

## ORIGINAL ARTICLE

# Gender Differences in Sociodemographic, Environmental and Comorbidities Factors Associated With Unintentional Falls Among Elderly Patients

Zamzaliza Abdul Mulud<sup>1</sup>, Mohd Azrulhisham Mat Nawi<sup>1,2</sup>, Ahmad Furqan Zulkifli<sup>3</sup>, Norfidah Mohamad<sup>1</sup>, Rashidah Mohd Yusof<sup>1,4</sup>

<sup>1</sup> Centre for Nursing Studies, Faculty of Health Sciences, Universiti Teknologi MARA (UiTM) Selangor, Puncak Alam Campus, 42300 Selangor

<sup>2</sup> Cardiothoracic Intensive Care Unit (CICU), Hospital UiTM, Kampus Sg Buloh, 47000 Sungai Buloh, Selangor

<sup>3</sup> Orthopedic Department, University Malaya Medical Centre, 59100 Lembah Pantai, Kuala Lumpur

<sup>4</sup> Orthopedic Department, Hospital Sultan Haji Ahmad Shah, 28000, Temerloh, Pahang

## ABSTRACT

**Introduction:** The incidents of falls increase with age. However, it is yet to be established whether these associations are influenced by gender. Therefore, this study aimed to determine gender differences in fall-related injuries among older adults treated at the hospital emergency department. **Methods:** A retrospective study design was utilised in this study. The authors analysed emergency department visits data for July through December 2019 in a teaching hospital in Klang Valley, Malaysia. Data related to fall-related injuries in elderly patients was retrieved through the patient management system. The Emergency Department Falls Checklist has been used to compile all sociodemographic, environmental and comorbidities factors associated with falls in this study. **Results:** One hundred eighty-seven cases of fall-related injuries were documented, and 62.0% were women. Fractures accounted for 91.4% of all injuries. There was a significant difference among women and men in terms of age groups ( $p=0.032$ ), marital status ( $p=0.019$ ) and living arrangement ( $p=0.019$ ) fall incidence treated in the emergency department. We also found significant differences between genders in risk factors and comorbidities such as having diabetes mellitus ( $p=0.005$ ), visual impairment ( $p=0.009$ ), history of hospitalisation due to fall ( $p=0.042$ ) and history of fractures ( $p<0.001$ ). Women also demonstrated longer hospitalisation time (more than three days) compared to men ( $p=0.006$ ). **Conclusion:** Among older adults, unintentional falls are more prevalent among women. Thus, the findings highlight the importance of recognising these differences in detail and the situations in which the fall occurred since this information is vital to plan preventive actions.

*Malaysian Journal of Medicine and Health Sciences* (2022) 18(8):66-72. doi:10.47836/mjmhs18.8.10

**Keywords:** Accidental falls, Retrospective studies, Sex characteristics, Emergency service, Risk factors

## Corresponding Author:

Zamzaliza Abdul Mulud, PhD  
Email: zamzaliza@uitm.edu.my  
Tel: 03-32584305

## INTRODUCTION

It has been estimated that the 723 million world adult population consists of the elderly population aged 65 and above (1). Globally, the number of older adults is increasing and has doubled since 1980 (2). In Malaysia, The Department of Statistics (2016) projected that proportion of the elderly will increase from 5.0% in 2010 to 14.5% in 2040. With the rapid growth of the population aged 65 and above, it is vital to address age-related health issues, including falls.

Unintentional falls can be defined as “an event that results in a person coming to rest unintentionally on the ground or other lower level, not as a result of a major intrinsic event or overwhelming hazard” (3). The incidence of falls among the elderly has become one health issue that cannot be ignored, as one in three community-dwelling adults aged more than 65 years reported to suffer from falls at least once (4). Globally, it has been reported that the incidence rate for unintentional falls is 20% and contributed to the top leading death among older adults (5). In the Asian region, the rates of unintentional falls among the elderly ranged from 4.1% to 18.7% (6). Meanwhile, in Malaysia, although estimates of fall rates vary widely based on the region, age and living arrangements of the elderly population, it is estimated

that older adults with age of over 60 years old, the fall incidence ranged is in between 15% to 34% (7). In comparison, a community study conducted among elderly patients with diabetes mellitus, it was reported that the prevalence of falls was 18.8% (8).

Fall is a major health threat among the elderly as it can cause significant injury and increase the risk of early mortality. Severe immediate or late complications, for example, contusion, concussion, head injuries and fracture, especially proximal hip fracture among women (9,10), are the commonly reported outcomes of falls in elderly patients. Subsequently, a study found that 12% of elderly patients who fell needed long term nursing home care (11). In addition, the indirect difficulties associated with falls among this population include increasing financial constraints due to infection and the long duration of hospitalisation. Besides that, some of the fall incidences do not result in physical harm. Still, the event makes them fearful of falling, resulting in constraints on daily activities and eventually a decline in physical and emotional functioning (12). Past studies have reported that the consequences of falls are different between men and women, where women are prone to sustain multiple injuries such as head injuries and hip fractures following falls compared to men (9,11).

It is widely accepted that the factors associated with falls in older adults are complex and multidimensional. Both intrinsic and extrinsic factors contributed to this unfortunate event. In addition, previous data have observed that environmental factors (causes and time) are associated with falls (13). Although many studies reported that older women were more prone to fall (8,14,15), only a little discussion about the gender differences in sociodemographic, environmental, clinical factors, and consequences of fall. Two national studies conducted in Canada and England reported differences in factors contributing to unintentional fall in men and women (16,17). The findings from both studies indicated that factors like marital status, nutritional risk, high levels of pain, comorbidities, and poor balance differed among men and women. However, a lack of data on gender differences in factors contributing to falls among older patients presented at the emergency department in Malaysia. The data is crucial in providing the government and health care system with information on the factors contributing to falling so that preventive measures focusing on the target group can be implemented. Thus, this study aimed to investigate the gender differences in sociodemographic, environmental, clinical factors in fall-related injuries among older adults presented at an emergency department. The research questions that informed this study were as follow: 1) What are the differences in sociodemographic factors associated with unintentional falls between men and women? 2) What are the differences in environmental factors associated with unintentional falls between men and women? 3) What are the differences in comorbidities factors

associated with unintentional falls between men and women? 4) What are the differences in consequences of unintentional falls between men and women?

## MATERIALS AND METHODS

A retrospective study design was conducted to obtain information related to gender differences in sociodemographic, environmental and comorbidity factors of unintentional falls. This study was conducted at a teaching hospital located in Petaling Jaya, Malaysia. Petaling Jaya is located in the central region of Malaysia, with a population of 619,925 residents, according to Petaling Jaya City Council (18). This hospital's emergency department currently provides emergency services for patients based on triage criteria and priority, which operate for 24 hours. The emergency department also acts as a front-liners in delivering services for critically ill, semi-critical and non-critical patients.

The study population was all elderly patients (>60 years) who attended the emergency department from July 2019 to December 2019 with unintentional fall-related injuries. The sample size was calculated using G\*Power version 3.1.9.4. The minimum sample required for Chi-square analysis to detect a medium effect of 0.30, with a power of 95%, significant levels at 0.05, df of 1 is 145. Universal sampling was utilised to choose the records for this study, where all patients who attended the emergency department from July to December 2019 were included. In total, 187 records that fulfilled the study criteria were selected for final analysis. Patients with other falls such as motor-vehicle accidents, suicidal, industrial injuries, assault cases were excluded. For each record of emergency department visit, coders identify the cause of admission and select records of the elderly patients with falls. The researchers obtained permission from the Medical Record Unit for access to patient data, and the patients' chart was accessed using the online patient management system.

## Variables

The Emergency Department Falls Checklist by Miller et al., (13) has been used to compile sociodemographic characteristics, environmental factors, comorbidities, and consequences of fall-related injuries. The variables measured include sociodemographic and environmental factors, type of comorbidities and outcomes of falls. We hypothesised that sociodemographic factors such as age, marital status, living arrangement and type of house. In this study, we would like to determine whether there are any differences in these environmental factors between older men and women.

We had included the presence of comorbidities (diabetes mellitus, cardiovascular diseases, osteoarthritis, neurological conditions, dementia, visual impairment and previous history of fall-related hospitalisation, fracture and surgery) as these factors might contribute

to falls. Meanwhile, the consequences of falls were sequel or diagnosis, a total length of stay and fracture management. An emergency physician from this hospital validated the checklist as these are the common factors associated with unintentional falls.

Data are analysed using IBM SPSS version 21. Descriptive analyses such as frequency and percentage are used to present the participants' sociodemographic characteristics and incidence of falls in men and women. A Chi-square test  $\chi^2$  is used to determine whether the men-women differences in factors related to falls are statistically significant. The significance level is determined at  $p < 0.05$ .

### Ethical approval

We sought ethical approvals for this study from the UiTM Research Ethics Committee (REC/735/19) and the Medical Research Ethics Committee (MREC) of UMMC (ID No: 2019722-7671).

## RESULT

The overall results showed that fall-related injuries were higher among women (62.0%) than their male counterparts (38.0%). Table I shows the occurrence of falls was higher among elderly patients aged between 60 to 80 years old (54%), married (92%), living with

**Table 1 - Sociodemographic characteristics of elderly patients with fall-related injuries.**

Variables	Frequency	Percentage (%)
<b>Gender</b>		
Male	71	38.0
Female	116	62.0
<b>Age</b>		
60 – 80 years old	101	54.0
> 80 years old	86	46.0
<b>Marital status</b>		
Single/divorced	15	8.0
Married	172	92.0
<b>Living arrangement</b>		
With spouse	30	16.0
With other family members	157	84.0
<b>Type of house</b>		
Landed/Terrace	170	90.9
Apartment	17	9.1
<b>Cause of fall</b>		
Tripped/Slipped	168	89.8
Dizzy/Syncope	19	10.2
<b>Time of fall</b>		
0700 – 1900 hours	134	71.7
1900 – 0700 hours	53	28.3

other family members (84%) and living in landed or terrace houses (90.9%). The most reported cause of fall was tripped or slipped, which accounted for 89.9% of overall fall incidence. Meanwhile, most fall occurred in the daytime between 7.00 am to 7.00 pm (71.7%).

Concerning gender, sociodemographic characteristics and fall, there are significant differences in age ( $p=0.032$ ), marital status ( $p=0.019$ ), and living arrangement ( $p=0.019$ ) (Table II). Based on the record, the most common cause of fall was tripped or slipped. Meanwhile, falls commonly occurred in the daytime between 0700 to 1900. There was a significant difference between the time of fall between men and women ( $p=0.007$ ).

**Table II - Gender differences in sociodemographic characteristics and environmental factors in fall incidence treated in the emergency department.**

Variables	Re-spondents	Men	Wom-en	$\chi$	$p$
<b>Age</b>					
60 – 80 years old	101	45	56	4.405	0.032*
> 80 years old	86	26	60		
<b>Marital status</b>					
Single/divorced	15	10	5	5.703	0.019*
Married	172	61	111		
<b>Living arrangement</b>					
With spouse	30	17	13	5.305	0.019*
With other family members	157	54	103		
<b>Type of house</b>					
Landed/Terrace	170	61	109	3.453	0.057
Apartment	17	10	7		
<b>Cause of fall</b>					
Tripped/Slipped	168	62	96	1.811	0.202
Dizzy/Syncope	18	9	9		
<b>Time of fall</b>					
0700 – 1900 hours	134	43	91	6.937	0.007*
1900 – 0700 hours	53	28	25		

\* Significant at  $p < 0.05$

Table III shows that the majority of older adults presenting with falls at the emergency department have comorbidities such as diabetes mellitus (91.0%) and cardiovascular diseases (79.1%). In addition, unintentional falls were more prevalent among those older adults with visual impairment (91.4%) and a previous history of hospitalisation due to fall (82.9%). Gender differences can be observed in the presentation of comorbidities such as diabetes mellitus ( $p=0.005$ ), osteoarthritis ( $p=0.042$ ) and visual impairment ( $p=0.009$ ). Meanwhile, there are significant differences in the previous history of hospitalisation due to falls ( $p=0.042$ ), previous fracture ( $p < 0.001$ ) and surgery ( $p < 0.001$ ) between men and women.

**Table III - Association between risk factors and comorbidities with gender in fall incidence treated in the emergency department**

Variable	Respondents	Men	Women	$\chi$	$p$
<b>Diabetes Mellitus</b>					
Yes	170	59	111	8.449	0.005*
No	17	12	5		
<b>Cardiovascular diseases</b>					
Yes	148	56	92	0.005	0.542
No	39	15	24		
<b>Osteoarthritis</b>					
Yes	39	20	19	3.709	0.042*
No	148	51	97		
<b>Neurological conditions</b>					
Yes	15	9	6	3.361	0.062
No	172	62	110		
<b>Dementia</b>					
Yes	14	7	7	0.930	0.246
No	173	64	109		
<b>Visual impairment</b>					
Yes	171	60	111	7.039	0.009*
No	16	11	5		
<b>Previous hospitalisation due to fall</b>					
Yes	155	54	101	3.766	0.042*
No	32	17	15		
<b>Previous fracture</b>					
Yes	41	26	15	14.438	<0.001*
No	146	45	101		
<b>Previous surgery</b>					
Yes	27	20	7	17.467	<0.001*
No	160	51	109		

\* Significant at  $p<0.05$

Table IV show the differences in consequences of fall in men and women. The majority of older adults with unintentional falls were ended up with fractures (91.4%), hospitalised more than three days (67.9%) and required surgical intervention (77.0%). And in relation to the length of stay in the hospital, women need a more extended stay than men ( $p=0.006$ ).

**Table IV Gender differences in the consequences of fall.**

Variable	Respondents	Men	Women	$\chi$	$p$
<b>Sequel / Diagnosis</b>					
Soft tissue injury	16	9	7	2.483	0.097
Fracture	171	62	109		
<b>Total length of stay</b>					
Less than 3 days	50	27	23	6.325	0.006*
More than 3 days	137	44	93		
<b>Management</b>					
Surgery	144	55	99	0.014	0.528
Conservative	43	16	27		

\* Significant at  $p<0.05$

**DISCUSSION**

This study aimed to determine the gender differences in sociodemographics, environmental and comorbidity factors associated with unintentional falls in elderly patients aged 60 years and older treated in emergency departments. Understanding these differences is crucial to designing a preventive programme that suits a target and high-risk population. Previous local data related to fall were conducted among older adults in a community-dwelling, tertiary centre or those with specific comorbidity such as diabetes mellitus (8,19,20). In addition, most of the existing studies compared the incidence and factors associated with falls between fallers and non-faller (21). However, this study attempted to investigate the differences of these factors between men and women attending the emergency department. Therefore, the findings of this study contributed to the baseline information needed by the health care professionals to offer help and support as necessary to the elderly with unintentional falls.

**Characteristics and falls incidence**

Hundred and eighty-seven cases were fulfilled the inclusion criteria and included in the final analysis of this study. The visit to the emergency department by older adults appears associated chiefly with the trauma related to falls. Based on the admission record to the emergency department, the incidence of unintentional falls is more prevalent among women than men. This study found that almost two-thirds of emergency department admission related to fall-related injuries are women than men at a comparable age. The finding is

also in agreement with previous studies conducted in Taiwan (22) United Kingdom (23), and Canada (17) that women are more prone to injuries or trauma related to fall incidences. Physically and physiologically, women are different from men. An Irish study in 2021 reported that when measured using the Timed Up and Go test, women were significantly low in functional mobility and limited lower extremity strength and balance than their male counterparts (1). Hormonal changes associated with ageing and inadequate nutritional intake may contribute to impaired mobility among women (24) and consequently increase the risk for falls. However, head injuries resulting from falls are more prevalent among men than women, making that falls will cause severe consequences, including fatal among men (25).

#### **Gender differences in sociodemographic factors associated with unintentional falls.**

Significant gender differences also are found in sociodemographic factors associated with falls. In this study, data shows that women tend to sustain fall at a later age than men. Recent data from the United Nations Population Division estimates that the world life expectancy is 73.2 years, with women are expected to live longer (75.6 years) than men (70.8 years) (2). Thus, this indirectly explains why more women aged 80 and above present to the emergency department with falls-related injuries. On the other hand, frailty is also significantly prevalent with advancing age (1). Interestingly, the incidence of falls is also with other sociodemographic factors such as marital status and living arrangement. One might think that if older adult lives with their spouse and family members, the risk of falls will be significantly lower; however, this is not the case in this study. Like other Asian countries, Malaysian are known for filial piety values or “respect for one’s elders” (26). A sense of cultural commitment and respectful values encourage the younger generation to accept the responsibilities as caregivers for their older parents. Larger proportions of women who sustained fall-related injuries live with their spouses and other family members. Living in an extended family means there will be a lot of works that need to be done and might involve significant physical activities and indirectly become a factor for falls.

#### **Gender differences in environmental factors associated with unintentional falls.**

We hypothesised that there would be a significant difference in the type of housing and causes of falls between men and women. However, this study found no significant differences between these factors. The only difference is with the time of falls occurred. Most of the fall incidence happened during the day, with 60.6% of older men and 78.4% of women reporting that they sustained the injuries between 7.00 am to 7.00 pm. A high incidence of falls was observed during the day, and it can be related to the number of tasks performed being higher than at night. The finding is in accordance with

data reported in the literature (27).

#### **Gender differences in comorbidities factors associated with unintentional falls.**

Previous data reported that comorbidities are associated with the risk of falls among older adults. Polypharmacy, frailty, and impaired nutritional and functional status are among the comorbidities’ health outcomes (28). Thus, increase the risk of falls among the elderly population. However, this current study analysed the gender differences of these factors. The record shows that 90.1% of the elderly suffer from falls had diabetes mellitus, and significant differences between men and women can be observed. Women with diabetes mellitus had more incidence of falls than men. Diabetes long term complications such as neuropathy, impaired vision and delayed wound healing may increase the risk of falls among the elderly population (8,19). Thus, falls are commonly higher among elderly patients with diabetes mellitus than the general population.

More older men with osteoarthritis presented to the ED with fall-related injuries than women. Global and national data are in agreement that osteoarthritis is more prevalent among women than men (29). However, since this is a single-centre study, the might be an underrepresentation of osteoarthritis cases. On the other hand, the symptoms of osteoarthritis like chronic pain and imbalances contributed to the risk of falls. A study by van Shoor et al. (30) found that the risk for recurrent falls (twice or more falls) among the elderly with osteoarthritis is increased 1.5 times compared with those without osteoarthritis.

Another health-related factor associated with falls among the elderly patients presented to the emergency department is visual impairment. As visual impairment is highly correlated with diabetes, these cases are higher among the elderly presented with falls. Ninety-five per cent of women are reported as having a visual impairment, and this data is almost similar to the reported diabetes mellitus cases in this study. In another local study among the elderly attending tertiary centre, diabetic retinopathy predicts falls (8).

In this study, significant differences between men and women can also be observed in the history of the previous hospitalisation due to falls, fractures, and surgery. Recurrent falls are significantly related to the prior incidence of falls (30).

#### **Gender differences in consequences of unintentional falls.**

Length of stay following fall-related injuries is more prolonged in older women than men, indicating they sustained more severe consequences from falls. In this study, almost 95% of older women have diabetes mellitus; therefore, any injuries or wounds will require more time to heal than those without diabetes. Statistically, osteoporosis is higher among older women,

which is one of the factors contributing to falls and hip fractures. In 2050, it is projected that 21 000 fractures will occur annually due to falls and osteoporosis, costing approximately MYR520 million (USD125 million) in health care expenditure (31).

### Strength and limitation

It is also crucial to address the limitations of this study. As we extracted the data solely from patients' medical records, other important factors such as functional ability, cognitive status and location of falls cannot be compiled. Then, the focus of this study is only for older adults presented to the emergency department with falls-related injuries, so we cannot generalise the findings to falls that happened in the community or unreported incidence.

However, notwithstanding the limitations, it is essential to acknowledge the contribution of this study findings. We observe significant differences in sociodemographic, environmental, and comorbidities factors between men and women who sustained fall-related injuries. Thus, the findings highlight the importance of designing appropriate interventions to tailor to the high-risk group.

### CONCLUSION

In conclusion, this study aimed to determine the differences in factors contributing to falls between men and women presented to the emergency department. As most of the local studies reported the factors associated with falls, this current study highlighted the gender differences in these factors. This study found that the incidence of unintentional falls is higher among women than men. Significant gender differences can be observed in sociodemographic factors such as age, marital status and time of fall. On the other hand, comorbidities such as diabetes mellitus, osteoarthritis, and having a visual impairment are also reported to be different in men and women. Lastly, women are found to stay longer time in the hospital due to their fall-related injuries compared to men.

### ACKNOWLEDGEMENTS

We would like to express our gratitude to all individuals directly or indirectly involved and who contributed to all stages of this study.

### REFERENCES

1. O'connell ML, Coppinger T, Lacey S, Arsenic T, McCarthy AL. The Gender-Specific Relationship between Nutritional Status, Physical Activity and Functional Mobility in Irish Community-Dwelling Older Adults. *Int J Environ Res Public Health*. 2021;18(16).
2. United Nations Department of Economic and Social Affairs Population Division. World Population Ageing 2019 [Internet]. Vol. Highlights, World Population Ageing 2019. 2019. 64p. Available from: <http://www.un.org/esa/population/publications/worldageing19502050/pdf/65executivesummaryspanish.pdf> [http://link.springer.com/chapter/10.1007/978-94-007-5204-7\\_6](http://link.springer.com/chapter/10.1007/978-94-007-5204-7_6)
3. Falls [Internet]. [cited 2021 Oct 24]. Available from: <https://www.who.int/news-room/fact-sheets/detail/falls>
4. Hart LA, Phelan EA, Yi JY, Marcum ZA, Gray SL. Use of Fall Risk-Increasing Drugs Around a Fall-Related Injury in Older Adults: A Systematic Review. *J Am Geriatr Soc*. 2020;68(6):1334–43.
5. Kioh SH, Rashid A. The prevalence and the risk of falls among institutionalised elderly in penang, malaysia. *Med J Malaysia*. 2018;73(4):212–9.
6. Pengpid S, Peltzer K. Prevalence and Risk Factors Associated with Injurious Falls among Community-Dwelling Older Adults in Indonesia. *Curr Gerontol Geriatr Res*. 2018;2018.
7. Ibrahim A, Ajit DKS, Shahar S, Omar MA. Timed up and go test combined with self-rated multifactorial questionnaire on falls risk and sociodemographic factors predicts falls among community-dwelling older adults better than the timed up and go test on its own. *J Multidiscip Healthc*. 2017;10:409–16.
8. Azidah AK, Hasniza H, Zunaina E. Prevalence of falls and its associated factors among elderly diabetes in a tertiary center, Malaysia. *Curr Gerontol Geriatr Res*. 2012;2012.
9. Gioffrè-Florio M, Murabito LM, Visalli C, Pergolizzi FP, Fama F. Trauma in elderly patients: A study of prevalence, comorbidities and gender differences. *G di Chir*. 2018;39(1):35–40.
10. Schoeneberg C, Probst T, Schilling M, Wegner A, Hussmann B, Lendemans S. Mortality in severely injured elderly patients: A retrospective analysis of a German level 1 trauma center (2002-2011). *Scand J Trauma Resusc Emerg Med*. 2014;22(1).
11. Stevens JA, Sogolow ED. Gender differences for non-fatal unintentional fall related injuries among older adults. *Inj Prev*. 2005;11(2):115–9.
12. Sekaran NK, Choi H, Hayward RA, Langa KM. Fall-associated difficulty with activities of daily living in functionally independent individuals aged 65 to 69 in the United States: A cohort study. *J Am Geriatr Soc*. 2013;61(1):96–100.
13. Miller E, Wightman E, Rumbolt K, McConnell S, Berg K, Devereaux M, et al. Management of fall-related injuries in the elderly: A retrospective chart review of patients presenting to the emergency department of a community-based teaching hospital. *Physiother Canada*. 2009;61(1):26–37.
14. Murabito LM, Visalli C, Pergolizzi FP, Fama F. original article Trauma in elderly patients: a study of prevalence , comorbidities. *G di Chir*. 2018;39(1):35–40.

15. Ozen PhD B, Demir PhD G. A Determinant for Falls and Risk Factors in the Elderly: Daytime Sleepiness. *Int J Caring Sci.* 2020;13(1):732–7.
16. Gale C, Cooper C, Aihie Sayer A. Prevalence and risk factors for falls in older men and women: The English Longitudinal Study of Ageing. *Age Ageing.* 2016;45(6):789–94.
17. Chang V, Do M. Risk factors for falls among seniors: implications of gender. *Am J Epidemiol.* 2015;181(7):521–31.
18. Background | Official Portal of Petaling Jaya City Council (MBPJ) [Internet]. [cited 2021 Oct 23]. Available from: <https://www.mbpj.gov.my/en/mbpj/profile/background>
19. Leong Joyce WS, Zukri INM, Ching SM, Devaraj NK. Factors associated with falls among the elderly attending a government clinic in Kuala Lumpur. *Malaysian J Med Heal Sci.* 2020;16(1):183–90.
20. Yeong UY, Tan SY, Yap JF, Choo Wy. Prevalence of falls among community-dwelling elderly and its associated factors: A cross-sectional study in Perak, Malaysia. *Malaysian Fam Physician.* 2016;11(1):7–14.
21. Leong JWS, Nadia I, Zukri M, Ching SM, Devaraj NK. Factors Associated With Falls among the Elderly Attending a Government Clinic in Kuala Lumpur. *Malaysian Journal of Medicine and Health Sciences.* 2020; 16(1): 183-190
22. Tsai YJ, Yang PY, Yang YC, Lin MR, Wang YW. Prevalence and risk factors of falls among community-dwelling older people: results from three consecutive waves of the national health interview survey in Taiwan. *BMC Geriatr.* 2020; 20(1):1–11.
23. Gale CR, Westbury LD, Cooper C, Dennison EM. Risk factors for incident falls in older men and women: The English longitudinal study of ageing. *BMC Geriatr.* 2018;18(1):1–9.
24. Ge L, Yap CW, Heng BH. Association of Nutritional Status with Physical Function and Disability in Community-Dwelling Older Adults: A Longitudinal Data Analysis.. 2020;39(2):131–42.
25. Kim SH, Kim S, Cho GC, Lee JH, Park EJ, Lee DH. Characteristics of fall-related head injury versus non-head injury in the older adults. *BMC Geriatr.* 2021;21(1):1–11.
26. Miyawaki CE. A review of ethnicity, culture, and acculturation among Asian caregivers of older adults (2000-2012). *SAGE Open.* 2015;5(1).
27. Meschial WC, Soares DFP de P, de Oliveira NLB, Nespollo AM, da Silva WA, Santil FL de P. Idosos vítimas de quedas atendidos por serviços pré-hospitalares: Diferenças de gênero. *Rev Bras Epidemiol.* 2014;17(1):3–16.
28. StJohn PD, Tyas SL, Menec V, Tate R. Multimorbidity, disability, and mortality in community-dwelling older adults. *Can Fam Physician.* 2014;60(5):e272.
29. Kamsan SS, Singh DKA, Tan MP, Kumar S. Healthcare utilization and knee osteoarthritis symptoms among urban older Malaysian. *Int J Environ Res Public Health.* 2021;18(7).
30. van Schoor NM, Dennison E, Castell M V., Cooper C, Edwards MH, Maggi S, et al. Clinical osteoarthritis of the hip and knee and fall risk: The role of low physical functioning and pain medication. *Semin Arthritis Rheum.* 2020 Jun 1;50(3):380–6.
31. Ong T, Khor HM, Kumar CS, Singh S, Chong EGM, Gantheil K, et al. The Current and Future Challenges of Hip Fracture Management in Malaysia. *Malaysian Orthop J.* 2020;14(3):16.