

นิพนธ์ต้นฉบับ

Original Article

การพลัดตกหกล้มของผู้สูงอายุในสถานบริบาลเอกชน
พื้นที่ภาคตะวันออกเฉียงเหนือของประเทศไทย

Falls among Older Adults in Private Nursing Homes in Northeastern Thailand

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บทคัดย่อ

ทั่วโลกพบการพลัดตกหกล้มเป็นสาเหตุการเสียชีวิตอันดับสองในการบาดเจ็บโดยไม่เจตนา และผู้สูงอายุเป็นกลุ่มที่มีอัตราการเสียชีวิตสูงสุด อย่างไรก็ตาม ไม่ปรากฏมีงานวิจัยการพลัดตกหกล้มของผู้สูงอายุในสถานบริบาลเอกชน โดยเฉพาะอย่างยิ่งในเขตภาคตะวันออกเฉียงเหนือของประเทศไทยซึ่งมีสัดส่วนประชากรผู้สูงอายุมากที่สุดในประเทศ การวิจัยแบบผสมผสานนี้ มีวัตถุประสงค์เพื่อหาความชุก ลักษณะการพลัดตกหกล้ม และ ศึกษาปัจจัยที่มีความสัมพันธ์กับการพลัดตกหกล้มของผู้สูงอายุที่อยู่ในสถานบริบาลเอกชน โดยคัดเลือกผู้สูงอายุจำนวน 56 คน จากสถานบริบาล 20 แห่ง ตามเกณฑ์ที่กำหนด เพื่อประเมินข้อมูลเชิงปริมาณเกี่ยวกับการพลัดตกหกล้มในช่วง 6 เดือนที่ผ่านมา และเก็บรวบรวมข้อมูลเชิงคุณภาพด้วยการสัมภาษณ์เชิงลึก โดยผู้ให้ข้อมูลสำคัญคือ ผู้แทน

Abstract

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Keywords

falls; older adults; nursing homes;
environmental hazards; risk factor

Introduction

A fall is defined as an occurrence that results in a person coming to rest accidentally on the ground, floor or another lower level. Globally, falls are the second leading cause of unintentional injury deaths, predominantly affecting adults aged 60 and older.⁽¹⁾ Thailand's mortality rate from falls in adults aged 60 and above in 2015–2019 ranged between 5 and 30 per 100,000 people per year, increasing with age.⁽²⁾ Falls may not result in death but can lead to multiple adverse consequences. Falls can cause impaired mobility, especially when associated with fractures, which contributes to progressive muscle weakness and subsequent functional decline in activities of daily living, increased dependence on others, an increased risk of complications, reduced quality of life, and higher long-term care costs.^(3–4) Falls in older adults may be influenced by personal factors (gender, age, income, and marital status), health factors (smoking, alcohol use, physical activity, body mass index, chronic illness, polypharmacy, sleeplessness, incontinence, depression, functional ability, fear of falling) and environmental conditions.^(5–7)

Thailand is one of the world's fastest-aging countries, having become an aged society by 2023, with 14 million older persons (aged 60 years and older) accounting for 20% of the total population. Over the next 15 years, the country is expected to become a super-aged society, with seniors accounting for 30% of the total population.^(8–9) The aged can be frail, with degeneration of the body impairing the functioning of numerous systems in the body, making older adults susceptible to illness. As a result, the aging population needs special care. Nursing homes (NHs) are a feasible alternative for families who are unable to provide comprehensive care for older adults

or those who live alone.^(10–11) From 2018 to 2023, the number of NHs in Thailand increased by an average of 25%. NHs are mostly located in the capital, Bangkok, its surrounding areas, and large provincial cities.⁽¹²⁾ In 2023, The northeastern of Thailand has the highest proportion of older adults (30%) and 62 licensed NHs in operation.^(8,13)

The growing demand for NHs services, as evidenced by the increasing number of private NHs, reflects Thailand's transition into an aging society. Despite being a critical public health issue, fall research in nursing homes remains limited, particularly in Northeast Thailand, which has the highest proportion of older adults in the country. A previous study examined falls in senior housing in Bangkok, Thailand, focusing on the prevalence and risk factors of falls among physically active older residents at risk of falling.⁽¹⁴⁾ To address these limitations, this study aimed to determine the prevalence and characteristics of falls and examine factors associated with falls among older adults in private nursing homes, including residents of all physical activity levels.

Material and Methods

Study population and design

The study conducted a mixed-method to describe falls and the factors associated with falls among older adults in NHs. For the quantitative component, to ensure representation from all four health regions of the northeastern, NHs were stratified into four strata based on health regions. The figure 1 showed that there were 39 licensed private NHs in the northeastern in 2024.⁽¹³⁾ To maximized coverage, the province with the highest number of NHs in each health region was selected. Data were collected from 20 participating NHs (51% of the total) and their

eligible older residents who met the inclusion criteria (aged ≥ 60 , Thai nationality, residing in an NH for ≥ 1 month, and was able to consent) and exclusion criteria (Alzheimer's disease or dementia). For the

qualitative component, 20 administrators or caregivers were recruited, with one participant representing each NH.

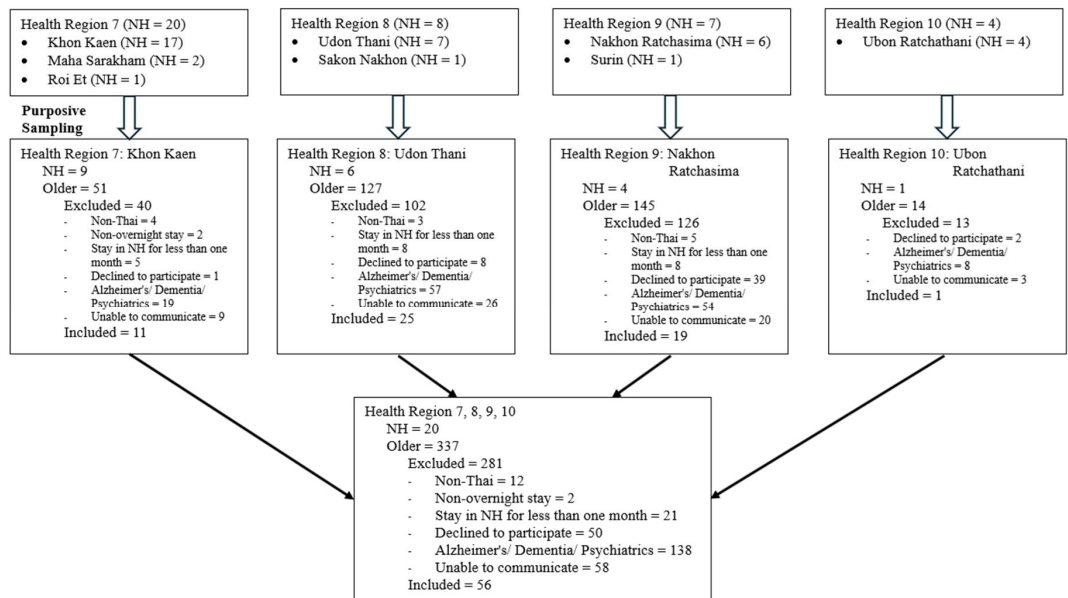


Figure 1 Participant recruitment flowchart.

Variables

Data of falls in NHs within the past six months included the number of falls, causes, activities at that moment, location, time, injuries, and whether the causes were addressed. Environmental factors within NHs. Factors included demographic characteristics, functional ability in activities of daily living, health conditions, depression, and fear of falling.

Research instruments

This study utilized six research instruments, including:

1) A questionnaire on falls among older adults in NHs consisted of 29-item, divided into three sections: (1) general characteristics, (2) health status and behaviors, and (3) fall experiences.

2) The Thai-Short Fear of Falling Questionnaire (Thai-Short FES-I) consisted of seven items, each rated on a four-point scale. Total scores ranged from 7 to 28, categorized into three levels: low fear⁽⁷⁻⁸⁾, moderate fear⁽⁹⁻¹³⁾, and high fear (14-28).⁽¹⁵⁾

3) The Activities of Daily Living (ADL) assessment (Barthel Index) consisted of 10 item used to evaluate the physical dependency of older adults; scores of 0-4 high dependency, 5-11 moderate dependency, and ≥ 12 independence.⁽¹⁶⁾

4) The Thai Geriatric Depression Scale (TGDS-15) consisted of 15 items, with a maximum total score of 15. Scores of 0-5 absence of depression, 6-10 mild depression requiring counseling, and 11-15 depression requiring medical care.⁽¹⁷⁾

5) The environmental assessment form consisted of 14 item structured observation tool adapted from the Department of Older Persons criteria.⁽¹⁸⁾ Classification of exposure to the hazard grouped to 0–3 items requiring a caution, 4–6 items as a prompt correction, and 7–14 items as an urgent improvement.

6) Semi-structured interview form was developed to collect in-depth information through interviews with NH administrators or caregivers regarding falls in NHs.

Validity and reliability

For the newly developed and adapted instruments (Instruments 1, 5, and 6), content validity was examined by a panel of five external experts specializing in geriatrics, physical therapy, and research methodology. The Index of Item–Objective Congruence (IOC) was calculated, and any items with an IOC score below 0.50 were revised or modified in accordance with the experts' recommendations. Prior to formal data collection, a pilot test was conducted with seven older adults residing in NHs (five from Roi Et Province and two from Sakon Nakhon Province) who met the inclusion criteria but were not part of the final study sample, to ensure the feasibility and clarity of the instruments. For the standardized instruments (Instruments 2, 3, and 4), translation and validation had already been established by the original authors. The Thai–Short FES–I had high internal consistency with a Cronbach's alpha of 0.92 and excellent test–retest reliability with an intraclass correlation coefficient (ICC) of 0.83.^(19–20) The Barthel Index had good reliability with a Cronbach's alpha of 0.97 and an ICC of 0.69.⁽²¹⁾ The TGDS–15 had high internal consistency with a Cronbach's alpha of 0.85.⁽²²⁾

Data Collection

Data collection began after written informed consent was obtained from the older adults and the administrators or caregivers of the NHs. Older adults were interviewed to collect data on demographic characteristics, health conditions, and falls within the past six months in NHs. ADL, depression, and fear of falling were assessed using standardized instruments. The interview took no more than 60 minutes per participant, including break and light refreshments. The researcher with two research assistants who were well-trained on how to utilize the tools for evaluation by direct observation and measurement toward the environmental factors requiring 15–30 minutes. A qualitative in-depth interview covered administrators or caregivers of the NHs in detail about falls among older adults in the facilities. Each interview lasted approximately 45 minutes. Data were collected between January 15 and April 30, 2024.

Statistical analyses

Descriptive statistics summarized participants' characteristics and fall occurrence, presented as frequencies and percentages. Firth's penalized logistic regression⁽²³⁾ was used to investigate the associations between the study factors and falls. Results were presented as prevalence (%) and crude odds ratios (ORs) with 95% confidence intervals (CIs), with statistical significance set at 0.05. All analyses were performed using STATA, version 18. In the qualitative data, thematic analysis was used to find recurring themes about falls, causes of falls, and the caregivers' perspectives. Two researchers independently extracted the data. Any uncertainties were discussed until both researchers reached a consensus. All transcribed interviews were entered into ATLAS.ti 24 software, coded, and categorized.

Ethical considerations

The study was approved by the Khon Kaen University Ethics Committee for Human Research on 9 January 2024 with reference No. HE662212, in accordance with the ICH Good Clinical Practice Guidelines and the Declaration of Helsinki. All participants received informed consent and details of the study before deciding to participate and signed a consent form before the data collection. No IP addresses of participants were saved. Data were collected anonymously.

Results

Characteristics of participants

The characteristics of all participants (n=56) are presented in Table 1. The mean age was 76.1 years (SD=8.5), and the majority were female (78.6%). Most participants were widowed or divorced (62.5%). Overall, 92.9% reported having at least one medical condition, with urinary continence (33.9%) and vision impairment (44.6%). Polypharmacy was observed in 60.7% of the participants. Antihypertensive medications were the most frequently used drugs (66.1%), followed by sedatives (10.7%). Based on the Barthel Index, 62.5% of the participants (were independent. A high level of fear of falling was reported in 59.0% of participants. Over 80% had no depressive symptoms, and the majority (91.1%) were exposed to a caution level of environmental risk factors.

Prevalence and characteristics of falls among older adults in NHs

Five of the 56 older participants (8.9%, 95% CI: 3.7%–20.2%) experienced falls in NHs during the previous six months. Two individuals fell twice,

resulting in a total of seven fall events. Among these events, two were attributed to drowsiness, two to wet or slippery flooring, and two to walking or balance instability, while the remaining event was attributed to numbness. Four events occurred while walking and three during changes in position. Five events occurred in the bedroom, while one event occurred in the bathroom and outside the building. Most falls occurred in the evening (5:01 p.m.–9:00 p.m.) (n=3) and morning (6:00 a.m.–12:00 p.m.) (n=2). Five falls resulted in no injury, while two caused minor injuries (e.g., bruising, pain, swelling, and abrasions). Post-fall, NHs implemented preventive measures, including environmental modifications (dry floors, anti-slip mats, and bathroom handrails), assistive device provision, and encouraging staff assistance.

Factors associated with falls among older adults in NHs

Personal factors. The univariate Firth's penalized logistic regression revealed no statistically significant association between personal factors namely sex, and age with falls in older adults. However, a higher proportion of participants who experienced falls were widowed or divorced (80.0%) compared to those who did not fall (60.8%) (Table 1).

Health factors. Table 1 presents that sedative use was the only factor significantly associated with falls (crude OR=19.40; 95% CI [2.75, 136.65], $p=0.003$). Notably, 62.8% of participants in the non-falls group used four or more medications daily, compared to 40.0% in the falls group, indicating 23.0% difference. Additionally, the prevalence of visual impairment differed by 16.0% between the two groups.

Table 1 Factors associated with falls among older adults in NHs (n=56).

Variable	Total n (%)	Without Falls (n=51) n (%)	With Falls (n=5) n (%)	Univariate		
				OR (crude)	95 %CI	p-value
Sex						0.873
Male	12 (21.4)	11 (21.6)	1 (20.0)	Ref.	0.12 to 6.05	
Female	44 (78.6)	40 (78.4)	4 (80.0)	0.85		
Age						0.605
60–75 years	27 (48.2)	24 (47.1)	3 (60.0)	Ref.		
over 75 years	29 (51.8)	27 (52.9)	2 (40.0)	0.64	0.11 to 3.53	
Mean (SD)	76.1 (8.5)					
Marital status						0.768
Single	11 (19.6)	10 (19.6)	1 (20.0)	Ref.		
Married–Couple	10 (17.9)	10 (19.6)	0 (0.0)	0.33	0.01 to 9.16	
Widowed / Divorced	35 (62.5)	31 (60.8)	4 (80.0)	1.00	0.14 to 7.21	
Medical condition						0.162
No	4 (7.1)	3 (5.9)	1 (20.0)	Ref.		
Yes	52 (92.9)	48 (94.1)	4 (80.0)	0.22	0.03 to 1.85	
Polypharmacy (≥4 medicines)						0.334
No	22 (39.3)	19 (37.3)	3 (60.0)	Ref.		
Yes	34 (60.7)	32 (62.7)	2 (40.0)	0.43	0.08 to 2.39	
Sedatives						0.003*
No	50 (89.3)	48 (94.1)	2 (40.0)	Ref.		
Yes	6 (10.7)	3 (5.9)	3 (60.0)	19.40	2.75 to 136.65	
Antihypertensives						0.210
No	19 (33.9)	16 (31.4)	3 (60.0)	Ref.		
Yes	37 (66.1)	35 (68.6)	2 (40.0)	0.33	0.06 to 1.86	
Diuretics						0.162
No	52 (92.9)	48 (94.1)	4 (80.0)	Ref.		
Yes	4 (7.1)	3 (5.9)	1 (20.0)	4.62	0.54 to 39.37	
Urinary incontinence						0.697
No	37 (66.1)	34 (66.7)	3 (60.0)	Ref.		
Yes	19 (33.9)	17 (33.3)	2 (40.0)	1.41	0.25 to 7.88	
Vision impairment						0.487
No 31 (55.4)	22 (43.1)	3 (60.0)	Ref.			
Yes 25 (44.6)	29 (56.9)	2 (40.0)	0.54	0.10 to 3.02		
ADL (Barthel Index)						0.472
Dependent (0–4)	6 (10.7)	6 (11.8)	0 (0.0)	Ref.		
Moderate dependent (5–11)	15 (26.8)	15 (29.4)	0 (0.0)	0.42	0.01 to 23.49	
Independent (≥12)	35 (62.5)	30 (58.8)	5 (100.0)	2.34	0.11 to 47.86	

Table 1. Factors associated with falls among older adults in NHs (n=56) (continue)

Variable	Total n (%)	Without Falls (n=51) n (%)	With Falls (n=5) n (%)	Univariate		
				OR (crude)	95%CI	p-value
Depression (TGDS-15)						0.791
No depression (0-5)	49 (87.5)	44 (86.3)	5 (100.0)	Ref.		
Moderate depression (6-10)	6 (10.7)	6 (11.7)	0 (0.0)	0.62	0.03 to 12.62	
Depression (≥11)	1 (1.8)	1 (2.0)	0 (0.0)	2.70	0.10 to 74.67	
Fear of falls						0.753
Low fear (7-8)	16 (28.5)	15 (29.4)	1 (20.0)	Ref.		
Moderate fear (9-13)	7 (12.5)	6 (11.8)	1 (20.0)	2.38	0.21 to 27.40	
Very fear (14-28)	33 (59.0)	30 (58.8)	3 (60.0)	1.19	0.16 to 8.83	
Environmental Risk Factors for Falls (Number of items)						0.865
Caution (0-3)	51 (91.1)	46 (90.2)	5 (100.0)	Ref.		
Prompt Correction (4-6)	5 (8.9)	5 (9.8)	0 (0.0)	0.77	0.04 to 15.86	

SD=Standard deviation, * $p<0.05$

Environmental factors. Environmental factors were not significantly associated with falls (Table 1). In the fall group, key hazards included the absence of partitions between shower and toilet areas and insufficient lighting, with two individuals experienced one factor, whereas three individuals experienced two factors. Similarly, in the non-fall group, 60.0% faced risks from unpartitioned bathrooms and inadequate lighting, 30.0% from slippery or uneven floors, and 10.0% from unsuitable furniture, such as chairs lacking armrests or backrests. Overall, 31.0% of the non-fall group were exposed to more than two environmental hazards (Table 2).

Table 2. Environmental risk factors for falls among older adults in NHs (n=56)

Environmental factors	Total (n=56) n (%)	Without Falls (n=51) n (%)	With Falls (n=5) n (%)
1. No partitions in the bathroom (n=53)	36 (67.9)	32 (66.7)	4 (80.0)
2. Inadequate lighting	36 (64.3)	32 (62.8)	4 (80.0)
Bathroom	24 (42.9)	21 (41.1)	3 (60.0)
Dining room/ Activity room	20 (35.7)	18 (35.3)	2 (40.0)
Bedroom	1 (1.8)	1 (2.0)	0 (0.0)
3. A different level floor or a slippery floor	16 (28.6)	16 (31.4)	0 (0.0)
4. Unsuitable height of furniture (n=55)	7 (12.7)	7 (13.7)	0 (0.0)
5. Chairs without armrests (n=51)	6 (11.8)	6 (13.0)	0 (0.0)
6. Chairs without backrest (n=51)	3 (5.9)	3 (6.5)	0 (0.0)
7. No bath bench in the bathroom	3 (5.4)	3 (5.9)	0 (0.0)
8. Light switches far from the bed	2 (3.6)	2 (3.9)	0 (0.0)
9. Cluttering on the floor or walkway	2 (3.6)	2 (3.9)	0 (0.0)
10. No staircase handrail or elevator (2 floors or more)	2 (3.6)	2 (3.9)	0 (0.0)

Table 2 Environmental risk factors for falls among older adults in NHs (n=56) (continue)

Environmental factors	Total	Without Falls	With Falls
	(n=56) n (%)	(n=51) n (%)	(n=5) n (%)
11. Reaching for something in the distance	1 (1.8)	1 (2.0)	0 (0.0)
12. Bathroom far from the bedroom	0 (0.0)	0 (0.0)	0 (0.0)
13. No flush toilet (use squat toilet)	0 (0.0)	0 (0.0)	0 (0.0)
14. No handrails in the bathroom	0 (0.0)	0 (0.0)	0 (0.0)
Number of items for environmental risk factor			
0	1 (1.8)	1 (2.0)	–
1	17 (30.4)	15 (29.4)	2 (40.0)
2	22 (39.3)	19 (37.3)	3 (60.0)
3	11 (19.6)	11 (21.6)	–
4	5 (8.9)	5 (9.8)	–

Understanding fall patterns through caregiver narratives in private NHs

To complement the quantitative findings, thematic analysis of caregiver interviews was conducted, confirming and expanding on the statistical results. Three main themes emerged: (1) the nature and frequency of falls in private NHs; (2) contextualized risk factors contributing to resident vulnerability; and (3) the effects of falls among older adults in NHs.

The nature and frequency of falls in private NHs. Falls among older adults in NHs varied depending on the characteristics of residents, interventions, caregivers’ experience, and the differences in the facilities’ environments. However, respondents reported that the fall rate among older adults in these NHs was relatively low, averaging 2–3 incidents per year. This was because most residents were bedridden, unable to walk, and under constant supervision by staff 24 hours.

“Most of the patients here are severe cases; there are very few older adults who can walk, so the chance of falling is low” (NH12, personal interviews, March 22, 2024)

Contextualizing risk factors. Falls in NHs resulted from caregiver-related issues, resident conditions, and environmental hazards.

1) Caregiver-related Causes–Falls occurred when caregivers failed to prepare equipment, leave residents unattended, or lack experience in fall prevention.

“An older adult fell because staff left them alone to retrieve bathing supplies” (NH7, personal interviews, February 8, 2024)

2) Resident-related causes–Health conditions such as Parkinson’s, dementia, and muscle weakness increased fall risk. Emotional factors, such as reluctance to ask for help, newly admitted residents often experienced insomnia and anxiety during the adjustment period, with some requiring sedative medication, which further compounds fall vulnerability.

“Most falls involved new residents who hesitated to call the staff and attempted to move alone” (NH20, personal interviews, March 20, 2024)

3) Environmental causes° Slippery floors and a lack of handrails were common hazards.

“The cause was that they slipped. There were some handrails, but they did not cover all the entire

area, especially near the bathroom doors” (NH13, personal interviews, March 14, 2024)

The effects of falls among older adults in NHs.

Falls ranged from minor bruises to severe injuries requiring hospitalization. Additionally, repeated incidents could damage a nursing home’s reputation and lead to legal action.

“We try to prevent falls because there had been older adult fell 2–3 times, leading to lawsuits from their families seeking compensation” (NH7, personal interviews, February 8, 2024)

Discussion

This study revealed that a low prevalence of five out of 56 older adults (8.9%, 95% CI=3.7%–20.2%) with no cognitive problems fell in NHs in the past six months. Despite the older participants in this study being approximately 75 years old, they were in good health, as shown by their Barthel ADL indexes, indicating that they were a non-dependent group. The prevalence in this study was lower than that reported in a previous study in Thailand, which found a rate as high as 64.1%.⁽¹⁴⁾ Specifically, the prior study utilized a longer one-year recall period and targeted physically active older adults at higher risk of falling. Conversely, our study did not restrict participation by physical activity, enrolling any residents capable of clear communication. Factors such as drowsiness, wet floors, loss of balance, and numbness disrupt physical equilibrium, leading to falls.⁽²⁴⁾ This aligns with falls occurring during movement or postural changes, particularly walking and transitioning positions in the bedroom.

The lower prevalence observed in this study may be attributed to the inclusion of privately licensed NHs, which were likely to offer safer environments

and more effective supervision compared to other care settings. Consistent with the qualitative findings of this study, it was revealed that most residents were bedridden, unable to walk, and under constant supervision 24 hours. Although limited mobility reduces environmental exposure, it can cause physical decline if unmanaged.⁽²²⁾ This highlights that NH falls are multifactorial, driven by caregiver inexperience, environmental hazards, and resident-specific medical or behavioral profiles. In contrast, a systematic review of 16 prospective NHs studies reported a higher pooled fall incidence of 43% (95% CI=38%–49%).⁽²⁵⁾ This discrepancy is likely driven by demographic and methodological differences. Specifically, participants in the systematic review were older (mean age ~85 years vs. 76 years in this study) and monitored prospectively, whereas our study relied on retrospective recall, which is susceptible to underreporting. Additionally, the reviewed studies were conducted primarily in Western countries and China, where NH infrastructures and resident profiles may differ from those in Thailand.

The health factors of individuals who experienced fall and those who did not were comparable. The association between falls and sedative use was one of the most significant findings. This was consistent with prior research that had identified sedatives as a significant factor in the risk of fall as a result of their effects on drowsiness or impaired balance which increased the risk of falls.^(26–27) Therefore, caregivers should pay attention to medication reviews in older adults. Statistical analysis discovered that polypharmacy was not significantly associated with falls. Nonetheless, the proportion of polypharmacy showed a variation of 22.0% between the two groups. Previous studies had indicated

statistical associations between polypharmacy and falls in older adults.^(5,17) The association between polypharmacy and falls may be mediated by underlying comorbidities requiring multiple medications. Additionally, falls can result from the cumulative effects of drug–drug interactions, drug–related adverse events, and overall poor health.⁽⁵⁾ These sedative–hypnotic medications frequently induce adverse effects such as postural instability, dizziness, and blurred vision, which directly elevate fall risks in older adults. This finding is consistent with prior research linking the use of sleeping medicine or sedatives to an increased risk of falls among older adults.⁽²⁸⁾

The fall group was exposed to a maximum of two environmental risk factors in NHs, whereas the non–falls group was exposed to a maximum of four factors. The reason NHs in Thailand had minimal risk factors required to maintain a safe environment for residents according to health care standards monitored by the Standard and Quality Control Board established under Chapter 6 of the National Health Security Act.⁽²⁹⁾ This contrasted with previous studies, which indicated that the overall number of environmental hazards in long–term care facilities (LTCFs) ranged from 2 to 22, whereas 17 (68.0%) LTCFs had more than 8 environmental hazards.⁽³⁰⁾ The primary environmental concerns for both groups were the absence of a partition between the shower area and the toilet, as well as inadequate lighting in the bathroom and dining room. A partition between the shower and the toilet kept the toilet area dry, preventing slips and falls. Proper lighting is essential for older adults to be able to see their surroundings and avoid tripping and falling.⁽³¹⁾ This finding was consistent with that of a previous study, which revealed that modifying the environment in living areas reduced the risk of falls

among older adults.⁽³²⁾ Nonetheless, most NHs maintain a suitable environment.

Conclusions

In this study, the prevalence of falls was low, at less than 10%. Among the five older adults who experienced falls, two fell twice, and one had repeated falls in the same situation. NHs should be aware of this issue and take appropriate action to prevent recurrence, as there were two falls occurring within a six–month period. Environmental factors that should be urgently addressed included installing partitions to separate dry and wet areas in the bathrooms and providing adequate lighting in different areas of the NHs. Sedative use was significantly associated with falls; therefore, regular medication reviews and cautious prescribing of sedatives are recommended in NHs.

Limitations and strengths

The questionnaire was pilot–tested with seven older adults from non–sampled provinces. Due to challenging access to private NHs and strict inclusion criteria, the study yielded a small sample size. Additionally, only 50% of the invited NHs participated, potentially introducing selection bias if non–participating facilities systematically differed from those that agreed to participate. Although Firth’s penalized logistic regression was used to reduce bias from a small sample size and quasi–complete separation.⁽³³⁾ However, due to the low event rate, only crude association analyses could be performed, which limited the interpretation of ORs without adjusting for potential confounders. Additionally, because the participating NHs lacked centralized databases, fall data were obtained retrospectively via interviews regarding the past six months. To minimize

recall bias, the data were cross-checked with NH staff. Despite these constraints, this pioneering study provides critical baseline data on the burden of falls in private NHs in northeastern Thailand. These insights can help stakeholders prioritize fall prevention and highlight the urgent need for standardized fall databases and collaborative research networks to enhance data quality in future investigations.

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