alone and being indigenous were major factors associated with falls among elderly. Preventive measures should be undertaken, which include providing social support and provision of health education to increase awareness among elderly. In addition, primary care physicians can provide comprehensive geriatric assessment for elderly including enquiry about living conditions and social support during screening or follow-up. Appropriate intervention to elderly living alone or with poor social support could be initiated, by referring them to social workers for welfare needs or to nurses for regular home visits.

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Conflict of interest

None.

How does this paper make a difference in general practice?

- The experience of falls among community-dwelling elderly is quite common. One in every 25 elderly reported fall in the past 1 year.
- Primary care physician should enquire about living conditions and social support of elderly while providing geriatric assessment during their follow-up.
- Healthcare providers at the primary care level can provide regular visits to elderly patients or refer them to social workers, especially for those living alone and with poor social support.

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