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Prevalence and associated factors of fall risk in Thai older people: a primary care based study in Chiang Rai

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Abstract

Falls are a major cause of morbidity and mortality in older persons, and the consequences of fall may impact an individual severely. Although prevalence rates for falls in older population have been established in Thailand, most of them were carried out in hospital. Chiang Rai is one of the provinces with highest older population in the northern part of Thailand, particularly in rural areas. However, no prevalence study of falls has been available, especially in primary care center. Hence, this study estimated 12-month prevalence rate of fall risk, and identified risk factors of fall risk in older population at Pa-Teung sub-district, Mae-Chan district, Chiang Rai. A cross sectional study was carried out in 11 villages and total 340 persons aged ≥ 60 years were systematic randomly selected. Fall risk was assessed by using Time up and Go (TUG). This study showed that the average age of participants was 69±6 years. The 12- month prevalence of fall risk was 12.6% (95% CI 9.5-16.6). Binary logistic regression revealed that potential factor of fall risk was age group 70-79 years old (OR = 4.39, 95% CI 2.14, 9.02, P=0.001). This study highlights that there are a number of older people with fall risk at primary care centers in rural areas of Chiang Rai. In particular, aged group between 70 and 79 years old should be concerned as a priority group of fall risk.

Keywords: *associated factors, care, Chiang Rai, community, fall risk, older people, prevalence*

1. Introduction

Falls are one of the major problems for functional limitations and difficulties in the elderly (Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015). Recurrent falls can cause physical disability in the older population (Krishnaswamy & Gnanasambandam, n.d.; WHO, 2018). A fall can be defined as "unintentionally coming to rest on the ground or other lower level with or without loss of consciousness" (Rubenstein, 2015). A fall is an unintentional loss of balance, causing one to make unexpected or unprepared contact with the ground or floor. Falling is a common problem among the elderly in many countries and remains an increasing problem worldwide (Gillespie et al., 2012). Falls tremendously affect either functional or psychological health of the elderly that leads to the poor quality of life (Boongird & Ratchneewan, 2017).

The causes of falls can be divided into intrinsic and extrinsic conditions. The intrinsic condition consists of age-related physiological changes and pathological problems (Pasquetti, Apicella, & Mangone, 2014). The age-related physiological causes can be involved with hearing impairment, the changes in central nervous system, poor balance and the musculoskeletal deterioration, whereas the pathological causes could be cardiovascular, endocrine, neurological and psychiatric problems (Pasquetti et al., 2014). Extrinsic condition of falling is environmental factors such as barriers and inappropriate footwear (Berry & Miller, 2008).

In Thailand, Assantachai et al. (2003) showed prevalence of falls in Thai elderly people in urban area was 19.8% (Assantachai, Praditsuwan, Chatthanawaree, Pisalsarakij, & Thamlikitkul, 2003). Chaiwanichsiri, Jiamworakul, and Kitisompra-yoonkul (2006) revealed that the incidence rate of falls among Thai older people was 3.44/1,000 patients/day and falls frequently occur while transferring (22.9%) or walking (20%). In addition, Worapanwisit et al. (2018) found that 26% of Thai older people aged 60-69 years old in an urban area experienced fall after the age of 60 years old by using self-report questionnaire (Worapanwisit,

Prabpai, & Rosenberg, 2018). With regard to the studies in the diference of falls among older population between urban and rural areas, the National Health Insurance Research Database in Taiwan showed that the rural group had a significantly lower risk of mortality after falls than the urban group (adjusted OR =0.32, 95% CI 0.28–0.37, P=0.001) and the risk factors for mortality from falls were age, gender, comorbidity, place of residence, polypharmacy use, and inappropriate use of the medication (Huang, Lin, Wu, & Chen, 2017). However, the study from Korea revealed that an older people in the rural area with low socio-economic status prone to have a fear of falling more than older people in an urban area and suggested to develop fall-prevention programs at the community level (Cho et al, 2013).

As we know that falls tremendously affect either functional or psychological health of the elderly that leads to the poor quality of life (Boongird & Ratchneewan, 2017). Nevertheless, older people and their family members in Thai rural community always overlooked the falls and did not report their falls to the health care providers if it's not serious injured (Chaiwanichsiri et al., 2006). To date, there is no available data regarding the prevalence and associated risk of falls in older people attending primary care centers in a rural area of Chiang Rai where there are an increasing number of older people. Thus, primary data of falls in older people should not be neglected in order to establish appropriated fall prevention in the next future.

2. Objectives

This study aimed to investigate the 12-month prevalence of fall risk and identify associated potential risk factor of fall risk among older population in rural areas, a primary care based, in Chiang Rai, Thailand.

3. Materials and methods

A cross sectional study was carried out in 340 older people who attending primary care centres by systematic random sampling in all 11 primary care centers at Pa-Teung sub-district between April and July 2016. The simple random sampling technique by computer program was used for selecting participants. Participants were included older people aged 60 years old and over who live in Pa-Teung sub-district, Mae-chan district, Chiang Rai, fluent in Thai speaking with no impairment of communication and hearing and willing to participate in this study. Participants were excluded if they were receiving medication which may lead to the limitation of movement such as anti-psychoactive, anti-epileptic and anti-histamine drugs, severely disabled, could not communicate in Thai or had hearing loss. All participants gave informed consent for participation before they participated in the study. Demographic data and health behaviors were obtained via interview questionnaires. Ethical approval was obtained from the Research Ethical Committees of Mae Fah Luang University. Descriptive statistic was used to analyze characteristic data. Univariate and binary logistic regression were used to explore which characteristics are associated with fall risk. Based on the results of univariate logistic regression, the variables that were significant at $p = 0.05$ level are applied in binary logistic regression with Backward Elimination Likelihood Ratio or Backward LR method.

3.1 Fall risk measurement

Timed Up and Go Test (TUG) is a valid, cost-effective tool to use for falls risk in the community (Beauchet et al., 2011; Alexandre, Meira, Rico, & Mizuta, 2012; Chantanachai, Pichaiyongwongdee, & Jalayondeja, 2014; Mehmood, Mushtaq, Ansa, & Jilani, 2016). It could be perform in a short time in order to administer the test which is suitable to use in primary care unit (Alexandre et al., 2012; Chantanachai et al., 2014; Mehmood et al., 2016). In addition, the test is a simple, quick and widely used clinical performance-based measure of lower extremity function, mobility and fall risk (Beauchet et al., 2011). This test measures the time it takes for a person to rise from a chair, walk three meters, walk back to the chair, and sit down (Shumway-Cook, Brauer, & Woollacott, 2000; Alexandre et al., 2012). The cut-off value of the test is 13.5 seconds as it has been suggested that a cut-off point of 13.5 seconds can serve as a threshold for identifying persons with an increased fall risk in general older population (Shumway-Cook et al., 2000; Beauchet et al., 2011; Ibrahim, Singh, Shahar, & Omar, 2017) and always use as an initial fall risk screening tool in older people in the community (Shumway-Cook et al., 2000; Chantanachai et al., 2014).

Before the data collection, the inter-rater reliability of TUG was carried out in 30 participants and the result showed a good strength of agreement with Kappa (K) = 0.78, $P<0.001$ (Fleiss, Levin, & Paik, 2003). As mentioned earlier about the early

prevention of falls by a routine screening in the primary care unit, especially in Chiang Rai, hence, this study focused on only one tool which is simple, quick and appropriate to apply in the study setting in order to promote the routine practice.

4. Results

Table 1 shows the characteristics of participants in the study. This study revealed that the 12-month prevalence of fall risk was at 12.6 % (95% CI, 9.5% -16.6%). The results was revealed that most variables were similar between the group with no fall risk and fall risk groups, except for age group and alcohol drinking, which were statistically significantly between groups at P = 0.001 in both variables (Table 2). By using the logistic regression analysis (Table 3), the data was shown that only age group was a potential factor associated with fall risk, particularly in the age group between 70-79 years old (OR = 4.39, 95% CI 2.14-9.02, P<0.001).

Table 1 Characteristics of the participants

Characteristics	340 (%)
Gender	
Male	153 (44.7%)
Female	187 (55.0%)
Age group	
60-69	216 (63.5%)
70-79	96 (28.2%)
>80	28 (8.2%)
Age	69±6*
Education	
illiterate	65 (19.1%)
Primary school	258 (75.9%)
Higher than primary school	17 (5.0%)
Ethnicity	
Thai	326 (95.9%)
Hill-tribe	14 (4.1%)
Marital status	
Single	12 (3.5%)
Married	232 (68.2%)
Separated/ divorced	12 (3.5%)
Widowed	84 (24.7%)
Living alone	
Yes	40 (11.7%)
No	300 (88.3%)
Health Behavior	
Alcohol drinking	
Yes	181 (53.2%)
Smoking	
Yes	149 (43.8%)
Chronic disease	
Hypertension	
Yes	152 (44.7%)
Diabetes	
Yes	47 (13.8%)
Heart disease	
Yes	19 (5.6%)
Dyslipidemia	
Yes	73(21.5%)

* Mean±SD

Table 2 Comparison of characteristics between no fall risk and fall risk groups

Characteristics	No fall risk(n=297)	Fall risk (n=43)	Total (n=340)	Statistic test	P-value
Gender				0.20	0.658
Male	135 (88.2%)	18 (11.8%)	153 (45%)		
Female	162 (86.6%)	25 (13.4%)	187 (55%)		
Age group				23.09	0.001*
60-69	202 (93.5%)	14 (6.5%)	216 (69.2%)		
70-79	71 (74%)	25 (26%)	96 (77.4%)		
≥ 80	24 (85.7%)	4 (14.3%)	28 (100%)		
Education				1.16	0.560
illiterate	55 (84.6%)	10 (15.4%)	65 (20.1%)		
Primary school	226 7.6%)	32(12.4%)	258(3.8%)		
> Primary school	16 (94.1%)	1 (5.9%)	17 (100%)		
Nationality				0.40	0.527
Thai	284 (87.1%)	42 (12.9%)	326 (95.9%)		
Hill tribe	13 (92.9%)	1 (7.1%)	14 (100%)		
Marital status				5.49	0.139
Single	11 (91.7%)	1 (8.3%)	12 (4.9%)		
Married	206 (88.8%)	26 (11.2%)	232 (95.1%)		
Separated/divorced	12 (100%)	0 (0%)	12 (12.5%)		
widowed	68 (81%)	16 (19%)	84 (100%)		
Living alone				0.00	0.976
No	262 (87.3%)	38 (12.7%)	300 (88.2%)		
Yes	35 (87.5%)	5 (12.5%)	40 (11.8%)		
Health Behavior					
Alcohol				12.04	0.001*
No	209 (83.6%)	41 (16.4%)	250 (73.5%)		
Yes	88 (97.8%)	2 (2.2%)	90 (26.5%)		
Smoking				3.16	0.076
No	254 (86.1%)	41 (13.9%)	295 (86.8%)		
Yes	43 (95.6%)	2 (4.4%)	45 (13.2%)		
Chronic disease					
Heart disease				0.18	0.671
No	281 (87.5%)	40 (12.5%)	321 (94.4%)		
Yes	16 (84.2%)	3 (15.8%)	19 (5.6%)		
Hypertension				0.16	0.688
No	163 (86.7%)	25 (13.3%)	188 (55.3%)		
Yes	134 (88.2%)	18 (11.8%)	152 (44.7%)		
Diabetes				0.20	0.655
No	255 (87%)	38 (13%)	293 (86.2%)		
Yes	42 (89.4%)	5 (10.6%)	47 (13.8%)		

*P ≤ 0.05

Table 3 Logistic regression of potential factor associated to fall risk

Risk factors	No fall risk (n=297)	Fall risk (n=43)	Univariate (OR)	95% CI	P	Multivariate (OR)	95% CI	P
Age group								
60-69	202	14	1.00	-	-	1.00	-	-
70-79	71	25	5.08	(2.50-10.31)	<0.001	4.39	(2.14-9.02)	<0.001
> 80	24	4	2.40	(0.73-7.90)	0.148	1.97	(0.59-6.57)	0.267

5. Discussion

Falls are very common among the older people (Rubenstein, 2015). This study showed that the 12-month prevalence of fall risk in older people at the primary care centers of rural area in Chiang Rai province was 12.6 %. This data lies within the prevalence of falls (14-15 %) reported by the studies in India and China (Wu et al., 2013; Ibrahim et al., 2017). Nevertheless, these data was much lower than prevalence of fall in other previous Thai studies (18% - 23%) (Assantachai et al., 2013; Chantanachai et al., 2014). This could be the difference in population, screening test and setting as well as the methodologies applied (Gillespie et al., 2012; Han , Ferris, & Blaum, 2014). In addition, this study was carried out by using screening test which was not dependent on self-report of falls compared to the previous studies as the self-report questionnaire of

previous falls could lead to a recall bias (Garcia, Dias, Silva, & Dias, 2015). Moreover, the activities of daily living, individual's life style (active or sedentary) and participation in social activities might be affected to the study results (Beauchet et al., 2011). Based on the author's search, the study of prevalence of fall in general Thai older population is limited for an updated data in the past five years, mostly the study of falls focuses on fear of falling (Phongphanngam & Lach, 2015; Thiamwong & Suwanno, 2017) and exercise intervention programs (Hill et al., 2018; Outayanik, Seabra, Rosenberg, 2018; Suttanon, Piriyaprasarth, Krootnark, & Aranyavalai, 2018).

Age was found as a solely potential factor associated with fall risk group in this study, especially between the age from 70-79 years old. This result is consistent with the previous studies on fall risk among older people which indicated that age is a crucial intrinsic factor which is significantly associated with falls among aging population either from Thai or international studies (Gale, Cooper, & Sayer, 2016; Thiamwong & Suwanno, 2017; Wu & Ouyang , 2017; Worapanwisit et al., 2018). The result from this study is support the study from Bhattacharya, Maung, Schuster, and Davis (2016), which found that the more ageing of elderly people, the more chance to fall and may fall harder. Ageing related to physical changing and older adults in the critical period of weakness in muscle and balance, hence the ability to be in the upright position in older people is reduced by physical health (Rubenstein, 2015). Some older people have a limitation of movement and flexibility due to the lack of exercise and illness (Hill et al., 2018). In addition, the reaction time to avoid all barriers on the way while older adults are walking is also significantly slow owing to the deterioration of nerves stimulation and transferring information from brain to muscle (Rubenstein, 2015). Apart from physical health, ageing may have some problem with vision and side-effects of multiple medications (Wu & Ouyang, 2017). However, from the result, there were no significant differences in the age group more than 80 years old in this study. It could be possible that with a small number of this age group for this study may have contributed to the lack of significant differences between fall risk and no fall risk groups (Yoshida, n.d.).

In addition, nearly half of participants (44.75%) in this study had hypertension. Many investigations suggest that antihypertensive medications may increase risk of falls and fall injuries. Risk factors for falls and fractures, such as balance and gait impairment, dizziness, and postural hypotension, are among the most common adverse effects of medications, including antihypertensive medications (van Iersel et al., 2006). meta-analysis of observational studies showed a 24% increased odds of falling associated with use of antihypertensive agents (Mehmood et al., 2016). With a high number of hypertension in the participants, the health care providers should also concern this health problem as one of falls risks in this community.

Besides, the geography of study setting might related to the falls prevalence, this study setting is located in low-land areas of Chiang rai province, the house styles are typically houses which have commonly found in Thailand i.e. elevated floors. Thus, the house style could be one of fall risk in older people (Thiamwong & Suwanno, 2017), however, we lack the information of the falls from uneven surface and tripping on object outside the house. In addition, the limitation of this study was the cross-sectional study design at a single point of time; hence this study cannot determine causality. The other factors such as some illnesses and medications that may relate to older people's physical health, as well as the extrinsic factors such as environment which includes the difference of landscape in the north region, especially in high-land areas were not included in the study. Therefore, the next future research study would further study in a prospective study design in order to examine possible effects on some outcomes and more factors which related to fall risk in older population In order to the reveal a strong evidence of falls screening, the next study should include the test of balance such as The Mini-Balance Evaluation Systems Test (Mini-BESTest) to use along with TUG (Yingyongyudha, Saengsirisuwan, Panichaporn, & Boonsinsukh, 2016). However, despite these limitations, this study provides primary data of prevalence and risk factor of fall risk at the primary care units in Chiang Rai province.

6. Conclusion

The health care providers at primary care units in Chiang Rai's rural areas should be aware of health promotion for fall prevention and more concern about a routine screening of falls in aging population. Exercise intervention to improve gait and

balance for falls prevention would be recommended in community-dwelling older people.

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