Fall Awareness Behaviour And Its Associated Factors Among Community Dwelling Older Adults

GOH JING WEN

Universiti Kebangsaan Malaysia

Devinder Kaur Ajit Singh (✉ devinder@ukm.edu.my)

Universiti Kebangsaan Malaysia <https://orcid.org/0000-0002-6551-0437>

NORMALA MESBAH

Universiti Kebangsaan Malaysia

ANIS AFIFA MOHD HANAFI

Universiti Kebangsaan Malaysia

ADLYN FARHANA AZWAN

Universiti Kebangsaan Malaysia

Research article

Keywords: Fall awareness behaviour, Fall strategy, Fall prevention, Older adults, Older people

Posted Date: August 14th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-54230/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published at BMC Geriatrics on April 6th, 2021. See the published version at <https://doi.org/10.1186/s12877-021-02122-z>.

Abstract

Falls are one of the major causes of mortality and morbidity in older adults. However, despite adoption of prevention strategies, the number of falls in older adults has not declined. The aim of this study was to examine fall awareness behaviour and its associated factors. A total of 140 community dwelling older adults (mean age of 70.69 ± 4.3 years) participated in this study. Physical performance was assessed using timed up and go (TUG), gait speed (GS), chair stand and hand grip tests. Fall Awareness Behaviour (FaB) and Fall Risk Assessment Questionnaires (FRAQ) were administered to assess behaviours and fall prevention knowledge respectively. Stepwise linear regression analysis showed that the practice of fall awareness behaviours ($R^2 = .256$) was significantly associated with being male [95% C.I.: 2.178 to 7.789, $p < .001$], having lower BMI [95% C.I.: -0.692 to -0.135, $p < .05$], living with family [95% C.I.: 0.022 to 5.953, $p < .05$] and those having higher functional mobility [95% C.I.: -2.008 to -0.164, $p < .05$]. Fall awareness behaviours should be emphasized among older females, those with lower functional mobility, higher BMI and living alone.

Introduction

Falls are a public health concern that results in increased mortality and morbidity among older adults (Yamazaki et al., 2017). Falls can lead to devastating health consequences, including injuries, hospitalization, emergency department visits and increased health care burden among older population (NICE, 2015 update 2017). Unintentional falls have been identified as a fifth leading cause of death among older adults (Ambrose et al., 2013). The overall prevalence of falls among Malaysian community dwelling older adults is estimated to be between 4.2–61% depending on its settings (Shaharudin et al., 2018). This is a higher prevalence as compared to other Asian (17.2%–36.8%) (Mane et al., 2014) and Western (27%–29%) (Filho et al., 2019) population.

An increased risk of falling has been reported among older adults with multiple health related problems, including osteoporosis, low calcium levels, loss of bone mineral density, low body mass index, loss of muscle strength, visual impairments, neuromuscular disorders (Parkinson disease) and cognitive impairment (Alzheimer's, dementia). Carelessness, lack of physical activity, wearing of inappropriate shoes and improper use of assistive devices, can intensify risk of falling (Ambrose et al., 2013). In addition, post-fall psychological problems, fear of falling can also place older adults at an increased risk of falling (Pitchai et al., 2019).

Almost one-quarter of older adults restrict themselves in daily living activities, with about 30%, 45% and 24% of older adults limiting indoor, outdoor and both indoor and outdoor activities respectively (Mane et al., 2014). This restriction may lead to falls and consequently disabilities. The risk is also significantly increased among those older adults who have not modified their home environment. Strategies of falls prevention adopted and practised by older adults include being aware of falling and recognising their limitations when participating in an activity (Uymaz & Nahcivan, 2015).

A number of factors associated with adoption of falls prevention practices among older adults have been identified in existing literature, including gender, age, educational level, living status, health status, socioeconomic status, cognitive impairment, depression, impaired mobility, falls prevention knowledge and previous experience of falls (Dickinson et al., 2011; Merom et al., 2012; Stineman et al., 2011). Out of these, Gaspar et al. (2017) found that there was higher adoption of falls prevention practices among older male adults, those who have good self-rated health status and higher education level. A significant association has also been found between age and adoption of falls prevention whereby older adults tend to behave in a safer way with advancing age (Bilik et al., 2017). Often, older adults use assistive devices (walkers or walking sticks) to assist in their ambulation and balance, and this has led to slower and more careful movements to protect themselves from a fall (Bilik et al., 2017).

Despite having various falls prevention educational programmes in place, participation of older adults in falls prevention is still limited. For example, some older persons still have negative perceptions on falls prevention recommendation, different beliefs and denial of having fall risks (Stevens et al., 2018). Moreover, falls prevention practices have not been adopted among older adults globally (Gopaul & Connelly, 2012). This could possibly stem from their refusal to acknowledge their weakness and being afraid to be seen as old (Stevens et al., 2018). It is also noteworthy that most older people failed to recognize their falls risk and did not consider it as a priority and disagreed with home modification (Stevens et al., 2018). In Malaysia, older adults are worried about the stigma of looking weak and frail and feel embarrassed about using walking aids (Loganathan et al., 2016).

The existing evidence suggests that falls prevention intervention should focus on risk factors (Rubenstein et al., 2011; Tricco et al., 2017). Currently, there is a lack of information regarding falls awareness and associated factors among older adults, specific to a multicultural population such as in Malaysia. This information is essential in designing falls prevention strategies specifically tailored for personalised client centred care.

Study Purposes And Hypothesis

This paper sets out a hypothesis that there is an association between falls and certain prevention behaviours in socio-demographic, physical and clinical factors. The aim of this present study was to examine the association between falls prevention behaviour, socio-demographic, physical and clinical factors among community dwelling older adult. Sociodemographic comorbidity factors of interest consisted of age, gender, race, number of comorbidities, living status and education level. Physical factors considered included mobility status, lower and upper limb muscle strength. Clinical factors examined were knowledge of falls, comorbidity, history of falls and number of falls.

Declaration Of Interest Statement

We are broadly interested in studying the relationship between falls prevention behaviours, socio-demographic, physical and clinical factors among community dwelling older adult. We hereby declare that this research paper represents our own work and it has not been previously included in a dissertation or thesis submitted to this or any other institution. We have read the University's current research ethics guidelines, and agree with the responsibility for

conducting the research procedures. We have attempted to determine and deal with all the risks related to this research that may arise in conducting this research, obtained the ethical approval, and acknowledged the rights of the participants and our obligation.

Methodology

Study Design

This descriptive and cross-sectional study was conducted in a number of districts in the state of Selangor, Malaysia, where the number of older adults is most dense, namely Tanjung Sepat, Cheras, Kajang, Dato Keramat, Petaling Jaya, Klang, Sepang, Rasa, Kuala Selangor and Sekinchan between September and November 2018. The study comprised of community dwelling older adults aged 60 and above.

Recruitment of participants

Multi-stage random sampling method was utilised to recruit the participants, which was conducted in three stages, namely Primary Sampling Unit (PSU), Secondary Sampling Unit (SSU) and Tertiary Sampling Unit (TSU). PSU involved the random selection of different states within four regions, while SSU was the selection of thirty-five Census Circle (CC) from each selected states. The final stages was TSU in which twenty Living Quarters (LQ) was randomly selected from each CC.

Inclusion and exclusion criteria

Older adults who attended the session were screened to meet the inclusion criteria. All participants were screened for cognitive impairment using Mini Mental State Examination (MMSE) and depression using Geriatric Depression Scale (GDS-15). Inclusion criteria included older adults who had no permanent disability or impairments, and were able to give consent independently, able to ambulate independently with or without assistive devices for at least 6 meters. The exclusion criteria were those who scored MMSE scores ≤ 24 , GDS-15 ≥ 6 , having recent lower limb fractures and acute illnesses.

Data collection

Verbal and written information regarding the procedure of study were provided to all participants. Subsequently, informed consent forms were signed by participants prior to data collection.

Demographic data

A face to face interview was conducted to obtain the sociodemographic data and medical history of participants and included questions focusing on age, race, gender, employment status, education level, living status, number of falls within past twelve months, self-reported medical history (hypertension, diabetes, heart disease, joint pain, incontinence, vision impairments) and medications taken.

Outcome Measures

Falls awareness was assessed using Fall Awareness Behaviour Questionnaire (FaB) (Clemson et al., 2003). The FaB is a self-rating scale utilised to assess the actions and behaviours that older adults usually practiced to prevent falling. The scale is made of thirty items and ten subscales. The subscales are: (1) protective mobility (5 items); (2) cognitive adaptations (6 items); (3) awareness (4 items); (4) avoidance (5 items); (5) pace (2 items); (6) practical strategies (3 items); (7) being observant (1 item); (8) displacing activities (1 item); (9) changes in level (2 items) and; (10) getting to phone (1 item). For each scale, the participants were required to give a score based on four categories, never, sometimes, often and always. The data was analysed based on its total score and scores could range from 30 (risky fall behaviour) to 120 (safest falls prevention behaviour). The lower the score, the more likely a person would engage in risky behaviours. Higher scores indicated a person who was more likely to be aware of falls prevention. FaB was found to have a high validity with internal consistency of 0.84 and content validity index of 0.93 (Clemson et al., 2003). The scale has been adapted for Malaysian culture in a previous local study. For the adapted scale, the Cronbach's Alpha coefficients was 0.723 with the removal of two items, indicating an acceptable internal consistency.

Fall Risk Assessment Questionnaire (FRAQ) was used to assess falls prevention knowledge among older adults (Sadowski et al., 2006). It consists of twenty-two questions and these questions evaluate falls prevention knowledge based on the aspects of: (1) behaviours (eight items); (2) environmental (five items); (3) medical condition (six items) and; (4) medication (three items). The total full score for this questionnaire is 21. Higher score suggests higher knowledge of falls among older adults (Rubenstein et al., 2011). FRAQ was found to have a strong agreement with clinical evaluation ($\kappa = .875$, $p < 0.001$) and good validity. The kappa value for individual items is ranged from 0.305 to 0.832 (Rubenstein et al., 2011). The Malay version of FRAQ used in this study was one that had been translated for a previous local study. Its internal consistency had a Cronbach's alpha value of 0.748 after removing one item.

Participants performed timed-up and go (TUG) test to assess balance and mobility status (Podsiadlo & Richardson, 1991). TUG test was found to have high sensitivity and specificity value of 87% (Shumway-Cook et al, 2000). The time taken from standing up from an armless chair with 46 cm height, walking 3 m towards a cone at their usual and comfortable pace, turning, walking back towards the chair and sitting down was recorded in seconds. The participants were instructed to wear their shoes and were allowed to walk with or without assistive devices. Time taken to complete the test was recorded in seconds.

Six-meter gait speed was performed by participants as a measure of functional mobility. Time taken to complete walking at own pace for a distance of six meters was taken in seconds. Time taken to complete the test was recorded.

30 seconds chair stand test was used to measure of lower limb muscle strength among the older adults. A 17 inches (43.2 cm) plastic chair without arm rests was placed against the wall to prevent the chair from slipping during the test. Participants were required to sit with their backs against the backrest, arms crossed against their chest, feet with shoulder distance apart and placed firmly on the floor. Participants were instructed to stand and sit as many times as

possible within 30 seconds. One repetition was considered as a complete sit and stand. Chair stand test has been shown to have a high test-retest correlation for both men (0.84) and women (0.92) (Jones et al., 1999). This test also has a good criterion related validity, $r = .78$ in men and $r = .71$ (Jones et al., 1999).

Dominant hand grip strength testing has been shown to have good validity with high correlation ($r = .99$, $p < .001$) (de Dobbeleer et al., 2019). The participants were asked to sit upright with elbow and shoulders positioned at a 90-degree angle, and forearms placed in neutral position. The participants were required to squeeze the dynamometer handle as hard as possible using their dominant hand on the command 'start' and sustain it for three seconds. This test was conducted twice and the maximum reading was taken as the result.

Data Analysis

Data was analysed using IBM Statistical Package for Social Sciences (SPSS) software version 23.0, IBM Corporation, United States. Statistical analysis of Alpha level 0.05 was utilised in all statistical tests. Kolmogorov-Smirnov and Shapiro-Wilk tests were employed to determine whether the data was normally distributed. Non-parametric tests were used in statistical analysis if the data was not normally distributed. Descriptive statistics were presented as means, standard deviations (age, MMSE scores, GDS-15 scores, BMI, FRAQ scores, FaB scores, TUG, gait speed, hand grip strength, chair stand tests) and percentages (gender, race, education status, marital status, living status, working status, number of comorbidities, number of medication, fall history) where appropriate.

Stepwise linear regression analysis with 5% significance level at Alpha level 0.05 was used to analyse the association between the practice of falls prevention behaviours (dependent variables) and sociodemographic factors (age, gender, race, number of comorbidity, marital status, employment status, living status and education level), physical factors (mobility status, lower limb and upper limb muscle strength) and clinical factors (knowledge of falls, comorbidity, history of falls and number of falls).

Results

Table 1 depicts comparison of sociodemographic data among community dwelling older adults categorised as fallers and non-fallers. Fallers were defined as older adults who had experienced falls in past 12 months, while non-fallers were those who had no falls within past year. Twenty-two percent of the participants had a history of a fall or falls within the past year. There was no significant difference ($p > .05$) between fallers and non-faller groups, except for gender. A majority of participants who were classified as fallers were females (30%) ($p = .03$). Although not significant faller group had lower mean scores for FaB (50.77 ± 7.7) and FRAQ (12.10 ± 3.3) compared to the non faller group (FaB = 53.97 ± 9.9 ; FRAQ = 12.35 ± 2.9) ($p > .05$).

Table 1
Sociodemographic of participants categorized based on fallers and non-fallers

Variables	Total Participants (n = 144)	Fallers (n = 31; 21.5%)	Non-fallers (n = 113; 78.5%)	P value
<i>Sociodemographic profiles</i>				
Age; mean (SD)	70.69 (4.3)	71.45 (4.6)	70.49 (4.2)	.27
MMSE; mean (SD)	27.88 (1.6)	27.71 (1.4)	27.92 (1.7)	.53
GDS; mean (SD)	1.49 (1.5)	1.58 (1.5)	1.47 (1.5)	.71
Gender; n (%)	71 (49.3)	10 (14.1)	61 (85.9)	.03*
Male	73 (50.7)	21 (28.8)	52 (71.2)	
Female				
Race; n (%)	65 (45.1)	10 (15.4)	55 (84.6)	.15
Malay	60 (41.7)	16 (26.7)	44 (73.3)	
Chinese	19 (13.2)	5 (26.3)	14 (73.7)	
India				
Education level; n (%)	8 (5.6)	3 (37.5)	5 (62.5)	.28
No education	40 (27.8)	9 (22.5)	31 (77.5)	
Primary	70 (48.6)	14 (20.0)	56 (80.8)	
Secondary	24 (16.7)	5 (20.8)	19 (79.2)	
Tertiary	2 (1.4)	0	2 (100)	
Others				
Marital status; n (%)	2 (1.4)	1 (50.0)	1 (50.0)	.81
Single	112 (77.8)	23 (20.5)	89 (79.5)	
Married	2 (1.4)	0	2 (100.0)	
Divorce	28 (19.4)	7 (25.0)	21 (75.0)	
Others				
Working status; n (%)	64 (44.4)	17 (26.6)	47 (73.4)	.20
Not working/ housewife	63 (43.8)	11 (17.5)	52 (82.5)	
Retired	5 (3.5)	2 (40.0)	3 (60.0)	
Retired but working	12 (8.3)	1 (8.3)	11 (91.7)	
Working				
Living status; n (%)	4 (2.8)	2 (50.0)	2 (50.0)	.29
Living alone	46 (31.9)	12 (26.1)	34 (73.9)	
Living with husband/ wife	88 (61.1)	15 (17.0)	73 (83.0)	
Living with husband/ wife/ child/ grandchild	6 (4.2)	2 (33.3)	4 (66.7)	
Others				
BMI (kg/m ²); mean (SD)	26.30 (5.29)	25.26 (4.5)	26.62 (5.5)	.20
<i>Clinical factors</i>				

*p < 0.05, Independent t-test

Variables	Total Participants (n = 144)	Fallers (n = 31; 21.5%)	Non-fallers (n = 113; 78.5%)	P value
No of comorbidity; n (%)	4 (2.8)	0	4 (100.0)	.09
No comorbidity	19 (13.2)	2 (10.5)	17 (89.5)	
One comorbidity	121 (84.0)	29 (24.0)	92 (76.0)	
≥ 2 comorbidities				
No of medication; n (%)	106 (73.6)	20 (18.9)	86 (81.1)	.46
< 3 medication	38 (26.4)	11 (28.9)	27 (71.1)	
≥ 3 medication				
Falls history in past 12 months; n (%)	113 (78.5)	0	113 (100)	.001
No falls	31 (21.5)	31 (100)	0	
≥ One fall				
<i>Falls knowledge</i>				
FRAQ; mean (SD)	12.30 (3.0)	12.10 (3.3)	12.35 (2.9)	.67
<i>Falls behaviours</i>				
FaB; mean (SD)	53.30 (9.5)	50.77 (7.7)	53.97 (9.9)	.10
<i>Physical test</i>				
Timed up and go test (sec); mean (SD)	10.17 (1.6)	10.41 (1.9)	10.10 (1.5)	.34
6 meters Gait speed test (m/ sec); mean (SD)	1.12 (0.7)	1.29 (1.4)	1.07 (0.2)	.42
30 seconds Chair stand test; mean (SD)	11.4 (2.4)	11.74 (2.9)	11.30 (2.3)	.37
Dominant Hand grip strength test (kg); mean (SD)	21.37 (6.8)	19.61 (6.4)	21.85 (6.9)	.11
<i>*p < 0.05, Independent t-test</i>				

Based on total FaB scores analysis, gender, BMI category, comorbidity and physical mobility (TUG test) were shown to be significantly different ($p < .05$) (Table 2). The total FaB scores were significantly higher among males (56.13 ± 10.35) compared to females (50.51 ± 7.71) ($p < .05$). While the TUG cut-off used in our study was 11.18 s (Ibrahim, Singh, & Shahar, 2017), older adults who took less time to complete the TUG test (54.31 ± 9.50) scored significantly higher in FaB as compared to those who took a longer time to complete the TUG test (50.19 ± 8.94) ($p < .05$). Post hoc analysis (using an α of 0.05) for BMI group and comorbidity were conducted. The analysis revealed that older adults who were underweight (65.71 ± 11.95) had significantly higher FaB scores than those who with normal weight (55.38 ± 9.33), overweight (51.84 ± 8.55) and obese (49.44 ± 8.68) ($p < .05$). However, there was no significant difference between FaB scores of older adults who were normal weight and overweight ($p > .05$), nor between the FaB scores of those who were overweight and obese ($p > .05$). Post hoc analysis also found that there were significantly higher scores of FAB between those without comorbidity (63.00 ± 12.79) and with more than two comorbidities (52.46 ± 8.56) ($p < .05$).

Table 2
Comparison of sociodemographic profiles, clinical and physical factors according to subscale scores of FaB

Variables	Total score; mean $\pm$ SD	Cognitive adaptation; mean $\pm$ SD	Protective mobility; mean $\pm$ SD	Avoidance; mean $\pm$ SD	Awareness; mean $\pm$ SD	Pace; mean $\pm$ SD	Practical strategies; mean $\pm$ SD	Displacing activities; mean $\pm$ SD	Being observant; mean $\pm$ SD	Changes in level; mean $\pm$ SD	Ge to ph m $\pm$ SD
<i>Sociodemographic profiles</i>											
Age	53.91 $\pm$ 9.01	10.00 $\pm$ 3.32	10.78 $\pm$ 3.73	10.00 $\pm$ 3.20	6.63 $\pm$ 2.76	5.21 $\pm$ 1.57	7.72 $\pm$ 2.32	3.30 $\pm$ 1.00	1.48 $\pm$ 0.99	2.37 $\pm$ 1.51	1.0 $\pm$ 1.0
65–69;n(67)					6.77 $\pm$ 2.82						
70–74;n(48)	53.19 $\pm$ 10.79	9.75 $\pm$ 3.47	10.44 $\pm$ 3.43	9.38 $\pm$ 2.51	6.19 $\pm$ 2.04	5.71 $\pm$ 1.50	7.65 $\pm$ 2.58	3.19 $\pm$ 1.14	1.35 $\pm$ 0.86	2.46 $\pm$ 1.34	2.0 $\pm$ 1.0
75–79;n(21)		8.81 $\pm$ 3.36	9.38 $\pm$ 2.78	9.71 $\pm$ 2.95	6.38 $\pm$ 2.26	5.81 $\pm$ 1.36	7.48 $\pm$ 1.89	3.19 $\pm$ 1.25	1.38 $\pm$ 0.74	1.71 $\pm$ 0.64	2.0 $\pm$ 1.0
80–84;n(8)	50.41 $\pm$ 6.54	11.5 $\pm$ 3.89	11.88 $\pm$ 4.40	9.25 $\pm$ 3.11		5.38 $\pm$ 0.52	7.13 $\pm$ 2.36	3.00 $\pm$ 1.07	2.00 $\pm$ 1.20	2.75 $\pm$ 1.91	2.0 $\pm$ 1.0
	56.13 $\pm$ 11.74										
Gender	***	***	10.63 $\pm$ 3.88	***	6.83 $\pm$ 2.72	5.42 $\pm$ 1.42	*	3.34 $\pm$ 1.04	1.58 $\pm$ 1.08	2.44 $\pm$ 1.34	1.0 $\pm$ 1.0
			10.41 $\pm$ 3.23			5.52 $\pm$ 1.56		3.12 $\pm$ 1.12	1.33 $\pm$ 0.75	2.22 $\pm$ 1.45	1.0 $\pm$ 1.0
Male;n(71)	56.13 $\pm$	10.97 $\pm$ 3.66		10.79 $\pm$ 2.90	6.37 $\pm$ 2.57		8.08 $\pm$ 2.49				
Female;n(73)		8.71 $\pm$ 2.77		8.66 $\pm$ 2.56			7.18 $\pm$ 2.10				
	10.35										
	50.51 $\pm$ 7.71										
Education level	50.18 $\pm$ 7.63	8.13 $\pm$ 3.87	***	**	5.88 $\pm$ 2.17	5.00 $\pm$ 0.93	7.13 $\pm$ 2.3	3.75 $\pm$ 0.46	*	1.63 $\pm$ 0.92	2.0 $\pm$ 1.0
No education;n(8)		10.60 $\pm$ 2.92	10.88 $\pm$ 5.00	8.38 $\pm$ 1.92	7.15 $\pm$ 2.37		8.08 $\pm$ 2.52		1.25 $\pm$ 0.71	2.18 $\pm$ 1.41	1.0 $\pm$ 1.0
Primary;n(40)	56.31 $\pm$ 7.22			9.38 $\pm$ 2.52	6.30 $\pm$ 2.83	5.65 $\pm$ 1.76		2.95 $\pm$ 1.20			1.0 $\pm$ 1.0
Secondary;n(70)		9.41 $\pm$ 3.47	12.40 $\pm$ 3.18	9.46 $\pm$ 2.91	6.83 $\pm$ 2.73		7.16 $\pm$ 2.24		1.75 $\pm$ 1.15	2.33 $\pm$ 1.29	2.0 $\pm$ 1.0
Tertiary;n(24)	51.33 $\pm$ 10.14	10.04 $\pm$ 3.74	9.57 $\pm$ 3.35	11.08 $\pm$ 3.31	6.00	5.40 $\pm$ 1.46	8.42 $\pm$ 2.15	3.29 $\pm$ 1.07	1.37 $\pm$ 0.80	2.79 $\pm$ 1.67	1.0 $\pm$ 0.0
Others;n(2)	54.44 $\pm$ 10.50	113.00 $\pm$ 1.41	9.92 $\pm$ 3.16	14.00 $\pm$ 2.83		5.58 $\pm$ 1.32	7.5 $\pm$ 2.12	3.42 $\pm$ 0.93	1.17 $\pm$ 0.70	2.50 $\pm$ 2.12	1.0 $\pm$ 0.0
	59.53 $\pm$ 6.16		12.00 $\pm$ 4.24			5.00		2.50 $\pm$ 2.12	2.50 $\pm$ 2.12		
Living status	47.40 $\pm$ 6.91	6.25 $\pm$ 2.99	8.50 $\pm$ 2.65	8.75 $\pm$ 3.59	6.75 $\pm$ 2.63	5.75 $\pm$ 1.71	6.50 $\pm$ 1.29	3.25 $\pm$ 1.50	1.00	2.00 $\pm$ 0.82	1.0 $\pm$ 1.0
Living alone;n(4)		9.50 $\pm$ 3.29		9.57 $\pm$ 2.90	6.41 $\pm$ 2.48				1.46 $\pm$ 0.96	2.33 $\pm$ 1.28	1.0 $\pm$ 1.0
Living with husband/ wife;n(46)	51.59 $\pm$ 9.87	10.09 $\pm$ 3.39	9.70 $\pm$ 3.45	9.83 $\pm$ 2.96	6.65 $\pm$ 2.74	5.52 $\pm$ 1.35	7.48 $\pm$ 2.18	3.35 $\pm$ 0.99	1.50 $\pm$ 0.96	2.32 $\pm$ 1.47	1.0 $\pm$ 1.0
Living with husband/ wife/ child/ grandchild;n(88)	54.41 $\pm$ 9.40	10.83 $\pm$ 4.26	11.11 $\pm$ 3.63	9.67 $\pm$ 2.66	7.17 $\pm$ 3.06	5.38 $\pm$ 1.56	7.75 $\pm$ 2.48	3.17 $\pm$ 1.11	1.00	2.67 $\pm$ 1.51	1.0 $\pm$ 0.0
Others;n(6)	53.53 $\pm$ 8.12		9.50 $\pm$ 2.17			6.33 $\pm$ 1.37	7.67 $\pm$ 1.97	3.17 $\pm$ 1.33			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$,Independent t -test, One-way ANOVA

Variables	Total score; mean $\pm$ SD	Cognitive adaptation; mean $\pm$ SD	Protective mobility; mean $\pm$ SD	Avoidance; mean $\pm$ SD	Awareness; mean $\pm$ SD	Pace; mean $\pm$ SD	Practical strategies; mean $\pm$ SD	Displacing activities; mean $\pm$ SD	Being observant; mean $\pm$ SD	Changes in level; mean $\pm$ SD	Gender to primary mean $\pm$ SD
BMI	***	12.80 $\pm$ 5.54	13.60 $\pm$ 3.21	**	6.60 $\pm$ 3.78	5.40 $\pm$ 0.55	*	3.20 $\pm$ 1.30	1.20 $\pm$ 0.45	3.60 $\pm$ 2.07	2.40 $\pm$ 1.10
Under weight;n(5)	65.71 $\pm$ 11.95	10.34 $\pm$ 3.38	11.00 $\pm$ 3.83	13.20 $\pm$ 2.95	6.57 $\pm$ 2.51	5.66 $\pm$ 1.49	10.40 $\pm$ 1.82	3.29 $\pm$ 1.12	1.52 $\pm$ 0.94	2.34 $\pm$ 1.29	1.90 $\pm$ 1.10
Normal weight;n(58)	55.38 $\pm$ 9.33	9.38 $\pm$ 3.47	10.26 $\pm$ 3.20	10.36 $\pm$ 2.84	6.93 $\pm$ 2.94	5.53 $\pm$ 1.41	7.78 $\pm$ 2.35	3.25 $\pm$ 1.02	1.51 $\pm$ 0.99	2.13 $\pm$ 1.23	1.80 $\pm$ 1.10
Overweight;n(53)	51.84 $\pm$ 8.55		9.46 $\pm$ 3.37			5.00 $\pm$ 1.70		3.07 $\pm$ 1.12	1.25 $\pm$ 0.84	2.43 $\pm$ 1.69	1.80 $\pm$ 1.10
	49.44 $\pm$ 8.68										
Obese;n(28)		9.07 $\pm$ 2.60		9.17 $\pm$ 2.76	8.75 $\pm$ 2.77		7.47 $\pm$ 2.37				
							7.11 $\pm$ 2.04				
<i>Clinical factors</i>											
No of comorbidity	*	*	13.25 $\pm$ 2.22	8.75 $\pm$ 1.71	**	6.50 $\pm$ 1.29	9.75 $\pm$ 2.22	2.50 $\pm$ 1.73	*	3.50 $\pm$ 1.73	2.40 $\pm$ 1.10
No comorbidity;n(4)	63.00 $\pm$ 12.79	12.50 $\pm$ 3.70	10.74 $\pm$ 4.41	10.95 $\pm$ 3.21	8.00 $\pm$ 2.16	5.47 $\pm$ 1.84	7.79 $\pm$ 2.82	3.53 $\pm$ 0.70	2.50 $\pm$ 1.29	2.21 $\pm$ 1.58	2.00 $\pm$ 1.10
One comorbidity;n(19)	56.46 $\pm$ 12.90	11.32 $\pm$ 3.71	10.40 $\pm$ 3.43	9.55 $\pm$ 2.88	6.81 $\pm$ 2.49	5.44 $\pm$ 1.44	7.53 $\pm$ 2.24	3.21 $\pm$ 1.10	1.68 $\pm$ 1.06	2.31 $\pm$ 1.35	1.80 $\pm$ 1.10
≥ 2 comorbidities;n(121)	52.46 $\pm$ 8.56	9.50 $\pm$ 3.29							1.39 $\pm$ 0.88		
No of medication	53.36 $\pm$ 9.39	9.82 $\pm$ 3.46	10.58 $\pm$ 3.72	9.73 $\pm$ 2.85	6.48 $\pm$ 2.68	5.37 $\pm$ 1.46	7.54 $\pm$ 2.31	3.24 $\pm$ 1.07	1.49 $\pm$ 0.96	2.36 $\pm$ 1.44	1.90 $\pm$ 1.10
< 3 medication;n(106)	53.05 $\pm$ 9.93	9.84 $\pm$ 3.36	10.37 $\pm$ 3.11	9.66 $\pm$ 3.17	6.92 $\pm$ 2.54	5.76 $\pm$ 1.57	7.87 $\pm$ 2.43	3.21 $\pm$ 1.14	1.34 $\pm$ 0.85	2.24 $\pm$ 1.28	1.90 $\pm$ 1.10
≥ 3 medication;n(38)											
Falls history in past 12 months	50.77 $\pm$ 7.75	9.16 $\pm$ 3.18	9.65 $\pm$ 3.50	8.84 $\pm$ 2.79	6.03 $\pm$ 2.12	5.61 $\pm$ 1.33	7.48 $\pm$ 2.05	3.23 $\pm$ 1.06	1.35 $\pm$ 0.80	2.23 $\pm$ 1.36	2.00 $\pm$ 1.10
No falls;n(31)	53.97 $\pm$ 9.85	10.01 $\pm$ 3.47	10.76 $\pm$ 3.55	9.95 $\pm$ 2.93	6.75 $\pm$ 2.76	5.43 $\pm$ 1.53	7.66 $\pm$ 2.42	3.23 $\pm$ 1.09	1.48 $\pm$ 0.97	2.35 $\pm$ 1.41	1.80 $\pm$ 1.10
$\geq$ One falls;n(113)											
<i>Physical test</i>											
TUG test	*	10.09 $\pm$ 3.48	*	*	6.61 $\pm$ 2.77	5.55 $\pm$ 1.42	7.75 $\pm$ 2.32	3.23 $\pm$ 1.10	1.48 $\pm$ 0.96	*	1.80 $\pm$ 1.10
< 11.18 s;n(108)	54.31 $\pm$ 9.50	9.03 $\pm$ 3.14	10.88 $\pm$ 3.41	9.99 $\pm$ 3.06	6.56 $\pm$ 2.25	5.25 $\pm$ 1.68	7.25 $\pm$ 2.39	3.22 $\pm$ 1.05	1.36 $\pm$ 0.83	2.44 $\pm$ 1.48	1.90 $\pm$ 1.10
≥ 11.18 s;n(36)	50.19 $\pm$ 8.94		9.44 $\pm$ 3.81	8.86 $\pm$ 2.29						1.97 $\pm$ 1.03	
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$,Independent t-test, One-way ANOVA											

When the sociodemographic profiles, clinical factors and physical tests were assessed according to FaB subscales, significant differences were identified in the subscales of *cognitive adaptation*, *protective mobility*, *awareness*, *avoidance*, *practical strategies*, *being observant* and *changes in level* ($p < .05$). Males obtained significantly higher scores for *cognitive adaptation* ($p < .001$), *avoidance* ($p < .001$) and *practical strategies* ($p < .05$) subscales compared to females. The participants with primary education were found to have a better score for *protective mobility* subscales ($p < .001$) compared to those without any education, secondary or tertiary. In addition, the *avoidance* ($p < .05$) and *practical strategies* ($p < .05$) subscales were also significantly higher among older adults who were underweight. In terms of clinical factors, participants without any comorbidity were reported to score significantly higher in *cognitive adaptation* ($p < .05$), *awareness* ($p < .05$) and *being observant* ($p < .05$) subscales. Participants who took less than 11.18 s to complete TUG test achieved significantly higher scores for *protective mobility* ($p < .05$), *avoidance* ($p < .05$) and *changes in level* ($p < .05$) subscales in comparison to those who took a longer time to complete TUG test.

Stepwise linear regression results of the association between sociodemographic profiles, clinical and physical factors, falls knowledge and awareness, and the practice of its prevention behaviours ($R^2 = .256$) are as depicted in Table 3. When assessed based on the FaB total mean score, older males [95% C.I: 2.178

to 7.789, $p < .001$] and those living with family [95% C.I: 0.022 to 5.953, $p < .05$] were found to have higher scores in practice of falls prevention behaviours compared to females and those living alone. Mean BMI [95% C.I: -0.692 to -0.135, $p < .05$] and TUG test [95% C.I: -2.008 to -0.164, $p < .05$] were inversely proportional to FaB scores, indicating participants with lower BMI and took less time to complete the TUG test had higher falls prevention practice scores. Although not statistically significant ($p > .05$), the participants with fewer comorbidity were more likely to anticipate these prevention behaviours actively [95% C.I: -1.313 to -0.64, $p > .05$].

Table 3
Linear regression (Stepwise) model : Variables associated with fall prevention practices among older adults

Linear regression (Stepwise) model : variables associated with fall prevention practices among older adults							
Variables	Unstandardized Coefficients	Standardized Coefficients	95% C.I for Beta		Collinearity Statistics	P-value	R ²
	B(S)	Beta	Lower	Upper	Tolerance		
Male	4.984 (1.419)	0.263	2.178	7.789	0.961	.001*	.256
TUG Test	-1.086 (0.466)	-0.182	-2.008	-0.164	0.881	.02*	
No. of comorbidity	-0.625 (0.348)	-0.141	-1.313	0.64	0.871	.075	
BMI (mean)	-0.414 (0.141)	-0.230	-0.692	-0.135	0.876	.004*	
Living with family (husband,/wife and children	2.988 (1.5)	0.154	0.022	5.953	0.905	.05*	
Linear Reggression (Stepwise) test of association*p < = 0.05. Excluded variables : Race, Age, Years of education, Working status, Hand Grip test, Chair stand test,Gait speed test, History of fall, No. of fall, Total FRAQ							

Discussion

The identification of falls awareness and practice of its prevention is of utmost importance prior to falls prevention intervention. The aim of our study was to determine the sociodemographic, clinical and physical factors associated with falls awareness and falls prevention behaviour among community dwelling older adults. In our study, we found that there was a significant association between the practice of falls prevention behaviour with males, having lower BMI, having higher functional mobility and living with family in Malaysian based community dwelling older adults.

Falls prevention behaviours were significantly associated with gender, male older adults having higher prevalence of falls prevention practice, specifically *cognitive adaptation*, *avoidance* and *practical strategies* subscales compared to females. This result is consistent with a study by Gaspar et al. (2017), where males were shown to be more active in falls prevention practices compared to females. Similarly, a moderate to strong significant association was found between males who actively involved in self-management of falls prevention behaviour in another recent study (Schnock et al., 2019).

Moreover, it was shown that there is greater adherence in falls prevention programmes among males compared to female older adults (Stineman et al., 2011). Although females were reported to be more active in seeking medical attention after a fall or to gather more information about falls prevention compared to males, they were more inclined to limit their daily activities and physical function due to fear of falls (Batra et al., 2013; Stevens et al., 2010). We also deduced that higher falls prevention practice among male older adults in our study findings could be linked to the fact that there is a higher likelihood of falls among females established in the literature (Sousa et al., 2017).

The relationship between higher falls prevention behaviour and living with family was demonstrated in our study. The plausible explanation for this could be that older adults who live alone practice restriction in their daily activities due to fear of falls, which may in turn reduce their engagement in falls prevention behavior (Schnock et al., 2019). Generally, older adults living with family members are known to have more social support which empowers them to participate and engage in daily activities (Durbin et al., 2016; Elliott et al., 2009). Moreover, family members could have played a role in providing falls prevention and environmental hazards awareness besides discouraging risky behaviours among older adults (Durbin et al., 2016).

Although not significant, our study revealed a negative association between falls prevention behaviour and the number of comorbidities, with higher number of comorbidities related to lower scores in falls prevention practice. It is worth noting that participants without any comorbidity were particularly more careful and aware of external fall risk factors, as they scored higher in these FaB subscales. These results are consistent with findings that, participation in fall prevention behaviour was higher in older adults who actively managed their health (Kiyoshi-Teo et al., 2019). Polypharmacy as a result of multiple comorbidities would increase risk of falls among older adults (Ambrose et al., 2013) thereby limiting their daily living activities to keep themselves safe. This may reduce their engagement in falls prevention practices (Casteel et al., 2018).

An association between increased falls risk in older adults with higher BMI has been highlighted in literature (Neri et al., 2019). In older adults, excessive weight may result in a reduction of muscle strength and consequently reduce physical function (Kalyani et al., 2014). This may explain the results in our study whereby older adults with obesity were associated with lower involvement in falls prevention practices due to physical inability (Fjeldstad et al., 2008). In addition, older adults with obesity have been shown to be more likely to have fatalistic view that no efforts can be taken to prevent themselves from falls (Mitchell et al., 2014). Decrease in physical activity levels, postural stability and physical functional levels due to obesity could possibly compound the reason for lower engagements in overall activities (Fjeldstad et al., 2008).

In line with the results of our study, previous studies have demonstrated that independent older adults had greater interest and engagement in falls prevention practices compared to older adults who are dependent (Gaspar et al., 2017). Participants who were more aware about falls prevention behaviour practices

took shorter time to complete TUG test in our study. This group of participants also scored higher in *changes in level* subscale, in which they had more ability to cope with the challenging activities, especially when climbing up and down stairs.

This result suggests that falls prevention practices were less common among older adults with reduced functional mobility. With deterioration of physical function, mobility and self-management ability due to reduced muscle mass and increased fear of falling, older adults were less likely to engage in falls prevention practices (Lee et al., 2017; Olij et al., 2019). Furthermore, older adults who are dependent have difficulty in performing a task or activity in addition to fear of falls during movements (Cawthon et al., 2019; Lee et al., 2017). Therefore, they are unable and less willing to engage actively in falls prevention practices compared to older adults with greater mobility.

While there was no significant relation between falls risk knowledge and the practice of its preventive behaviours in our study, fallers had lower mean scores of FRAQ compared to non-fallers. The practice of falls prevention among older adults could be significantly influenced by falls risk knowledge and awareness whereby higher educational levels can lead to better prevention behaviours (Gaspar et al., 2017). Often, older adults with higher education levels tend to acquire more information compared to those with lower education levels (Feinberg et al., 2016). With higher levels of education, older adults probably understand guidance by health care professionals, and practise falls prevention behaviour in their daily routine.

One limitation is that this study was conducted among community dwelling older adults and therefore the results may not be applicable to older adults in institutions or hospitals. Moreover, this study was conducted in a single state in Malaysia. However, we used multistage random sampling methods to best represent the outcome. Future large-scale studies are required to determine the factors associated with falls prevention behaviour practice among older adults.

Conclusion

Our present study identified four factors associated in falls prevention behaviour practices among older adults which includes, being males, living with family, having lower BMI and higher functional mobility. Addressing these factors may be helpful in empowering at-risk older adults in falls prevention behaviours. The findings from our current study suggest that there is a need to empower older adults to engage in falls prevention behaviour, especially among women, those with high BMI, lower functional mobility and living alone.

Declarations

AVAILABILITY OF DATA AND MATERIALS

The material analyzed during the current study is not publicly available. Datasets generated may be available from the principal investigator (DKAS) on reasonable request, after ethical considerations.

ETHICS

This study was approved by the Research and Ethics Committee of Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2018-559). Participants provided written informed consent prior to the study.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTEREST

The authors declare that they have no conflict of interest.

FUNDING

This study was funded using grants from Universiti Kebangsaan Malaysia and The Ministry of Education (MOE), Malaysia (DCP-2017-002/2 and LRGS/BU/2012/UKM-UKM/K/01).

AUTHORS' CONTRIBUTIONS

DKAS and NM designed the study. GJW, AAMH & AFA collected the data, performed the statistical analyses and wrote the first draft of the manuscript with supervision from DKAS. Interpretation of the data: DKAS, NM, GJW, AAMH & AFA. DKAS critically revised the manuscript. All authors read and approved the final version of the manuscript.

ACKNOWLEDGEMENTS

The authors thank all participants for their participation and the LRGS team for their help and support rendered in the study.