

Fall Prevention Literacy among Thai Elderly: A Cross-Sectional Study in a Municipal Community Context

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Objective: To assess the proportion of fall prevention literacy and identify factors related to fall prevention literacy among Thai elderly in the municipal community context.

Materials and Methods: A cross-sectional study was conducted among the elderly aged 60 to 69 years in the Sakon Nakhon Municipality, Sakon Nakhon Province, Thailand. The sample size based on a simple random sampling. One hundred forty-five older persons were interviewed using a fall prevention literacy questionnaire. The data were analyzed with descriptive statistics such as frequency, percentage, mean, standard deviation, and 95% confidence interval (CI). Chi-squared, crude odds ratio, adjusted odds ratio (AOR), and multiple logistic regression statistics were used to evaluate the factors related to fall prevention literacy.

Results: The response rate was 97.22%. Most elderly were female, married, had chronic morbidity, and had a caregiver. The proportion of fall prevention literacy in respondents was inadequate at 50.70%, 95% CI 42.46 to 58.94. Multiple logistic regression analysis showed that chronic morbidity (AOR 2.24, 95% CI 1.04 to 4.48) and health education by village health volunteers (AOR 3.17, 95% CI 1.12 to 9.00) were statistically related to adequate fall prevention literacy.

Conclusion: Half of the elderly had inadequate fall prevention literacy. Therefore, to improve the fall prevention literacy among the elderly, it is important to consider elderly targets without chronic morbidity, and the village health volunteers are the key persons to educate and enhance fall prevention literacy among community-dwelling elderly.

Keywords: Fall prevention literacy, Elderly, Municipal

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Globally, the number of elderlies has increased, and they live longer. In 2019, there were 702.9 million persons, and by 2050, the number of these elders is expected to reach 1,548.9 million⁽¹⁾. Life expectancy at birth of the world population is projected to rise between 68.7 years in 2005 to 2010 and 71.0 years in 2015 to 2020^(1,2). The population aging trend in Thailand is expected to grow rapidly from 17.1% of the total population in 2017 to 35.1% in 2050⁽³⁾.

The average life expectancy at birth rose from 73.3 years in 2005 to 2010 to 75.2 years in 2015 to 2020⁽²⁾. The structure of the population change results from declining fertility and increasing longevity causing higher old-age dependency ratios⁽¹⁾. In addition, the elderly experience physical function decline along with multiple morbidities, causing a high risk of falls^(4,5).

Fall is the most common geriatric problem. The incidence of falls each year among the elderly aged 65 and over has been approximately 28.0% to 35.0%. The trend of falls increases to 32.0% to 42.0% in those aged 70 years and older⁽⁵⁾. In Thailand, the elderly had one or more falls in the last six months in the rural area at 18.7% and in the urban area at 19.8%^(6,7). The consequence of falls are injury to the elderly at 68.1%, disability at 35.3%, and mortality at 40.0%⁽⁸⁾. The elderly have multiple falls risk, with both intrinsic and extrinsic factors⁽⁵⁾. The intrinsic factors for falls are the aging process and chronic disease, along with multiple medications used, affecting muscle

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weakness, gait deficit, and balance impairment⁽⁹⁾. The extrinsic factors stimulating falls are environmental hazards and fall risk behaviors, such as slippery floors, loose rugs, insufficient lighting, alcohol consumption, and wearing slippers^(5,10).

The multiple risk factors of falls can be prevented by multifactorial interventions, consisting of health education, exercise programs, medication reviews, and home environmental modifications^(5,11). All fall prevention programs must have health education as an essential strategy to facilitate the elderly obtaining health information. In addition, it helps the elderly to improve their health literacy, which develops knowledge and builds fall management skills^(5,11,12). On the other hand, inadequate literacy will cause a higher fall incidence, especially in an urban area, together with neglect at engaging in health care services^(4,13). Health literacy is the individual's skills and the ability to act on knowledge according to receiving and understanding information to make health decisions in different situations⁽¹²⁾. Health literacy is divided into three levels. These are 1) functional health literacy, which includes necessary skills like reading and writing to obtain information, 2) interactive health literacy, which is the cognition to improve knowledge for health decision-making leading to behavior change, and 3) critical health literacy, which is the ability to analyze information and social skills to take action to benefit their health⁽¹²⁾.

The previous studies have found that age is related to health literacy. Specifically, older age is strongly associated with low health literacy⁽¹³⁾. This is due to the physical health declining from age-related biological changes, such as poor vision and cognitive impairment⁽¹⁴⁾. Moreover, active aging groups can improve health literacy and have better fall prevention behaviors than those with advanced age⁽⁵⁾. Having fall prevention literacy helps the elderly to know the risk factors of falls. They can decide on the choice of fall risk management on their own, leading to reducing the number of falls^(4,5,11). Therefore, the present study was performed in the young-old group, aged 60 to 69 years. The study aimed to assess the proportion of fall prevention literacy and identify factors related to fall prevention literacy. The study findings will be useful for fall prevention programs among the community-dwelling elderly in Sakon Nakhon municipality and other similar areas.

Materials and Methods

The present study design was a cross-sectional study in the Sakon Nakhon municipality, Muang

district, Sakon Nakhon province, Thailand. The study population was elderly at 60 to 69 years, who lived in the area of responsibility and were registered at the That Choeng Chum Health Promotion Hospital. The inclusion criteria were being older adults who had been living in the area for more than six months, agreed to participate in the present study, and could communicate in Thai. The exclusion criteria were being elderly with a disability or cognitive disorders.

The sample size was calculated based on simple random sampling considering the outcomes from the pilot study, which were having a proportion of fall prevention literacy of 0.43 calculated with the WinPepi program⁽¹⁵⁾, defined confidence level at 95%, acceptable error 0.085 and expected loss of subjects at 10%. The sample size required was 145 persons who had registered in the name list at the That Choeng Chum Health Promotion Hospital in 2019.

The operational definition

Fall prevention literacy referred to measuring cognition in fall prevention among older adults, which covered two parts. These were 1) functional health literacy, which was having an understanding of the risk factor for falls in older adults, and 2) interactive health literacy, which was decision-making to manage fall risk factors.

Data collection methods

The tool was a questionnaire consisting of two parts, which were 1) demographic characteristics, and 2) fall prevention literacy.

The demographic characteristics questionnaire was developed by the researchers. It was composed of three parts as follows, 1) socio-demographic variables consisting of gender, age, marital status, education level, still working, number of family members, and having a caregiver, 2) health status variables being having a chronic morbidity, medication usage, vision problems, hearing problems, perceived health status, having fallen in the past six months, and 3) obtaining knowledge of fall prevention information.

The fall prevention literacy questionnaire was developed by the researcher. The construction of this part was based on the health literacy concept and the health belief model^(5,12,16). This questionnaire was composed of two parts, 1) the functional health literacy measure was the fall risk factors with 26 items, and 2) the interactive health literacy measure was the fall risk management factors with 15 items. The possible score for the fall prevention literacy was between 0 (incorrect answer) and 1 (correct answer).

The total score was 41 marks. An inadequate fall prevention literacy level refers to a sum score less than 32.8, while an adequate fall prevention literacy level refers to a sum score of 32.8 and over⁽¹⁷⁾. The content validity was reviewed by three experts, which were one geriatrics doctor and two family doctors. Fall prevention literacy questionnaire found the validity test result as 0.97, as well as the reliability test, which found a Cronbach alpha of 0.89. Data were collected by well-trained university student interviewers using the local language, the Isan dialect. The periods of recruitment and data collection were conducted between September and October 2019.

Statistical analysis

The data and forms were checked for completeness, and then double-entered and validated in the Microsoft Excel program before being transferred into SPSS Statistics, version 17.0 (SPSS Inc., Chicago, IL, USA), licensed to Khon Kaen University. The present descriptive statistic was to describe the demographic characteristic and fall prevention literacy. There were frequencies, percentages, means, standard deviations (SD), and 95% confidence intervals (CI). To identify the factors related to fall prevention literacy among the elderly, multiple logistic regression was used with the enter method. Univariate analysis was performed to identify factors potentially associated with fall prevention literacy. Factors found to be significantly (*p*-value less than 0.25) from univariate analyses were considered for inclusion in the multivariate analyses⁽¹⁸⁾.

Ethical considerations

The study was approved by the Ethics Committee for Research on Human Subjects (HE621243), Faculty of Medicine, Khon Kaen University, Thailand.

Results

The demographic characteristics among the elderly

The response rate was 97.22% (140/145). Most respondents were female. The mean age was 65.30 years old (SD 2.88). Half of the elderly were married, had completed secondary school and higher, and did not work. Most of the elderly had family members of one to three persons and had a caregiver. For the health status, most respondents had a chronic morbidity, medication usage, and vision problems. Two-thirds of the elderly perceived their health status at moderate or poor. The respondents had fallen in the past six months at 17.10%. The majority received health education by village health volunteers, from

television, and from peer groups, in following order (Table 1).

The fall prevention literacy among the elderly

In terms of functional health literacy, it was found that the respondents had the highest percentage of correct answers in the top three, which were chronic morbidity, slippery floor or uneven surface, and a cluttered room, in following order. The lowest percentage of answers for fall risk factors were foot pain, wearing multifocal glasses, needing help to use toilet, and having inadequate exercise (Table 2).

In the part of interactive health literacy, the highest responses for activity to be managed for fall prevention were making the interior of the house orderly and safe, improving room lighting, and attending the fall prevention training program. Besides these, half of the elderly reported the activities chosen to manage for fall prevention were proper use of sleeping pills, and self-prescription (Table 2).

Overall, the respondents had a mean score of fall prevention literacy of 30.53 (SD 8.14), 95% CI 29.18 to 31.90. Half of the elderly had an inadequate fall prevention literacy level (Table 3).

Factors related to fall prevention literacy among the elderly

Univariate analysis indicated that chronic morbidity and health education by village health volunteers were statistically related to fall prevention literacy among the elderly. In more detail, the present study revealed that the respondent elders who had chronic morbidity had a fall prevention literacy score higher than those who did not, as well as the elderly who received health education by village health volunteers had higher score than those who did not (Table 4).

Multiple logistic regression analyses showed that chronic morbidity and health education by village health volunteers were related to fall prevention literacy among the elderly with statistical significance (Table 5).

Discussion

The present study was done with a sample of elders 60 to 69 years old, which is young-old and has active aging. They have good functional health status, and normal cognitive ability due to having slight physical health decline from age-related change⁽⁵⁾. The elders with a disability have a high fall risk as they have poor physical health, although they do not have limited literacy^(5,14). The authors selected the sample

Table 1. Demographic characteristic among the elderly (n=140)

Demographic characteristic	n (%)
Socio-demographic variables	
Sex	
• Male	33 (23.60)
• Female	107(76.40)
Age (years)	
• Minimum, maximum [mean (SD)]	60, 69 [65.30 (2.88)]
• 60 to 64 years	53 (37.86)
• 65 to 69 years	87 (62.14)
Marital status	
• Married	70 (50.00)
• Single/widowed/separated	70 (50.00)
Education level	
• Primary and no school	70 (50.00)
• Secondary school and higher	70 (50.00)
Still working	
• Yes	61 (43.60)
• No	79 (56.40)
Number of family members	
• 1 to 3 persons	85 (60.70)
• ≥4 persons	55 (39.30)
Having a caregiver	
• Yes	93 (66.40)
• No	47 (33.60)
Health status variables	
Chronic morbidity	
• Yes	86 (61.40)
• No	54 (38.60)
Medication usage	
• Yes	88 (62.90)
• No	52 (37.10)
Vision problems	
• Yes	75 (53.60)
• No	65 (46.40)
Hearing problems	
• Yes	21 (15.00)
• No	119 (85.00)

SD=standard deviation

Demographic characteristic	n (%)
Perceived health status	
• Good	31 (22.20)
• Moderate and poor	109 (77.80)
Fallen in the past six months	
• Yes	24 (17.10)
• No	116 (82.90)
Obtaining knowledge of fall prevention information	
Television	
• Yes	100 (71.40)
• No	40 (28.60)
Radio	
• Yes	32 (22.90)
• No	108 (77.10)
Leaflets and Manuals	
• Yes	55 (39.30)
• No	85 (60.70)
Health professionals	
• Yes	83 (59.30)
• No	57 (40.70)
Village Health Volunteers	
• Yes	113 (80.70)
• No	27 (19.30)
Family	
• Yes	63 (45.00)
• No	77 (55.00)
Peer groups	
• Yes	84 (60.00)
• No	56 (40.00)
LINE application	
• Yes	56 (40.00)
• No	84 (60.00)
Internet	
• Yes	43 (30.70)
• No	97 (69.30)

with healthy aging and having normal cognitive ability that impacts the proper functioning of health literacy. The characteristics of the sample were similar to the study of Geboers et al and included participants who had a mean age of 68.9 years at baseline. The results showed the elderly had low health literacy⁽¹⁹⁾.

The study showed that half of the elderly had inadequate fall prevention literacy level. These findings were similar to a systematic review of the study by Chesser et al⁽¹³⁾ who reported that the elderly had low health literacy. The results can be described by the ageing process that wears off the structures and functions throughout the life span.

Table 2. Fall prevention literacy among the elderly (n=140)

Fall prevention literacy	Answer correct; n (%)
Functional health literacy; understanding the risk factor of falls	
1. Recurrent falls	97 (69.30)
2. Rapid body position change	105 (75.00)
3. Turn from facing left to right causes dizziness	104 (74.30)
4. Upper and lower extremity weakness	109 (77.90)
5. Knee pain	106 (75.70)
6. Vision impairment	113 (80.70)
7. Wearing multifocal glasses	64 (45.70)
8. Chronic morbidity	114 (81.40)
9. Cognitive impairment	102 (72.90)
10. Parkinson's disease	96 (68.60)
11. Foot pain	63 (45.00)
12. Need help to use toilet	65 (46.40)
13. Depressed	81 (57.90)
14. Fear of falling	97 (69.30)
15. Urinary incontinence	83 (59.30)
16. Psychotropic drug	84 (60.00)
17. Polypharmacy (\geq four drugs)	90 (63.30)
18. Alcohol consumption	108 (77.10)
19. Inadequate exercise	76 (54.30)
20. Slippery shoes	112 (80.00)
21. Slippery floor or uneven surface	114 (81.40)
22. Poor room lighting	111 (79.30)
23. Cluttered room	114 (81.40)
24. No handrail in the bathroom	109 (77.90)
25. Doormat not firmly attached to the floor	106 (75.70)
26. Inappropriate walking aids	106 (75.70)
Interactive health literacy; the decision to correct what activity for fall risk management	
1. Training moderate-intensity aerobic exercise and to supplement with resistance, flexibility, and balance exercise training	120 (85.70)
2. Self-prescription	83 (59.30)
3. Take sleeping pills	69 (49.30)
4. Searching for side effects of a drug and following the advice	109 (77.90)
5. When having vision problems see the doctor and check visual acuity	110 (78.60)
6. Choose walking on ramps or with handrails	131 (93.60)
7. Change posture balance with careful movement and slowly	130 (92.90)
8. Avoid alcohol drinking	131 (93.60)
9. Using walking aids	131 (93.60)
10. Choose a doormat attached to the floor	130 (92.90)
11. Make inside the housing orderly and safe	138 (98.60)
12. Wear well-fitting shoes with good support	117 (83.60)
13. Improve room lighting	133 (95.00)
14. Clean up spills or water on the floor	112 (80.00)
15. Attend the fall prevention training program	132 (94.30)

Table 3. Fall prevention literacy level (n=140)

Fall prevention literacy level	n (%)	95% CI
Inadequate (<32.8 score)	71 (50.70)	42.46 to 58.94
Adequate (\geq 32.8 score)	69 (49.30)	41.06 to 57.54
Total score of 41 scores; mean score	30.53 (SD 8.14)	29.18 to 31.90

SD=standard deviation; CI=confidence interval

Table 4. Univariate analysis of factors related to fall prevention literacy among the elderly

Factors	Fall prevention literacy; n (%)		Crude odds ratio	95% CI	p-value
	Adequate	Inadequate			
Socio-demographic variables					
Sex					
• Male	13 (39.40)	20 (60.60)	0.59	0.27 to 1.31	0.194
• Female	56 (52.30)	51 (47.70)			
Age group					
• 60 to 64 years	26 (49.10)	27 (50.90)	0.98	0.50 to 1.95	0.966
• 65 to 69 years	43 (49.40)	44 (50.60)			
Marital status					
• Married	35 (50.00)	35 (50.00)	1.06	0.55 to 2.05	0.866
• Single/widowed/separated	34 (48.60)	36 (51.40)			
Education level					
• Primary and no school	32 (45.70)	38 (54.30)	0.75	0.38 to 1.46	0.398
• Secondary and higher	37 (52.90)	33 (47.10)			
Still working					
• Yes	34 (55.70)	27 (44.30)	1.58	0.81 to 3.10	0.180
• No	35 (44.30)	44 (55.70)			
Number of family members					
• 1 to 3 persons	38 (45.90)	46 (54.10)	0.71	0.36 to 1.40	0.317
• ≥4 persons	30 (54.50)	25 (45.50)			
Having caregiver					
• Yes	46 (49.50)	47 (50.50)	1.02	0.51 to 2.06	0.953
• No	23 (48.90)	24 (51.10)			
Health status variables					
Chronic morbidity					
• Yes	50 (58.10)	36 (41.90)	2.56	1.27 to 5.17	0.008*
• No	19 (35.20)	35 (64.80)			
Medication usage					
• Yes	46 (52.30)	42 (47.70)	1.38	0.69 to 2.75	0.358
• No	23 (44.20)	29 (55.80)			
Vision problems					
• Yes	33 (44.00)	42 (56.00)	0.63	0.32 to 1.24	0.179
• No	36 (55.40)	29 (44.60)			
Hearing problems					
• Yes	11 (52.40)	10 (47.60)	1.16	0.46 to 2.93	0.758
• No	58 (48.70)	61 (51.30)			
Perceived health status					
• Good	15 (48.40)	16 (51.60)	0.96	0.43 to 2.12	0.910
• Moderate and poor	54 (49.50)	55 (50.50)			
Fallen in the past six months					
• Yes	8 (33.30)	16 (66.70)	0.45	0.18 to 1.14	0.086
• No	61 (52.60)	55 (47.40)			
Obtaining knowledge of fall prevention information					
Television					
• Yes	50 (50.00)	50 (50.00)	1.11	0.53 to 2.30	0.789
• No	19 (47.50)	21 (52.50)			
Radio					
• Yes	18 (56.20)	14 (43.80)	1.44	0.65 to 3.18	0.370
• No	51 (47.20)	57 (52.80)			
Leaflets and Manual					
• Yes	27 (49.10)	28 (50.90)	0.99	0.50 to 1.95	0.970
• No	42 (49.40)	43 (50.60)			
Health professionals					
• Yes	44 (53.00)	39 (47.00)	1.44	0.73 to 2.84	0.287
• No	25 (43.90)	32 (56.10)			
Village Health Volunteers					
• Yes	62 (54.90)	51 (45.10)	3.47	1.36 to 8.87	0.007*
• No	7 (25.90)	20 (74.10)			
Family					
• Yes	32 (50.80)	31 (49.20)	1.12	0.57 to 2.17	0.747
• No	37 (48.10)	40 (51.90)			
Peer groups					
• Yes	40 (47.60)	44 (52.40)	0.85	0.43 to 1.67	0.629
• No	29 (51.80)	27 (48.20)			
LINE application					
• Yes	33 (58.90)	23 (41.10)	1.91	0.96 to 3.80	0.062
• No	36 (42.90)	48 (57.10)			
Internet					
• Yes	25 (58.10)	18 (41.90)	1.67	0.81 to 3.46	0.163
• No	44 (45.40)	53 (54.60)			

CI=confidence interval

* Statistically significant at p<0.05

Table 5. Multivariate analysis of factors related to fall prevention literacy among the elderly

Variables	Adjusted odds ratio	95% CI	p-value
Sex: male/female	0.74	0.31 to 1.80	0.509
Still working: yes/no	1.53	0.72 to 3.27	0.274
Chronic morbidity: yes/no	2.24	1.04 to 4.84	0.040*
Vision problems: yes/no	0.71	0.34 to 1.50	0.369
Fallen in the past six months: yes/no	0.45	0.16 to 1.29	0.137
Village health volunteers: yes/no	3.17	1.12 to 9.00	0.030*
LINE application: yes/no	1.67	0.64 to 4.40	0.297
Internet: yes/no	1.21	0.44 to 3.30	0.717

CI=confidence interval

* Statistically significant at $p < 0.05$

As a consequence, aging causes losses in vision, hearing capacity, memory, motor coordination, and other neural functions⁽²⁰⁾. Thus, older adults have limited health literacy concerning reading, writing, comprehension, and numeracy skills⁽¹⁴⁾.

However, older adults can develop health literacy by enhancing communication skills and health education using adult learning concepts to facilitate more comprehension and knowledge⁽¹²⁾. However, they have limitations in their ability to access information and their memory performance⁽²¹⁾.

The present study found chronic morbidity and health education by village health volunteers were related to fall prevention literacy. Chronic morbidity and health literacy can be described according to the concepts of the health belief model⁽¹⁶⁾. When people perceive they are at risk of morbidity and serious problems, they will search for the health information most relevant to their condition from various sources, instigating more health knowledge. They will apply the new information along with life experience in decision-making, resulting in creating self-efficacy to act on their knowledge to improve their health behavior⁽¹²⁾. These results were similar to the study of Liu et al that reported the respondents with one or more chronic conditions were associated with higher health literacy and a reduction in a comorbid condition. They revealed that diagnosis with chronic diseases might help an individual to access health literacy and have better knowledge about chronic diseases in the first diagnosis⁽²²⁾.

The Village Health Volunteers in the present study refers to the representatives who are trusted by community members and have been trained by a health professional⁽²³⁾. Their roles cover health promotion, disease prevention, and health education. These include 1) the outreach of health information,

2) health education and advising villagers, 3) ongoing social support by a home visit, and 4) dealing with a series of public health problems, comprising health screening, collecting vital statistics, primary care, and coordination with the health care system^(23,24). Village Health Volunteers are intermediaries who transfer health knowledge in a variety of ways, such as face-to-face conversation, peer support to share information, and innovation among the elderly groups⁽²⁴⁾. Therefore, older people could easily learn and understand, meaning an increase in knowledge. In addition, they provide emotional support to motivate and help with problem solving, along with demonstrations and practice to encourage continuous behavior change. Consequently, the elderly have more health literacy^(12,21). This was confirmed by Srisarakham et al, who conducted a training health education program for village health volunteers to carry out home visits to support self-management and provide knowledge to high-risk groups of type 2 diabetes (T2DM). The results show that participants at risk of T2DM had a significant increase in T2DM knowledge and self-management ($p < 0.001$)⁽²⁵⁾.

The strength of the present study was the data collection with a high response rate. There were some limitations in the cross-sectional descriptive design that studied only a single point in time. Nonetheless, some limitations occur, such as not explaining fall prevention literacy among the elderly of all ages, including disability groups. However, the present study can be applied in other similar areas. Future studies should examine the relationship between fall prevention literacy and the incidence of falls, comparing the elderly who have adequate health literacy. They are more likely to reduce their accidents from falls than those who have inadequate health literacy.

Conclusion

The present study showed that the elderly had an inadequate fall prevention literacy level at 50.70%, 95% CI 42.46 to 58.94. The factors related to fall prevention literacy were chronic morbidity and health education by village health volunteers with statistical significance at $p < 0.05$.

What is already known on this topic?

Health literacy among the elderly is at a low level, due to old age and biological decline.

What this study adds?

This study, which focused on specific health literacy issues, found that nearly half of the elderly had adequate amount of fall prevention literacy. This study also found factors related to adequate fall prevention literacy, which were having chronic morbidity and obtaining health education from village health volunteers.

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Conflicts of interest

The authors have no conflict of interest.

References

1. United Nations. World population ageing 2019 highlights. New York: Department of Economic and Social Affairs United Nations; 2019.
2. United Nations. World population prospects: The 2012 revision, highlights and advanced tables. New York: Population Division Department of Economic and Social Affairs United Nations; 2012.
3. United Nations. World population ageing 2017 highlights. New York: Department of Economic and Social Affairs United Nations; 2017.
4. Chesser AK, Woods NK, Reyes J, Rogers NL. Health literacy and older adults: Fall prevention and health literacy in a midwestern state. *J Aging Res Health* 2018;2:31-40.
5. World Health Organization. WHO Global report on falls prevention in older age. Geneva: WHO; 2007.
6. Assantachai P, Praditsuwan R, Chatthanawaree W, Pisalsarakij D, Thamlikitkul V. Risk factors for falls in the Thai elderly in an urban community. *J Med Assoc Thai* 2003;86:124-30.
7. Jitapunkul S, Songkhla MN, Chayovan N, Chirawatkul A, Choprapawon C, Kachondham Y, et al. Falls and their associated factors: a national survey of the Thai elderly. *J Med Assoc Thai* 1998;81:233-42.
8. Stel VS, Smit JH, Pluijm SM, Lips P. Consequences of falling in older men and women and risk factors for health service use and functional decline. *Age Ageing* 2004;33:58-65.
9. Tinetti ME, Kumar C. The patient who falls: "It's always a trade-off". *JAMA* 2010;303:258-66.
10. Kuhirunyaratn P, Prasomrak P, Jindawong B. Factors related to falls among community dwelling elderly. *Southeast Asian J Trop Med Public Health* 2013;44:906-15.
11. Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society. Summary of the Updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. *J Am Geriatr Soc* 2011;59:148-57.
12. Nutbeam D. Defining, measuring and improving health literacy. *Health Eval Promot* 2015;42:450-5.
13. Chesser AK, Keene Woods N, Smothers K, Rogers N. Health Literacy and Older Adults: A Systematic Review. *Gerontol Geriatr Med* 2016;2:1-13.
14. Kobayashi LC, Wardle J, Wolf MS, von Wagner C. Aging and Functional Health Literacy: A Systematic Review and Meta-Analysis. *J Gerontol B Psychol Sci Soc Sci* 2016;71:445-57.
15. Abramson JH. WINPEPI updated: computer programs for epidemiologists, and their teaching potential. *Epidemiol Perspect Innov* 2011;8:1-9.
16. Rosenstock IM. Historical origins of the health belief model. *Health Educ Monogr* 1974;2:328-35.
17. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: a new instrument for measuring patients' literacy skills. *J Gen Intern Med* 1995;10:537-41.
18. Sperandei S. Understanding logistic regression analysis. *Biochem Med (Zagreb)* 2014;24:12-8.
19. Geboers B, Reijneveld SA, Jansen CJ, de Winter AF. Health literacy is associated with health behaviors and social factors among older adults: Results from the lifelines cohort study. *J Health Commun* 2016;21:45-53.
20. Viña J, Borrás C, Miquel J. Theories of ageing. *IUBMB Life* 2007;59:249-54.
21. Chin J, Morrow DG, Stine-Morrow EA, Conner-Garcia T, Graumlich JF, Murray MD. The process-knowledge model of health literacy: evidence from a componential analysis of two commonly used measures. *J Health Commun* 2011;16 Suppl 3:222-41.
22. Liu L, Qian X, Chen Z, He T. Health literacy and its effect on chronic disease prevention: evidence from China's data. *BMC Public Health* 2020;20:690.
23. Suvanavejh C. Thailand primary health care profile. Bangkok: Primary Health Care Office, Office of Permanent Secretary, Ministry of Public Health; 1992.
24. Kowitt SD, Emmerling D, Fisher EB, Tanasugarn C. Community health workers as agents of health

promotion: Analyzing Thailand's Village Health Volunteer Program. *J Community Health* 2015;40:780-8.

25. Srisarakham P, Amnatsatsue K, Kerdmongkol P, Leerapan P. Development of a capacity building

program for Village Health Volunteers to support Self-Management in a high risk population for diabetes in a rural community in northeast Thailand. *Asian Pac Isl Nurs J* 2016;1:46-54.