Original Article

Factors Associated with Falls Among Community-Dwelling Older People in Taiwan

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Abstract

Introduction: Falls are common among older people. Previous studies have shown that falls were multifactorial. However, data regarding community-dwelling Chinese population are minimal. We aimed to study factors associated with falls among community-dwelling older Chinese people. Materials and Methods: We conducted a cross-sectional study in a community hospital in Taiwan in 2010. Our sample included 671 elders from the 3680 examinees of the free annual Senior Citizens Health Examination. Participants were interviewed with a detailed questionnaire, and 317 elders were further invited for serum vitamin D tests. The main outcome was falls in the previous 12 months. Predictor variables included sociodemographic characteristics, lifestyle risk factors, body stature, frailty, serum 25 (OH) D levels, and medications. Results: The mean age of the 671 participants was 75.7 ± 6.4 years old, and 48.7% of which were female. Fallers comprised 21.0% of the study population. In multivariate models, female gender (adjusted odds ratio (aOR): 2.32), loss of height in adulthood (aOR: 1.52), low body weight (aOR: 2.69), central obesity (aOR: 1.67), frailty (aOR: 1.56), polypharmacy (aOR: 2.18) and hyperglycaemia (aOR: 1.56) were factors associated with falls. Vitamin D insufficiency (serum 25 (OH) D levels <30 ng/mL) was not associated with falls (OR: 0.78; 95% CI, 0.38 to 1.60) (n = 317) in this study. Conclusion: Among community-dwelling older people in Taiwan, falls were mainly associated with female gender, polypharmacy, frailty, reduced body height, low body weight or central obesity, and hyperglycaemia. In addition to other risk factors, body stature should be considered as a novel risk factor when screening elders at risk for falls.

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Key words: Accidental falls, Aged, Risk factors

Introduction

Falls are an important issue in geriatric medicine. Falls are particularly associated with increased morbidity, disability, lower quality of life, and earlier entry into residential care.[1,2] Injuries resulting from falls are usually much more severe in older people than in younger generations owing to poor functional reserve. Falls contribute to the occurrence of fractures in 5% of community-dwelling older people.[3] In Taiwan, recent prevalence of falls was 22.7%.[4]

Falls may be a key signal of unmet medical needs and should trigger an in-depth diagnostic process and clinical intervention accordingly.[5] Over 60% of falls are attributable to multiple causes, and the most effective fall prevention strategies are multidisciplinary intervention targeting various factors.[2,6] Previous reports have shown that female gender,[4] physical frailty,[7] depression,[8] vitamin D deficiency,[9] and polypharmacy[10] were all linked to increased risk for falls. Preventing falls requires the identification of these interacting factors and the selection of the population most in need.[11]

Although many studies have discussed risk factors for falls, the majority of existing literature was based on the Caucasian population. Not many studies discussed falls

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in the Asian population.[12,13] However, the fall incidence in Chinese older people has been reported to be half that of Caucasian counterparts, and risk profile for falls differ between the 2 ethnicities.[12] To our knowledge, a comprehensive study evaluating factors contributing to falls in the Asian population is yet minimal.

Given the complexity of the geriatric conditions, we hypothesised that falls are positively associated with female gender,[4] frailty,[7] polypharmacy,[10] and vitamin D deficiency.[9] We aimed to identify intrinsic factors contributing to falls among community-dwelling older people in Taiwan.

Materials and Methods

Participants

We conducted a hospital-based, cross-sectional study in 2010. Each year, the Taipei City Government provides free annual Senior Citizens Health Examination for residents aged over 65 and native Taiwanese over 55 years old in several local hospitals. Our population of interest was community-dwelling senior citizens in Taipei City, Taiwan. Eligible candidates were ambulatory older people who participated in the health exam in a city hospital. Exclusion criteria included inability to provide reliable data, cognitively impaired, difficulties communicating face to face, reluctant to join the study, and being at risk of possible adverse effects.

A total of 3680 health examinees were identified in 2010. By drawing paper lots, we designated whom to be invited for study participation, as shown in Figure 1. We recruited 671 (18.2%) residents for a detailed questionnaire interview (the questionnaire group). Among them, 317 (47.2%) participants were further invited for serum vitamin D (25(OH)D) tests (the vitamin D test group). Oral and written informed consent was obtained.

Measurements

The health examination included: physical examination, laboratory tests, and screening for mood disorder (brief symptom rating scale (BSRS)).[14] BSRS questionnaire identified depression and anxiety disorders in non-psychiatric medical settings with 78.9% sensitivity and 74.3% specificity.[14] BSRS-6, its 6-item version, was used specifically for depression screening. Having depressive disorder was defined as BSRS-6 score above zero in our study. Participants were asked to fast overnight before the next morning's examination and all samples were processed in a standardised laboratory. Low body weight, normal weight, overweight and obesity were defined as body mass index (BMI, kg/m^2) <18.5, between 18.5 and 24, between 24 and 27, and ≥27, respectively, according to the national guidelines released by the Department of Health, Taiwan.[15,16] Central obesity was defined as abdominal girth ≥80 cm and ≥90 cm in females and males, respectively. Basic demographic characteristics and data about lifestyle habits were also collected.

The detailed questionnaire additionally assessed frailty status, medications and long-term medical conditions. Participants were considered civil servants if their job before retirement was military, police, government worker or teacher. Polypharmacy was defined as concomitant use of more than 4 drugs.[10] Self-reported loss of body height was defined as a greater than 3 cm decrease in stature after the age of 40. Frailty was assessed by the Chinese-Canadian study of health and aging clinical frailty scale (CSHA-CFS), which had inter-rater reliability of weighted kappa of 0.68 and criterion validity of weighted kappa of 0.69.[17] We dichotomised participants into frail (CSHA-CFS category ≥4) or robust (CSHA-CFS category ≤3).

Serum 25(OH)D level was measured by DiaSorin 25-Hydroxyvitamin D 125I RIA (DiaSorin Company, Italy)

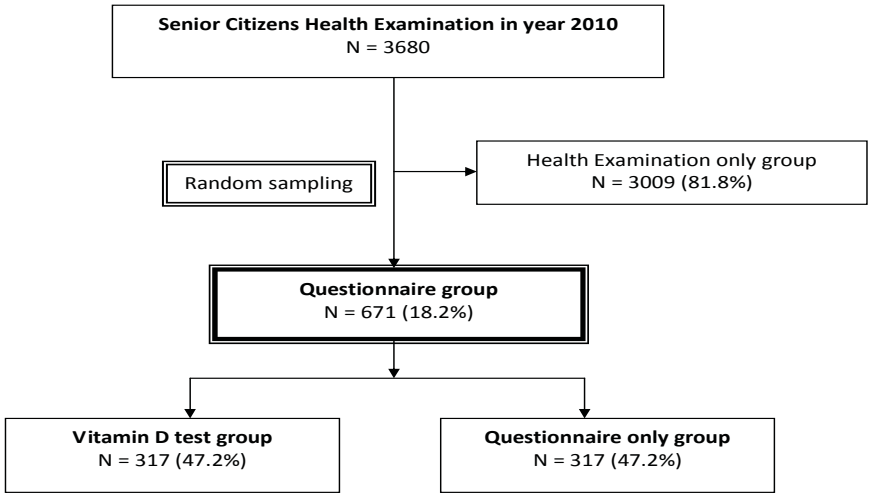

Fig. 1. Flowchart of the study design.

within 2 months (May 15 to July 6) to minimise seasonal variation. The sensitivity of the assay was ≤1.5 ng/mL and the specificity was 100%. Vitamin D insufficiency and deficiency were defined as serum 25 (OH)D levels <30 ng/mL or <20 ng/mL, respectively.

Our main outcome variable (falls in the last 12 months) was based on self report and defined as when a subject unintentionally comes to rest on the ground or on some other lower level, not as a result of a major intrinsic event or overwhelming hazard.[18] This study was approved by the Institutional Review Board of Taipei City Hospital, Taiwan [TCHIRB-990204].

Statistical Analysis

SPSS 16.0 for Windows (SPSS Inc., IBM Company, Chicago, USA) was used with P <0.05 for 2-tailed tests considered statistically significant. Student's t and chi-square tests were used as appropriate. Univariate logistic regression was used to estimate the effect of different factors on falls in the form of odds ratios. Only significant variables in univariate models entered into multivariate models. Multivariate analysis (MANOVA) was used to link lifestyle habits with serum vitamin D levels and numbers of falls.

Results

There were in total 671 enrollees aged 55 to 94 (the questionnaire group). Table 1 summarises the baseline characteristics: the vitamin D test group (n = 317), the questionnaire only group (n = 354), and the health examination only group (n = 3009). The mean ± SD age was 75.5 ± 5.9, 75.9 ± 6.9, and 75.4 ± 6.8 years old, respectively. Females comprised 52.1%, 45.8%, and 50.1% of these populations, respectively. There was no significant difference among groups with regard to education level, perceived economic status, or living status. General health status was similar regarding self-rated health, percentage with depression or with chronic disease. Lifestyle habits

Table 1. Comparability of the 3 Groups who Participated in the Senior Citizens Health Examination in a Taipei City Hospital in 2010 (n = 3680)

Variables	Vitamin D Test Group (n = 317)*		Questionnaire Only Group (n = 354)†		Health Examination Only Group (n = 3009)‡		*P* Value
	N	%	N	%	N	%	
Demographic Characteristics							
Age (years) (mean, (SD))	75.5 (5.9)		75.9 (6.9)		75.4 (6.8)		0.51
Gender (female)	165	52.1	162	45.8	1507	50.1	0.22
Education (elementary and over)	300	94.6	342	96.6	2842	94.5	0.26
Living in the nearby district	176	55.5	191	54.1	1610	53.6	0.79
Having a partner	236	74.4	256	72.3	2268	75.4	0.43
Living alone	34	10.7	56	15.8	368	12.2	0.10
Job before retirement (civil servant)	137	43.2	159	45.2	-	-	0.61
Perceived economic status (good)	272	86.3	282	81.0	-	-	0.07
General Health							
Depressive disorders (BSRS-6 score ≥1)	198	62.5	204	57.6	1691	56.2	0.10
Having chronic disease	243	76.7	290	81.9	2460	81.8	0.08
Self-rated health (good)	255	82.3	274	79.7		-	0.40
Lifestyle Habits					-		
Smoking (regular)	10	3.2	18	5.1	88	2.9	0.09
Drinking	76	24.0	97	27.4	724	24.1	0.38
Regular exercise	193	60.9	235	66.4	1998	66.4	0.14
Teeth brushing	287	90.5	324	91.5	2685	89.2	0.34
Drinking milk everyday	189	59.6	197	55.6	1655	55.0	0.29
Fruit and vegetables everyday	238	75.1	278	78.5	2325	77.3	0.56
Riding a motorcycle or driving a car	45	14.2	63	17.8	542	18.0	0.24

BSRS: brief symptom rating scale

*Participants received serum vitamin D test, detailed questionnaire interview, and ordinary health check-up.

†Participants received both detailed questionnaire interview and ordinary health check-up.

‡Participants received only ordinary health check-up.

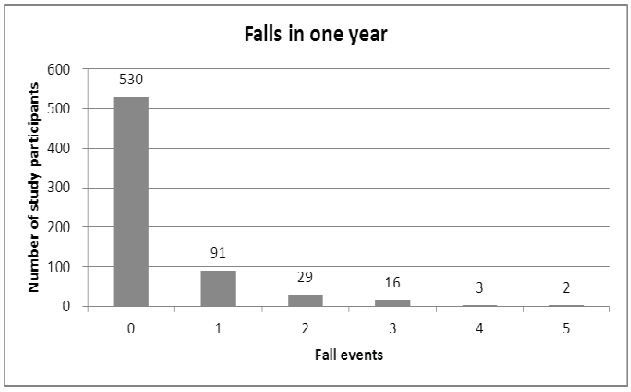

Fig. 2. Graph showing the number of fall events in one year of the study participants (n = 671). There were in total 141 fallers (21.0%).

were also alike.

Figure 2 shows the number of fall events in the last 12 months. Fallers comprised 21.0% of study participants, and females predominated in the faller group (63.8%). Among the fallers, 35.5% experience recurrent falls (7.5% of all participants). The mean age of the non-fallers, single fallers and recurrent fallers were 75.5, 76.2 and 76.9 years old (P = 0.25) and females comprised 44.1%, 61.5% and 68.0% of the groups (P <0.01), respectively.

Table 2 presents independent variables associated with falls (n = 671). In univariate model, falls were positively associated with female gender (crude odds ratio (OR): 2.18; 95% confidence interval (CI), 1.49 to 3.20), frailty (OR:

Table 2. Factors Associated with Fall Events in Univariate and Multivariate Logistic Regression Models (n = 671)

Variables	Univariate Model		Model 1*		Model 2†	
	Crude OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Demographic Characteristics						
Old age (≥75 year old)	1.43	0.97 to 2.09				
Female gender	2.18	1.49 to 3.20‡	2.32	1.56 to 3.45‡	2.18	1.45 to 3.28‡
Civil servant (before retirement)	0.62	0.42 to 0.92‡				
Past History						
Known hypertension	1.49	1.03 to 2.16‡				
Known diabetes mellitus	1.20	0.70 to 2.07				
Self-reported blurred vision	1.26	0.80 to 1.98				
Lost more than 3 cm after 40 years old	1.68	1.16 to 2.44‡	1.52	1.03 to 2.23‡	1.55	1.05 to 2.29‡
Physician's Examination						
BMI						
Low body weight (BMI<18.5)	2.45	1.09 to 5.52 ‡			2.69	1.12 to 6.48‡
Normal weight (18.5 BMI<24)(Reference group)	-	-			-	-
Overweight (24 BMI<27)	0.91	0.61 to 1.38			0.74	0.45 to 1.23
Obesity (BMI≥27)	1.02	0.61 to 1.71			0.53	0.27 to 1.03
Central obesity§	1.56	1.07 to 2.26‡			1.67	1.02 to 2.72‡
Frailty (CSHA-CFS category ≥4)	1.65	1.09 to 2.50‡	1.56	1.02 to 2.40‡		
Depressive disorder (BSRS-6 score ≥1)	1.69	1.14 to 2.52‡				
Medications						
Polypharmacy	2.08	1.17 to 3.70‡	2.18	1.20 to 3.95‡	2.17	1.18 to 3.97‡
Taking cardiovascular medications	1.55	1.05 to 2.29‡				
Laboratory Tests						
Preprandial hyperglycaemia (blood sugar ≥100 mg/dL)	1.50	1.03 to 2.18‡			1.56	1.05 to 2.34‡
Lifestyle Habits						
Drinking	0.62	0.39 to 0.99‡				
Regular exercise	0.61	0.42 to 0.90‡				
Riding a motorcycle or driving a car	0.38	0.20 to 0.73‡				

Note: The variables used in the regression models 1 and 2 were: gender, civil servant, hypertension, loss of body height, BMI group (dummy variable), central obesity, frailty, depressive disorder, polypharmacy, hyperglycaemia, drinking, exercise, and riding/driving.

BMI: body mass index; BSRS: brief symptom rating scale; CSHA-CFS: Chinese-Canadian study of health and ageing clinical frailty scale

*Multivariate logistic regression model using stepwise or forward selection of the variables.

†Multivariate logistic regression model using backward selection of the variables.

‡Statistically significant odds ratio.

§Defined as abdominal girth of ≥80 cm in females and ≥90 cm in males.

1.65; 95% CI, 1.09 to 2.50), low body weight (OR: 2.45; 95% CI, 1.09 to 5.52), central obesity (OR: 1.56, 95% CI, 1.07 to 2.26), loss of body height in adulthood (OR: 1.68; 95% CI, 1.16 to 2.44), depressive disorder (OR: 1.69; 95% CI, 1.14 to 2.52), history of hypertension (OR: 1.49; 95% CI, 1.03 to 2.16) or taking cardiovascular medications (OR: 1.55; 95% CI, 1.05 to 2.29), polypharmacy (OR: 2.08; 95% CI, 1.17 to 3.70), and preprandial hyperglycaemia (OR: 1.50; 95% CI, 1.03 to 2.18).

On the other side, being former civil servants (OR: 0.62; 95% CI, 0.42 to 0.92), exercise habit (OR: 0.61; 95% CI, 0.42 to 0.90), drinking (OR: 0.62; 95% CI, 0.39 to 0.99) and driving a car or riding a motorcycle (OR: 0.38; 95% CI, 0.20 to 0.73) seemed to exert protective effects. Neither vitamin D insufficiency nor deficiency was associated with falls (OR: 0.78; 95% CI, 0.38 to 1.60 and OR: 0.82; 95% CI, 0.45 to 1.51, respectively) (n = 317). There was a statistically significant difference between an older people's exercise habit on their serum vitamin D level and fall incidents (P = 0.002, data not shown).

In multivariate logistic regression analysis, female gender (adjusted OR (aOR): 2.32, 95% CI, 1.56 to 3.45 in model 1), loss of height in adulthood (aOR: 1.52, 95% CI, 1.03 to 2.23 in model 1), low body weight (aOR: 2.69, 95% CI, 1.12 to 6.48 (model 2)), central obesity (aOR: 1.67, 95% CI, 1.02 to 2.72 (model 2)), frailty (aOR: 1.56, 95% CI, 1.02 to 2.40 (model 1)), polypharmacy (aOR: 2.18, 95% CI, 1.20 to 3.95 in model 1), , and preprandial hyperglycaemia (aOR: 1.56, 95% CI, 1.05 to 2.34 (model 2)) were significant factors associated with falls.

Subgroup analysis of fall incidents according to body stature revealed a gradient towards more fallers in decreasing order of BMI subgroups. There was also a tendency that more fallers were in the centrally obese subgroups as compared to their non-centrally obese counterparts with the same BMI category. Overall, fallers comprised 38.5%, 20.2%, 20.0% and 21.4% of the low body weight, normo-weight, overweight and obese elders and 25.6% and 18.1% of the centrally obese and non-centrally obese subgroups, respectively.

Discussion

In community-dwelling older Taiwanese people, we observed that female gender, loss of height in adulthood, low body weight, central obesity, frailty, polypharmacy, and preprandial hyperglycaemia were all associated with falls. These findings support the argument that falls were in fact multifactorial.

Identifying the associated factors is important for preventing future falls, since simply identifying potential risk factors can reduce fall rates.[19] Our result that 21.0% of community-dwelling older people fell in a year is consistent with previous reports that fall rates among Chinese older population ranged from 14.7% to 34% per year.[12] Similarly, recurrent fallers tended to be females and the oldest,[13] although age alone does not reliably identify elders most likely to fall.[20]

Our findings are concordant with previous reports that female gender,[4] frailty[21] and polypharmacy[10] were all associated with increased risk for falls.[4] Chu et al reported that females in Hong Kong had significantly higher risk of falling than males (relative hazard 1.30; 95% CI, 1.03 to 1.64).[13] Lin observed that in Taiwan, the OR of female gender for falling was 1.94 (95% CI, 1.36 to 2.76).[4] Females were more likely to report falls,[22] and female gender correlated independently with severe fear of falling.[7,23] Inappropriate footwear (high heels, low surface contact area) in females increase the risk of falling.[6] Women prefer activities in companion, and exercising this dual task (e.g. talking to companion while walking) may increase fall risks. We therefore suggest that fall prevention programmes should focus on females.

Decullier et al reported that 44% of inside falls were associated with frailty.[21] Bloch et al reported that difficulties in activities of daily living (ADL) or in instrumental activities of daily living (IADL), components of frailty, doubled the risk of falling.[24] Medications and polypharmacy were also risk factors for falling.[25] As comorbidity increases, polypharmacy is more frequently seen in older generations[10] and is often associated with dysfunctions of multiple organ systems. Polypharmacy increases the likelihood of adverse drug reactions (ADRs) including falls.[26] The more the number of drugs prescribed, the higher the risk for falling.[27] Owing to the good accessibility and low cost of the Taiwanese National Health Insurance and a preference for medications of the Chinese culture, up to 8.8% of our study participants were experiencing polypharamcy. Nevertheless, physicians must bear in mind that polypharmacy remains one of the most preventable iatrogenic risk factors for falls.

Interestingly, we observed that body height reduction in adulthood was associated with falls. Loss of height (≥3 cm) after the age of 40 may signal the presence of osteoporosis, decreased muscle strength or physical frailty, which were all associated with falls. Height decrease may represent a proxy of musculoskeletal ageing. Our findings might possibly be due to some common background pathway. Scarce literature discussed the relationship between height reduction in adulthood and fall risk. Auyeung et al reported that modest height loss was associated with excess hip fracture, total mortality in older Chinese men and excess bone mineral density decline and hip fractures in women.[28]

It is also worth noting the association between low body weight and falls. People with lower BMI tend to have

lower muscle strength.[29] Low body weight might represent a surrogate for sarcopenia and hence, higher risk for falls. Pluijm et al reported that low body weight along with other risk factors predicted recurrent falling.[30] Honeycutt and Ramsey also concluded that men with low body weight were more likely to fall.[31] Low body weight, as an integral component of frailty, might be the single most important factor of the frailty syndrome to be associated with falls.

Lin et al proposed that waist circumference, as a measure of visceral adiposity, was associated with falls.[4] Centrally obese elders may fall easier due to instability of centre of gravity of the body. In fact, we observed that central obesity and low body weight served as an effect modifier of each other and both accentuated the other's relationship with falls reciprocally (data not shown). We hence suggest that both a lower BMI and central obesity were contributive to falls.

Diabetes in the elderly is associated with a high risk of geriatric syndromes including falls.[32] It is widely accepted that diabetic peripheral neuropathy resulted in dysfunction of gait and balance. Kuang et al reported that a history of diabetes (OR: 3.61; 95% CI, 2.03 to 6.40) was independently associated with falls.[33] However, it was not clear whether such impairment started as early as in the hyperglycaemic (impaired glucose tolerance, IGT) stage. Goldberg et al reported that older people with IGT exhibit deficits in standing balance and trunk position sense and IGT-related neuropathy represents the earliest stage of diabetic neuropathy.[34] Although preprandial hyperglycaemia may not equate to IGT, our findings highlight the importance of early screening for dysglycaemia and associated balance deficits among older people.

Certain lifestyle habits such as drinking, regular exercise and riding a motorcycle or driving a car were associated with less falls in univariate models. Regular exercise is one of the most important strategies for fall prevention.[35-37] Drinking has traditionally been linked to increased falls.[38] Interestingly, we noted that drinking is associated with less falls. Cauthon et al reported that older men with light alcohol intake had a lower risk of incident falls than abstainers (relative risk: 0.77, 95% CI, 0.65 to 0.92).[39] Analysis of the Cardiovascular Health Study also indicated a similar 4-year risk of falls in abstainers and light to moderate drinkers but a 25% higher risk in heavy consumers.[40] In our sample, older people who drink had fewer chronic diseases as compared to abstainers, although not statistically significant (1.66 vs 1.73 chronic diseases, $P = 0.59$). Sicker older people might refrain themselves from drinking. A drinking habit might imply a better perceived health and hence, less falls.

There was minimal literature linking driving/riding habit and fall events. Being able to ride a motorcycle or drive a car might signify that the elder's cognitive function and motor ability is in a good level. Moreover, 85.2% of the drivers/riders were males who were less likely to fall, as compared to females. Nevertheless, all these lifestyle habits did not remain significant in multivariate models possibly due to colinearity with other stronger contributing factors for falls.

Snijder et al reported that poor vitamin D status is independently associated with an increased risk of falling in the elderly.[41] However, our study failed to demonstrate an association between serum 25(OH)D levels and falls. It was hard to tell whether the mechanism underlying vitamin D and fall reduction were straightly causal or mediated by other intermediary steps. Bischoff-Ferrari et al suggested that falls were not notably reduced by achieved serum 25(OH)D concentrations of less than 24 ng/mL.[42] More than half (56.8%) of our participants had serum concentrations of less than 24 ng/mL. This might partly explain the lack of association we observed. In our sample, those who exercised regularly had the lowest serum vitamin D levels (mean: 23.80, 23.82, and 23.24 ng/mL in elders who never, occasionally and regularly exercised, respectively), although not statistically significant ($P = 0.74$). The protective effect of exercise might attenuate the adverse consequences of low vitamin D levels on falls. Last of all, sample size and hence power restrictions limited our inferences, particularly vitamin D.

Certain of the significant factors (female gender, loss of body height and polypharmacy) remained in both multivariate models (model 1 and model 2) whereas others (low body weight, (dummy variable), central obesity, frailty and preprandial hyperglycaemia) entered into only one multivariate model. Female gender, loss of body height and polypharmacy were the factors with larger crude OR (2.18, 1.68 and 2.08, respectively) in univariate model, while the others had smaller crude OR (0.91 to 2.45 for BMI, 1.56 for central obesity, 1.65 for frailty, and 1.50 for preprandial hyperglycaemia). This might imply that the assumption of association among fall events and female gender, loss of body height or polypharmacy was more robust as compared to that of the association between falls and low body weight, central obesity, frailty or hyperglycaemia.

To our knowledge, few studies explored comprehensively the relationship between falls and various clinical, demographic and lifestyle factors among community-dwelling older Chinese people. Given the ethnic differences in fall occurrence,[12] our data from a homogeneous racial background provides some new insights into the nature of the associated factors for falls in the older Chinese population.

A major limitation is that owing to our observational nature, causality cannot be inferred. Though baseline characteristics among groups were similar, selective loss to follow-up remains a possibility. Health examinees tend to be healthier and have better health literacy (healthy volunteer bias), thus caution must be taken when generalising our

findings to other older populations. Compared to the latest official survey from a national representative sample in Taiwan,[43] our sample had a similar gender (male (national sample vs ours): 50.9% vs 51.3%) and partnered status (75.3% vs 73.3%) distribution, but was older and more highly educated. Given the potential differences between our cohort and older people in other parts of Taiwan, our results could at best be generalised to Taipei City alone but not Taiwan. While environmental factors are important for falls,[44] our analysis focused on intrinsic factors. Recall of falls in the past 12 months was reported to be specific (91% to 95%) but less sensitive (80% to 89%) than prospective studies.[45] Our fall recording is subjective to recall bias. However, this bias will only attenuate but not change the associations we observed. Despite all efforts, residual confounding factors might still exist.

Conclusion

Among community-dwelling older people in Taiwan, falls were mainly associated with female gender, loss of height in adulthood, low body weight, central obesity, frailty, polypharmacy, and preprandial hyperglycaemia. These findings support the argument that falls are a potential marker of poor overall health. Further studies are needed to determine the underlying causal relationship.

Older people who fall should be clinicians' focus of concern, and screening is the first step in preventing future falls. Self-reported loss of height, low body weight, and central obesity as novel risk factors for falls can serve as simple, inexpensive measures for screening potential fallers and a trigger for comprehensive fall risk assessment. Public health strategies and city-wide advocates should aim at targeting the identification of elders bearing non-modifiable risk factors for falls, such as female gender, and the delivery of interventions designed to improve the modifiable risk factors such as: reversing physical frailty, low body weight or central obesity through adequate nutrition and exercise, advising prudent control of blood sugar, and reducing unnecessary medicinal prescriptions.

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