

## Internal factors associated with falls among older adults in Thailand

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### Abstract

**Background:** Falls are a major public health issue and one of the leading causes of morbidity among the older adults in many countries. A previous study found the prevalence of one or more falls is 18.7% and older females fell more often (21.5%) than their male counterparts (14.4%). Studies on falls are scarcely conducted in Thailand. Therefore, this study aims to identify the internal risk factors of falls among older adults in across Thailand.

**Method:** A survey across Thailand was conducted by the National Statistical Office in 2014. This data was obtained and a secondary data analysis study was carried out. From a total of 10,014,705 participants, data curation provided a complete sample size of 233,889 participants aged 60 years and above. The collected data were analyzed using percentages and chi-squared test and presented in the form tables.

**Results:** From the 233,889 participants, most were women (55.8%), aged 60-65 years (55.8%) and lived in Bangkok (31.9%). The majority of participants (68.3%) had normal overall health conditions. Most of the participants (80.2%) had their physical health check-up during a 12-month period prior to the interview date. Furthermore, most of the participants (86.34%) did not experience any falls during the 6-month period before the interview. However, health conditions such as vision, hearing, ability to dress themselves and use the bathroom were significant factors associated with falls ( $p$ -value < 0.05).

**Conclusion:** There are various internal factors of falls in older adults which should be addressed in order to help prevent falls and their associated consequences.

**Keywords:** Falls in Thailand, Internal factors of falls, Older adults, Senior population

### Background and importance of the problem

The global population of the world continues to experience a substantial change in the age structure which is driven by increasing levels of life expectancy and decreasing levels of fertility (1). As of 2020, there are 727 million people aged 65 years or over, globally (1). Southeast Asia represents some of the most rapidly ageing countries in the world. For example, the

population of Singapore for those over the age of 65 is expected to reach 26.6% in 2035, whereas the ageing population in Thailand is expected to reach 22.8%. In addition, the proportion of older adults in Vietnam will rise to about 20% in 2038 (2). Furthermore, in 2019, it was reported that Thailand has 8.6 million people over the age of 65 and will become an aged society by 2021 (3). Over the next 15 years, more older Thai people will need healthcare

support, raising the annual healthcare spending to 1.4 trillion THB (44.8 billion USD) to meet their needs. This represents a major socio-economic issue for the country and the world as a whole (3).

Older adults have to adjust in many aspects of their lives, both physically and mentally. As a result of age-related deterioration of the body, their ability to take care of themselves, decreases (4). Accidental injuries are estimated to be the fifth leading cause of death in older adults, with falls accounting for two-thirds of such deaths (5). In addition, non-injurious falls adversely affect quality of life, induce fear of falling, and limit mobility and activity (6). Secondary to injuries from road accidents, falls can range from falling on the same level (such as from slipping, tripping, missteps, being hit or pushed) or from falling from one level to another (for example from climbing, falling from a height, falling down stairs etc.) (6).

According to the Thailand National Statistical Office, older adults constitute 17.5% of the population (7). In addition, according to the Ministry of Public Health, In Thailand, more than 1,000 older adults die each year, or an average of 3 people per day, due to increased risk of falls (8). As a result, the daily performance of these older adults is reduced. Falls are a major public health issue and one of the leading causes of morbidity and mortality among the older adults in many countries. Falls and their consequences have an impact on quality of life, particularly the older adults. Previous studies have shown that the majority of falls occur among older adults aged 60 years and over and the incidence of falls increases with age (9).

In Thailand, Jitapunkul et al. (10), found the prevalence of one or more falls is 18.7% and older females fell more often (21.5%) than their male counterparts (14.4%). Most falls occurred outside (65%) and during the day time (85%). However, there have been very few studies on falls related to older adults in Thailand. Factors related to falls comprise of both internal factors and external factors. Internal factors include physical problems such as deterioration of the body (11), illness and treatment, as well as psychological problems such as depression, stress, anxiety, confusion and fear of falling (12). On the other hand, external factors including unsuitable housing structure and

neglect, treatment costs, the ability to care for oneself, having to rely on others to perform daily activities (13).

Since Thailand has now become a full-fledged aging society (WHO), protection of its older populations is a must. Falls can lead to devastating health consequences including injuries, hospitalization, emergency department visits and increased health care burden among older population (14). In addition, studies related to falls in Thailand are limited, especially ones that use national level data. Thus, it is pertinent to gain insight on factors associated with falls among the older population so as to create awareness and reduce the risk of falls. Herein, the study focuses on the internal factors associated with falls pertaining to older adults in Thailand through a nationwide survey.

## Literature Review

### *The definition of fall*

According to the World Health Organization, a fall is defined as “*an event which results in a person coming to rest inadvertently on the ground or floor or other lower level*” (5). This is similar to the definition of a fall provided by the Royal College of Nursing where a fall is defined as “*an event which causes a person to, unintentionally, rest on the ground or lower level, and is not a result of a major intrinsic event (such as a stroke) or overwhelming hazard*” (15). Whereas, in Thailand, the Department of Health states that a fall is “*an unintentional loss of balance caused by an external force by causing any part of the body, including the hands, arms, knees, buttocks, or the whole body to come into contact with the ground and must have happened at least 2 times*” (16).

### *The situation of falls in older adults*

According to the Department of Health, the situation of falls among the older population suggests that out of the > 2,000 people that die from falls in Thailand per year, almost half of them are older adults aged 60 years and above (17). As previously stated, falls are a major public health problem worldwide. According to the WHO, an estimated 684,000 fatal falls occur each year, making it the second leading cause of unintentional injury death, after road traffic

injuries (5). The risk of falls increases with age while males had more than three times the mortality rate than females with most of the falls occurring outside the home, while traveling or at work. In addition, falls are the second leading cause of death among injuries. Furthermore, the major causes of falls are slippery floors, tripping over obstacles, loss of balance, muscle weakness, home environment, taking certain medications and using improper footwear, uneven floors, dizziness and falling from stairs. Injuries after falls ranged from bruises, fractures and death (18).

#### *Factors that cause falls in older populations*

Thailand is stepping into an aging society, with more than 20% of the population being aged 60 years and over, which has a tendency to increase continuously to 30% by 2025 (19). Therefore, it is considered an important factor. The impact of falls to older adults encompasses a wide range of platforms and several cover socioeconomic factors such as level of education, income, access to healthcare etc. Moreover, the economic impact of falls is critical to family, community, and society. Healthcare impacts and costs of falls in older age are significantly increasing all over the world (20).

Furthermore, factors which increase the risk of falls in older adults can be divided into 2 main groups namely, intrinsic or internal and extrinsic or external factors. Internal factors are factors related to health and physical conditions of an individual (such as, vision, hearing, osteoporosis, muscle deterioration, balance, vertigo, chronic health conditions etc.) while external factors are factors regarding the environment of the individual (such as, uneven and slippery surfaces, poor lighting, ill-fitting shoes etc.) (18). Since the case report used in this study is based on internal factors, herein we will focus only on internal factors.

#### **Research objectives**

To study internal factors related to falls in older adults in Thailand.

#### **Materials and methods**

This study is a secondary analysis of data from the 2014 National survey obtained from the National Statistical Office of Thailand which is the government of Thailand's official statistics surveyor. The population surveyed, as provided in the report was 10,014,705 participants aged 60 years and above across the country in 2014 (21). After data preprocessing and curation, the sample size used in this study was 233,889 older adults aged 60 years and above from across the country. The selected data provides the most complete available information on falls in the older population. However, only internal factors related to falls was surveyed and thus, in this study we will focus on internal factors associated to falls in older adults aged 60 years and above across Thailand.

#### **Ethics statement**

Informed consent was obtained verbally from the study participants or their next of kin. A written consent was not requested taking into account the observational nature of the whole study and trying to minimize any influence in the results. The informed consent, however, was documented in the Case Report sheets.

#### **Data Analysis**

The incidence of falls was categorized into 2 groups; persons who reported 2 or more falls (occurred) versus persons who reported no falls or only one fall (non-occurred). We chose to categorize falls in this way given that people who have recurrent falls are of greater clinical importance than people who fall less frequently.

The statistics used in the data analysis of this research are as follows:

- 1) Descriptive Statistics to analyze general data such as frequency (Frequency) and percentage (Percentage).
- 2) Inferential Statistics to test the hypothesis of the research by using Chi-Square statistics. Over 20% of all cells use Monte Carlo Significance instead of Asymptotic Significance.

#### **Results**

Table 1: General characteristic of the participants (n = 233,889)

<b>General Characteristics</b>	<b>Number (n)</b>	<b>Percentage (%)</b>
<i>Gender</i>		
Male	103,379	44.2
Female	130,510	55.8
<i>Age</i>		
60- 65 years	130,510	55.8
66- 70 years	66,191	28.3
over 70 years	37,188	15.9
<i>Region</i>		
Bangkok	74,611	31.9
Central and Western	31,575	13.5
North	43,036	18.4
Northeastern	39,761	17
South	44,907	19.2
<i>Education level</i>		
Uneducated	72,973	31.2
Primary	119,517	51.1
Secondary	21,986	9.4
Bachelor's degree and above	19,413	8.3
<i>Occupation</i>		
Not working	143,608	61.4
Personal business	48,649	20.8
Work for hire	41,632	17.8
<i>Overall health condition</i>		
Normal	159,746	68.3
Have a chronic but not serious disease	39,995	17.1
Have chronic and severe disease	34,148	14.6
<i>Income</i>		
< 1000 baht per month	164,003	70.12
1,001 – 5,000 baht per month	35,925	15.36
5,001 – 10,000 baht per month	23,553	10.07
> 10,000 baht per month	10,408	4.45

<i>Religion</i>		
Buddhism	223,598	95.6
Islam	8,420	3.6
Christianity	1,637	0.6
Other	234	0.1
<i>Marital Status</i>		
Single	9,589	4.1
Married	144,543	61.8
Widow, divorced, separated	79,756	34.1

According to Table 1, the majority of the participants were female, totaling 130,510 (55.8%) while 103,379 (44.2%) were male. Moreover, most were in the range of 60-65 years, totaling 130,510 participants, representing 55.8%, and lived in Bangkok and the surrounding provinces (n=74,611; 31.9%). Furthermore, a total of 119,517 participants had completed primary school, accounting for 51.1%. However, most of the participants were unemployed (n=143,608; 61.4%), followed by those with private businesses (n=48,649;

20.8%). Majority of the participants had a normal overall health condition (n=159,746; 68.3%), followed by those with congenital and severe diseases (n=39,995; 17.1%). In addition, majority of the participants had an income ranging from 1,001 - 5,000 baht per month (n=164,003; 70.12). Additionally, most of the participants were Buddhist, totaling 223,598 (95.6%) and were married, totaling 144,543 (61.8%).

Table 2: Health condition of the participants in 2014 (n = 233889)

<b>Health condition</b>	<b>Number (n)</b>	<b>Percentage (%)</b>
<i>Not able to perform routine activities</i>		
Yes	68,763	29.4
No	165,126	70.6
<i>Health check in 12-month period prior to the interview (which was not due to sickness)</i>		
Yes	187,579	80.2
No	46,310	19.8
<i>Falls while walking/standing/from bed/chair/from height in 6-month period prior to the interview</i>		
Yes	31,949	13.66
No	201,940	86.34
<i>Place where latest fall took place</i>		
Indoor	145,713	62.3
Outdoor	88,176	37.7

<i>Medical attention for the latest fall</i>		
Yes	6,316	2.7
No	227,573	97.3

According to Table 2, we discovered that a large number of participants did not suffer from health conditions which prevented them from performing their routine activities, (165,126; 70.6%) while the remaining 68,763 (29.4%) could not perform their daily activities due to some health conditions. Most of the participants (187,579; 80.2%) had their physical health check-up during a 12-month period prior to the interview date (which was not due to sickness) while the rest of the participants (46,310; 19.8%) did not do so. Furthermore, most of the participants (201,940; 86.34%) did not experience any falls while

walking/standing/from bed/chair/height during the 6-month period before the interview, while 31,949 (13.66%) participants experienced falls. As many as 145,713 (62.3%) of the total number of participants experienced falls in their house while the rest of the participants (88,176; 37.7%) experienced falls outdoors. Moreover, only 6,316 (2.7%) of participants sought medical attention due to their latest falls while the majority of the participants (227,573; 97.3% did not seek medical help.

Table 3: Factors and their associated occurrence of falls where “*occurred*” is defined as 2 or more falls.

Factor	Falls occurred in the last 6 months			
	Non- occurred	Occurred	Chi-Square	Significance
Visual ability	160426	73463	14.014	0.000
Hearing ability	150417	83472	115.35	0.000
Ability to delay urination	160026	73863	747.371	0.000
Ability to delay defecation	155396	78493	4620.70	0.000
Ability to take food	155426	78463	8053.24	0.000
Ability to wear clothes	159406	74483	7356.937	0.000
Ability to take a bath	86426	147463	2878.01	0.000
Ability to wash face	128106	105783	2815.7	0.000
Ability to brush teeth, to use toilet (including the ability to clean up after that)	86426	147463	84.233	0.007
Ability to shave/comb hair	160406	73483	1935.65	0.000
Ability to put on shoes	159636	74253	1528.84	0.000
Ability to take one’s own medications correctly and completely	152626	81263	9266.79	0.000
Ability to get up/sit up form bed	160426	73463	4944.84	0.000
Ability to lift objects weighing approximately 5 kilograms	80426	153463	14097.3	0.000

Ability to walk 200-300 meters	70426	163463	14727.49	0.000
Ability to go up the stairs for 2-3 levels	90426	143463	15373.1	0.000
Ability to travel alone by public transport	128106	105783	15308.36	0.000
Ability to sit in squatting position	70426	163463	15308.7	0.000

Findings from Table 3 suggests that visual ability, hearing ability, ability to delay urination, ability to delay defecation, ability to wear clothes, ability to put on shoes, ability to take a bath, ability to wash face, to brush teeth, ability to use toilet (including the ability to clean up after that), ability to shave/comb hair, ability to take food, ability to take one's own medications correctly and completely, ability to get up/sit up form bed, ability to sit in squatting position, ability to lift object weighing approximately 5 kilograms, ability to walk 200-300 meters, ability to go up the stairs for 2-3 levels, ability to travel alone by public transport are all factors related to falls that occurred in the last 6 months in the lives of the participants with a statistical significance of less than 0.05.

## Discussion

The current study showed correspondence with earlier studies in that the probability of fall was higher among females in comparison to their male counterparts (22) owing to gender defined differences in terms of bone density, activity levels, rate of mortality and muscle strength (23). Previous studies have also explored the risk of falls in older persons in a variety of marital circumstances including married, single, widowed and divorced individuals (24); however, such studies failed to deduce any connections between fall risk and marital status. Furthermore, in accordance with other studies conducted on urinary incontinence (25), visual difficulties (22) (26) and impaired hearing (27), this study also found association between these factors and falls in older adults.

In older populations, deafness is found in up to one-thirds of the those aged 65-74 years due to degeneration of the inner ear and the auditory nerve resulting in shrinkage of the cochlea which results in increased vertigo and thus, higher occurrences of falls (28). In addition, ageing accompanies structural changes to the

eyes, such as, the lens becomes heavier and thicker and loses its elasticity, the diameter of the ciliary muscle negatively correlates with age and aberrations of the cornea increases with age (29). Thus, the resulting narrow field of vision decreases the visualization or perception of depth of the surface which causes the older adults to trip or fall easily. As can be seen from Table 3, visual ability and hearing ability is a factor associated with falls. This is consistent with the research of Wells et al. (30), whereby the authors found that older adults with hearing and visual impairments were at high risk for falls. In addition, a hearing aid did not significantly alter the association of fall risk. Furthermore, the study by Suchada Pattamongkolrit et al. (31), conducted on visually impaired Thai people, reveals that their physical performance significantly predicted a fall occurrence ( $p < .001$ ) with those with poorer physical performance having a higher risk of falls. The findings suggested the importance of nurses, in an effort to prevent falls as well as to assess the physical performance of older, visually impaired Thai people.

The ability to delay urination and defecation is considered a common ability in younger populations. However, in the older adults, the lack of bladder control can lead to other problems. Foley et al. (32), observed that urinary incontinence and both the urge and stress incontinence were positively related to falls. Besides being common, it also affects their quality of life, both in terms of physical health, (such as the urine can cause skin irritation, increased risk of urinary tract infections and increase the incidence of falls) and mental health (depression and embarrassment to join social activities and refusal to travel outside the home).

The results (Table 3) where the ability to wear clothes by themselves and the ability to put on/wear shoes, the ability to bathe, the ability to wash face, brush teeth, the ability to use the bathroom, the ability to shave/comb/gather hair

by the older adults were measured, was found to be consistent with the study of Howharn et al (33), whereby the authors used a descriptive study to show significant associations between daily activities and falls for older adults ages 60 years and above in the Northeastern provinces of Thailand.

Another study conducted by Silva et al. (34), It was found that wearing shoes that do not fit, wearing skirts or pants that are too long is a correlation factor with the occurrence of falls in older adults who live in the community. In addition, the authors also found that educating the older people on taking medicine, diet, adjusting environmental risk factors, and promoting physical activity to increase physical strength could help with reduction in fall occurrences.

Furthermore, the older adults with the ability to get up/sit out of bed, the ability to squat, the ability to lift about 5 kg, the ability to walk 200-300 meters, the ability to climb 2-3 steps or the ability to travel by car/boat by themselves corresponds to the study (35). Here, the authors were able to determine that the ability to maintain balance was correlated at a moderate level while health awareness showed a low level of negative correlation with the fear of falling. Therefore, health care workers should pay attention to the fear of falling in older patients. The development of a program in order to promote the confidence of safe movement for older patients by giving importance to improving their balance could be helpful towards the prevention of falls.

Moreover, increasing the level of awareness of health conditions could help the older adults know their limitations. At the same time, training the main muscles used in walking and balance could help to prevent falls in the older population. This exact phenomenon was observed in a study conducted by Sitdhiraksa et al. (35), where the authors studied the effects of progressive step marching exercise (PSME) on balance ability in older adults. After 8 weeks of the program, the authors revealed that the PSME program could improve balance ability, lower limb muscle strength, quality of life, and fear of falling in participating older adults. Therefore, exercise should be a part of daily activity for older adults.

Furthermore, our findings provide evidence that intrinsic factors are highly associated with risk of falls. Thus, caregivers such as nurses should provide support and education to family caregivers in helping older persons to improve self-management and meet ongoing self-care needs, which could provide positive outcomes such as reduced incidences of falls.

### **Limitations of the study**

Since this study uses a nationwide survey data from the year 2014, this could be the limitation of this study. Further analysis needs to be conducted on surveys taken at other points in time after 2014 in order to do a comparison study and determine whether similar factors of falls still remain. Using secondary data does not allow control of research questions to the researchers but we have to rely on others to collect the data. This sometimes results in many missing data points which needed to be cut from the final data set. In addition, external factors should also be explored in future works.

### **Conclusion and Recommendations**

The results showed that falls in the older populations increased with age and were due to various factors. Prevention is therefore important and absolutely necessary. In particular, prevention by the older adults themselves as well as their caretakers. Therefore, all departments and health care workers must be aware of and cooperate in identifying the causes, risk factors and corrective measures from the primary prevention level. Furthermore, secondary and tertiary prevention to reduce risk factors or complications that will occur in the long term should also be carried out. Hence, it is important to prevent falls in older adults in order to reduce the incidence of falls as well as the potential dangers of falling. Preventive education to reduce potential risk factors by providing knowledge on proper and safe walking and movement patterns can also be set up. This will help reduce falls in older adults.

In addition, the authors believe that Orem's theory which is a theory of self-care, can be a guideline to help older adults better take care of

themselves and aid in preventing falls. Various nursing theories are also useful in providing measures in helping the individual to be able to take care of themselves continuously, and to maintain a healthy lifestyle.

### Future directions

A health promotion program should be prepared to educate the older populations regarding falls. In addition, implementation of walking practice, vision training, practice for self-help exercise program to increase balance could be useful in preventing falls and building self-esteem in the daily life of older adults. Furthermore, the development of housing arrangements that prevent falls could help to reduce the fear of falling among older adults.

Lastly, policies that recommend exercise for posture correction (such as, yoga, Thai hermit exercise or Tai chi) should be organized to help the older population to maintain balance, be agile and thus, help to prevent falls.

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