Relationship and Characteristics of Falling at Temples among the Elderly Group in Nakhon Ratchasima, Thailand

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Background: *Falls and their consequences are serious health problems among the elderly. In Thailand, temples are where the elderly often visit to pray and socialize with others. However, studies related to characteristics and severity of falls within temples are limited.*
Objective: *To study characteristics of falls (falls, near falls, and fall-related injuries) and severity of falls among the elderly in temples.*
Material and Method: *A cross-sectional analytic study. Subject is elderly population group (aged 60 and above) in the province of Nakhon Ratchasima (17 districts) who attend temples at least once a week (22 temples). The survey was conducted by questionnaires that required personal information, medical condition, frequency of fall, fall description, fall location, time of fall, and severity after a fall.*
Results: *Total 742 subjects aged adult were screened through questionnaires. A number of 451 persons were reported to have fallen in temples, which was 60.8% of the population, whereas 76.1% of the population was said to have fallen or nearly fell. Most of the subjects have fallen only once in the past year by tripping (55%) and slipping (28.7%). Most of the falls occur outdoors (48.0%) rather than indoors (30.4%) and in the bathroom (21.6%). Some adults do not have any fall-related injuries (33.5%), though most of them experience muscle pain (27.3%). The rate of fractures among the elderly was 7.1%. A total of 117 subjects required hospitalization (25.9%). Upon being discharged from the hospital, 24.8% of the subjects were required to continue recovery at home.*
Conclusion: *The number of near falls and falls among Thai older adults in temples are quite high and very concerning. Such numbers are alarming and indicate that the elderly attending services and activities in temples require appropriate facilities and close attention from accompanying and surrounding persons. This study presented fundamental yet beneficial information which is useful for the architectural, engineering, and public health development for the elderly.*

Keywords: *Elderly, Falls, Temple*

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According to the National Statistical Office, the aging population in Thailand (over 60 years of age) in 2007 was 7,038,000 persons, which was approximately 10.7% of the entire population. The youth population of the population structure, has decreased from 30% in 1994, to 24.9% and 22.4% in 2002 and 2007, respectively. On the other hand, the aging population has increased from 6.8% in 1994 to 9.4% and 10.7% in 2002 and 2007, respectively[1].

The aging dependency ratio in Thailand was 10.7% in 1994, and increased to 14.3% and 16.0% in 2002 and 2007, respectively. The aging dependency ratio is calculated from the ratio of the aging population (over 60 years of age) over the working population of 100 persons (aged between 15-59 years). When comparing the rate of entering the aging society to the USA, European countries, and Japan, it only took 22 years to increase the population aged 65 years and

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above in Thailand from 7% to 14%. It is expected that in the next two decades, Thailand will have an aging dependency ratio of up to 1:3[2].

Falls and their consequences, such as fracture, other injuries, fear of falling, impaired functions and dependency are serious health problems among the elderly[3]. In the United States, over 700,000 patients a year are hospitalized because of a fall injury, most often because of a head injury or hip fracture[4]. One out of five falls causes a serious injury such as broken bones or a head trauma[5,6]. In Thailand, the elderly spend most of their time in a few places such as their home, temple, park, and market, etc. Temples are where the elderly often visit to pray and socialize with others. However, studies related to characteristics and causes of severe falls within temples are limited. Therefore, the underlying objective of this research is to study characteristics of falls (including near-falls and fall-related injuries) and severe falls among the elderly in temples. The focus is on an elderly group in the Nakhon Ratchasima province, which has the second highest aging population in the country after Bangkok. Outcomes of this research will provide fundamental information in providing facilities to support and monitor the elderly in temples who may have various medical conditions.

Material and Method

This is a cross-sectional analytic study on an elderly group of 451 persons aged 60 and above in the province of Nakhon Ratchasima who attend temples at least once a week. A number of 22 temples were sampled in 17 districts in Nakhon Ratchasima province, which include districts of Pak Thong Chai, Soong Noen, Sri Kiew, Pak Chong, Wang Nam Khieow, Chok Chai, Muang, Kham Thale Sor, Non Thai, Non Soong, Chalerm Prakiat, Chakrat, Huay Talaeng, Nong Boon Nak, Kham Sagae Saeng, Kong, and Kornburi.

The survey was conducted by using questionnaires which gathered personal information (sex, education, exercise, housing), medical condition, fall description, frequency of fall, fall location, time of fall, and severity after a fall. Descriptive statistics were used to describe general information of the collected data. The Chi-square test of independence was employed to determine the relationships among studied parameters. By default, a significance level (*p*-value) of 0.05 was used throughout this study.

Results

The collected data of 742 adult subjects were screened with distribution shown in Table 1. A number of 565 persons were reported to have fallen or nearly fell in temples, which was 76.1% of the population, whereas 60.8% of the population were said to have fallen.

Characteristics data of the aged adults were collected from 742 subjects with details of the subjects shown in Table 2. The group of adults who visit the temple the most often is early aging group (aged 60-69 years), which was 55.8% of the population, followed by the middle aging group (aged 70-79 years), which was 32.2% of the population, and the terminal aging group (aged 80 years and above), which was 12% of the population. Most of the population was female, which accounted for 65.8% of the population. Most of the population (91.5%) did not live alone, have completed primary school (74.4%), and have had regular annual health checkups (83.4%). Most subjects have balancing problems (49.9%), visual problems (46.8%), and hearing problems (27.4%). They have chronic illnesses that require regular medication (76.4%). Most subjects have regular exercise no more than twice a week (39.8%), followed by those who do not exercise at all (32.2%), as shown in Table 2.

The top 5 illnesses found among the aged adults were visibility-related illnesses (20.2%), followed by hypertension, backache and lower back pain, diabetes, and osteoporosis (19.4%, 18.7%, 15.9% and 14.7%, respectively) as shown in Fig. 1.

As for the fall circumstances of the aged adults who fall or near fall collected from 565 subjects (76.1%) of the population, most visited the temple once a week (48.1%) and travel to the temple by themselves (59.6%) either by motorcycle or bicycle (55.2%). Most of the subjects have fallen only once in the past year by tripping (55%) or slipping (28.7%).

The most frequent time of fall is between 08.00-14.59 H (50.8%). The most frequent location of fall is on horizontal ground (65.7%), followed by the stairs or steps (18.6%). Most of the falls occur outdoors (48.0%)

Table 1. Number and percentage of the aged adults and relatives classified according to type of fall

History of fall	n = 742	
	Number	Percent
Not fall	177	23.9
Near fall	114	15.3
Fall	451	60.8

Table 2. Characteristics of adults aged 60 and older

Characteristics	n = 742	
	Number	Percent
Age group		
60-69	414	55.8
70-79	239	32.2
80+	89	12.0
Gender		
Male	254	34.2
Female	488	65.8
Live alone		
Yes	63	8.5
No	679	91.5
Education		
No	132	17.8
Primary education	552	74.4
Secondary education	57	7.7
Bachelor and above	1	0.1
Annual health checkup		
Yes	619	83.4
No	123	16.6
Hearing problems		
Yes	203	27.4
No	539	72.6
Visual problems		
Yes	347	46.8
No	395	53.2
Balancing problems		
Yes	370	49.9
No	372	50.1
Have chronic illness that require regular medication		
Yes	567	76.4
No	175	23.6
Exercise		
Do not exercise	239	32.2
No more than twice a week	295	39.8
Regular exercise	208	28.0

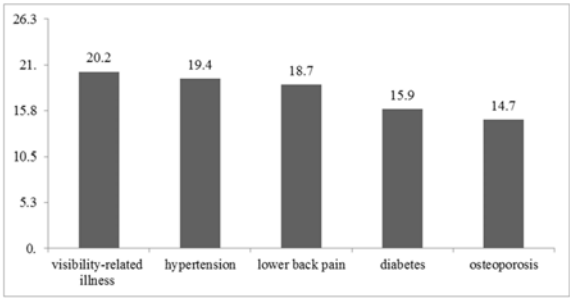

Fig. 1 Percentage of the top 5 illnesses in the sampled aged adults.

rather than indoors (30.4%), and in the bathroom (21.6%) as shown in Table 3.

Most aged adults do not have any fall-related injuries (33.5%), though some experience muscle pain (27.3%). A total of 117 subjects required hospitalization (25.9%), of which subjects underwent

Table 3. History of falls or near falls conducted from the survey

	n = 565	
	Number	Percent
1) Frequency of times to go to temple		
1 time/month or less than	26	4.6
2-3 times/month	173	30.6
Once a week	272	48.1
Almost everyday	94	16.7
2) Go to temple by themselves		
Yes	337	59.6
No	228	40.4
3) How do you go to temples		
Walking	172	30.5
Bus	8	1.4
Motorcycle or bicycle	312	55.2
Car	73	12.9
4) How many times of fall or near fall in past one year		
1 time	493	87.2
2 times	54	9.6
3 times	8	1.4
4 times	10	1.8
5) The last time you fall or near fall in temples is falling in any manner		
By tripping	311	55.0
By slipping	162	28.7
By dizziness	92	16.3
6) The last time you fall or near fall happen any time		
05.00-07.59 H	170	30.1
08.00-14.59 H	287	50.8
15.00-15.59 H	32	5.7
16.00-18.59 H	76	13.4
7) The last time you fall or near fall are horizontal ground or the stairs or steps		
The stairs or steps	105	18.6
Horizontal ground	371	65.7
Horizontal ground but there more messy flat	89	15.7
8) The last time you fall or near fall indoor or outdoor (stairs entrance is indoor)		
Indoor	172	30.4
Bathroom	122	21.6
Outdoor	271	48.0

treatment no more than one week (70.9%), 30 subjects (25.7%) had to be admitted for 1 to 4 weeks, and 4 subjects (3.4%) were admitted for over 4 weeks. Upon being discharged from the hospital, 24.8% of the subjects required continued recovery at home as shown in Table 4 and 5.

There are significant relationships among characteristics of fall, time when falling occurs, location where falling occurs, and age of the elderly as shown in Table 6-8.

Discussion

Falls are the leading cause of fatal and non-fatal injuries among older adults[4], even those who fall and are not injured often suffer negative health consequences. In Thailand, temples are places where Thai elderly regularly visit and attend services. Results of this study have shown that 60.8% of Thai elderly have fallen in temples in the past year. The rate of falls obtained in this study was higher than that of the report on the Fourth National Health Survey conducted on Thai population in 2009, of which 9,210 subjects aged over 60 years were interviewed about fall incidents that occurred in the past 6 months. It was found in that report that only 18.5% of the population had experienced a fall[7]. The rate of fall in this study was higher than an existing study by La-orm Soysaeng, which found that the only 34.8% of the elderly in the Mitrapap Pattana Community have experienced a fall in the past 6 months[8]. From the study conducted in temples, it can be inferred that temples have been a common place where falls can occur among the Thai elderly, and such falls are of high severity (from the past studies). It is necessary to provide suitable facilities and preventive measures for these elderly. Although falls outside the temple occurred at a lower rate, it was found that the rate of falls among Thai elderly was still higher than that of developed countries such as the USA, and thus requires close monitoring. In a study by Rebecca Boyd, it was found that only 9.6% of US older adults fell in the past 3 months[9].

The rate of falls in temples among the Thai

Table 4. Outcome of fall

Outcome of fall	n = 451	
	Number	Percent
1) Outcome of fall		
None	151	33.5
Muscle pain	123	27.3
Hematoma	108	23.9
Laceration	35	7.8
Fracture	32	7.1
Head injury	2	0.4
2) Required hospitalization		
Yes	117	25.9
No	334	74.1

Table 5. Severity of fall on physical function

	n = 117	
	Number	Percent
1) Duration of hospitalization		
No more than one week	83	70.9
1-4 weeks	30	25.7
Over 4 weeks	4	3.4
2) After discharged, required continued recovery at home, how long		
Yes	29	24.8
No	88	75.2
(Duration continued recovery at home max = 30 days, min = 1 day, mode = 7 day, $\bar{X}$ = 6.5, SD = 5.8)		

Table 6. Relationship between characteristics of falls and the time of fall

Characteristics of falls	Number (%)		*p*-value
	Sufficient lighting (08.01-16.00 H)	Insufficient lighting (05.01-08.00 H and 16.01-19.00 H)	
Falls caused by tripping	140 (45.0)	171 (55.0)	0.00*
Falls caused by slipping	110 (67.9)	52 (32.1)	0.00*
Falls caused by dizziness	69 (75.0)	23 (25.0)	0.00*
Total	319 (56.5)	246 (43.5)	0.00*

* Significant correlation at $p<0.05$

Table 7. Relationship between location and characteristic of falls

Location of falls	Characteristics of falls			*p*-value
	Falls caused by tripping	Falls caused by slipping	Falls caused by dizziness	
Indoors except bathrooms	92 (53.5)	25 (14.5)	55 (32.0)	0.00*
Bathrooms	35 (28.7)	66 (54.1)	21 (17.2)	0.00*
Outdoors	184 (67.9)	71 (26.2)	16 (5.9)	0.00*
Total	311 (55.0)	162 (28.7)	92 (16.3)	0.00*

* Significant correlation at $p<0.05$

Table 8. Relation between age groups and fall characteristics

Age group	Characteristics of falls			*p*-value
	Falls caused by tripping	Falls caused by slipping	Falls caused by dizziness	
60-69 years	167 (54.6)	102 (33.3)	37 (12.1)	0.00*
70-79 years	101 (53.7)	48 (25.5)	39 (20.7)	0.00*
80+ years	43 (60.6)	12 (16.9)	16 (22.5)	0.00*
Total	311 (55.0)	162 (28.7)	92 (16.3)	0.00*

* Significant correlation at $p<0.05$

elderly is close to the rate of falls in commonly visited venues among elderly in other countries. Barbara Resnick reported that the falls that occurred over a 5-year period in a group of older adults living in a continuing care retirement community (CCRC), was up to 57% of the residents[10]. Kallin et al investigated predisposing and precipitating factors for falls among the older people in residential care. They found that incidents fall of at least once during a 1-year period was 62.6%[11].

There are three main characteristics of fall: tripping, slipping, and fall due to dizziness. Results from this study reveal that there are significant relationships among characteristics of fall, time when falling occurs, location where falling occurs, and age of the elderly. In a study involving relations between characteristics of fall and the time of fall, it was found that tripping occurs more during limited lighting periods than sufficient lighting periods, while slipping and fall due to dizziness occur more during sufficient lighting period than insufficient lighting periods. Most falls occur during times of sufficient lighting rather than insufficient lighting, which is likely to coincide with the time the elderly perform their activities at the temple as shown in Table 6.

In a relationship study between the location of falls and characteristics of falls, it was found that tripping was the most common type of fall occurring both indoors and outdoors. Bathrooms are the most frequent place for slipping as shown in Table 7. Therefore, proper arrangements to provide obstacle-free walkways both indoors and outdoors, installation of anti-slip floors and keeping the bathroom floors dry would enhance fall protection among the elderly.

An analysis between the age group and characteristics of falls revealed that tripping was most common fall for all age groups, whereas slipping occurred most in the early aged group (60-69 years) and fall from dizziness was most common for the terminal aged group (80+ years) as shown in Table 8.

From this study, it was found that the rate of fracture in the elderly was 7.1%, which was similar to that study by Baldwin et al[12], Berg et al[13], Overstall[14] Sattin[15], and Sattin[16], which reported that the rate of fracture was relatively low (9%) in their communities. On the other hand, in a study by Patricia H. Honeycutt

and Priscilla Ramsey, a 27.2% rate of fracture in the elderly was reported, which was higher than found in this study[17].

This research highlights the alarming frequency of falls among the elderly, which must not be overlooked. Efforts to provide friendly indoor and outdoor surroundings as well as bathrooms in temples are thus necessary. In addition, informing the elderly of preventive measures from falling is equally important.

Conclusion

A proportion of 60.8% of the elderly who performed activities in temples have experienced falls within the past year and 76.1% have fallen or nearly fell in temples. Such numbers are alarming and indicate that the elderly attending services and activities in temples require appropriate facilities and close attention from accompanying and surrounding persons. Most of the fall incidents in temples occurred between 08.00-14.59 H (50.8%), coinciding with the period in which most of the elderly perform activities at temples, with bathrooms being the most frequent fall location, and most falls by slipping (up to 54.1%). Therefore, temples should provide elderly-friendly bathroom facilities. The elderly must also be accompanied to the facilities and use the bathroom with caution. A portion of 25.9% of those who experienced falls were hospitalized, or about one fourth of the group. Similar to other studies, a rate of fracture of 7.1% was reported for falls incurred in temples.

This study presented fundamental yet beneficial information, which is useful for the architectural, engineering and public health development for the elderly. Such knowledge would enable improved wellbeing of the elderly and lessen the workload of caretakers leading to the betterment of the country's overall economy and society.

What is already known on this topic?

The previously reported severity of falls among the elderly has been limited to nursing home, community, and continuing care retirement community (CCRC). This investigation in temples where the elderly often visit and fall is thus novel and significant.

What this study adds?

This paper presents characteristics and severity of falls among the elderly in temples, which are beneficial information and useful for the architectural, engineering and public health development for the elderly.

Acknowledgements

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Potential conflicts of interest

None.

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ลักษณะและความรุนแรงของการล้มของผู้สูงวัยในวัด

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ภูมิหลัง: *การล้มและผลกระทบจากการล้มเป็นปัญหาสุขภาพที่สำคัญของผู้สูงวัยในประเทศไทย วัดเป็นสถานที่ที่ผู้สูงวัยไปสวดมนต์ ไหว้พระและประกอบกิจกรรมอยู่บ่อย ๆ อย่างไรก็ตามการศึกษาลักษณะการล้มและความรุนแรงของการล้มในวัดยังมีอยู่อย่างจำกัด*

วัตถุประสงค์: *เพื่อศึกษาลักษณะการล้มและความรุนแรงของการล้มของผู้สูงวัยขณะไปทำกิจกรรมที่วัด*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาเชิงพรรณนาแบบภาคตัดขวาง ณ ช่วงเวลาใดเวลาหนึ่งโดยทำการศึกษาในผู้สูงวัยอายุตั้งแต่ 60 ปีขึ้นไปที่อาศัยอยู่ในจังหวัดนครราชสีมา และไปทำกิจกรรมที่วัดเป็นประจำสัปดาห์ละไม่น้อยกว่า 1 ครั้ง การสำรวจใช้แบบสอบถามที่ระบุข้อมูลส่วนบุคคล โรคประจำตัว ความถี่ของการล้ม ลักษณะการล้ม สถานที่ล้ม ช่วงเวลาล้ม และความรุนแรงหลังจากล้ม*

ผลการศึกษา: *ผู้สูงวัยเคยล้มในวัดมีจำนวน 451 คน คิดเป็นร้อยละ 60.8 และผู้สูงวัยที่มีประวัติเคยล้มหรือเกือบล้มรวมกันมีจำนวนมากถึงร้อยละ 76.1 ผู้สูงอายุส่วนใหญ่ล้มเพียง 1 ครั้งใน 1 ปีที่ผ่านมา ลักษณะการล้มเป็นแบบสะดุดมากที่สุด (ร้อยละ 55.0) รองลงมาคือลื่นไถล (ร้อยละ 28.7) บริเวณที่ล้มหรือเกือบล้มส่วนใหญ่อยู่นอกตัวอาคารมากที่สุด (ร้อยละ 48.0) ในตัวอาคาร (ร้อยละ 30.4) และห้องน้ำ (ร้อยละ 21.6) เมื่อพิจารณาการบาดเจ็บหลังล้ม พบว่าผู้สูงวัยที่ล้ม ส่วนใหญ่ไม่มีอาการ (ร้อยละ 33.5) รองลงมาเป็นปวดกล้ามเนื้อ (ร้อยละ 27.3) และพบกระดูกหักได้ถึงร้อยละ 7.1 ผู้สูงวัยที่ล้มแล้วต้องเข้าโรงพยาบาลมีจำนวนสูงถึง 117 คน (ร้อยละ 25.9) เมื่อออกจากโรงพยาบาลแล้วผู้สูงวัยต้องนอนพักฟื้นต่อที่บ้านคิดเป็นร้อยละ 24.8*

สรุป: *สัดส่วนผู้สูงวัยที่มาทำกิจกรรมในวัดเคยเกือบล้มหรือล้มในวัดภายใน 1 ปีที่ผ่านมาสูงมากจนน่าเป็นห่วง และแสดงให้เห็นว่าผู้สูงวัยที่มาทำกิจกรรมในวัดต้องการสิ่งอำนวยความสะดวกที่เหมาะสมและต้องการความดูแลอย่างใกล้ชิดจากผู้ติดตามและบุคคลรอบข้าง ผลงานวิจัยนี้เป็นองค์ความรู้พื้นฐานที่จำเป็นและมีประโยชน์อย่างมากในการต่อยอดพัฒนางานด้านสถาปัตยกรรม วิศวกรรม และสาธารณสุข เพื่อการพัฒนาคุณภาพชีวิตของผู้สูงวัย*