THE RELATIONSHIP BETWEEN PHYSICAL FUNCTION, PERCEIVED FALLS RISK FACTORS, AND ENVIRONMENT AND FALLS RISK AMONG ELDERLY PEOPLE IN KOTA JAMBI DISTRICT, JAMBI, INDONESIA

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ABSTRACT:

Background: For elderly people, falling is a crucial health problem that can lead to severe injuries and mortality, and it needs to be prevented with suitable strategies. Identifying the multifactorial causes of the fall risk model is a prerequisite to elucidate and prioritize the highest associations among falls risk factors. The purpose of this study is to examine the relationships between physical function, perceived falls risk factors and, environment, and falls risk among elderly people.

Method: A cross-sectional study included 166 elderly people who received health examinations at five Primary Health Centers in the Kota Jambi District, Jambi, Indonesia. A face-to-face interview method was used to administer questionnaires of fall risk, perceived fall risk factors and the environment. The Timed Up and Go Test was also conducted. The Spearman rank-order correlation was used for data analysis.

Results: The study showed that the relationship of falls risk factors were at moderate levels, and there were significant correlations between physical function ($r = .439$, $p < .001$), perceived fall risk factors ($r = .430$, $p < .001$), the environment ($r = -.429$, $p < .001$) and falls risk among elderly people.

Conclusion: Elderly people who had better physical functions, a higher perceived fall risk factors and an environment that promoted the safety of elderly people were less likely to be exposed to the risk of falls. Physical exercise to improve balance and a safe environment for elderly people living alone or with family members should be promoted in targeted interventions.

Keywords: Physical function, Perceived falls risk factors, Environment risk factor, Elderly people, Indonesia

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INTRODUCTION

A risk factor of falls is something that increases the elderly people's chance of falling in Indonesia [1]. One - third of elderly people living in the community were in the falls risk group [2]. For elderly people, the risk of falls can lead to severe injuries and mortality, and it needs to be prevented with suitable strategies [3]. The risks of fall rates have risen significantly from 7.5% to 8.2% among elderly people, especially in the Jambi area [4]. Interestingly, females were shown to be of a higher risk than males by 2.57 times [1] while also having 13% of those people who were 85 years of age with hospital admissions of severe injuries for head trauma [1]. These incidences have led to the economic burden to families while also disrupting their families' daily activities due to this hospitalization [5]. The elderly people might also have had a fear for the risk of falling during their mobility [6] and self-care activities [7]. Therefore, identifying falls risk factors was a key indicator to the public for further consideration of fall risk factors in community-dwelling elderly people.

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Among elderly people, the risk of falls could happen suddenly from an overwhelming number of external factors [8]. Previous studies were widely studied to identify the consequences of fall risk factors of elderly people which found head injuries would increase by 30% [9] and mortality rate by 60% [10]. Many factors were investigated as falls risk factors, both intrinsic and extrinsic factors [11]. Hiura et al. [11] examined that functional ability caused falls risk factors, elderly people who were active in their mobility were found to have a higher risk of falling than the elderly who were of passive mobility. Moreover, gait and balance problems caused a decline in physical function among those aged 60 and over when walking on the surface floor [12].

Previous studies tested only few empirically for correlation between the perception held by the elderly people of risk factors causing falls, and the falls itself. A study by Delbaere et al. [13] reported that a perception of risk factors of falls for elderly people was positively correlated with falls risk. The elderly perceived falls risk factors for their age, of these were those known to effectively engage elderly people on fall risk prevention through improving their functional ability, independent mobility, and controlling environmental hazards [14]. In fact, when elderly people understood how to reduce the risk factors of falls by themselves, then they would be more concerned about the risk of falls and the falls risk factors itself [15]. Therefore, a greater awareness of falls risk contributed to the falls risk prevention strategy among elderly people.

The extrinsic factors were still inconsistent in regards to the findings. The home hazards were referred to be environmental hazards while occurring in and around the conditions of yard fields, the bathroom and the bedroom [16]. Poor lighting, inadequate stairs or handrails, as well as unfit-for-use furniture around the home were positively associated with the risk of falls [17]. In fact, this factor of fall risk incidences still increased per year [18]. The highest proportion of falls risk occurred while walking or changing position during their usual activities in a familiar area [19]. Walking was the most common type of reported physical activity across all racial, ethnic, income, and old-age groups [20]. Meanwhile, falls risk had no significant correlation to the home environment since falls risk were a frequently occurring problem without any specific place, time, date or year [21].

Several studies discussed by focusing on intrinsic factors. Of these, only limited factors of the risk of falls had been studied, and only a few studies had been undertaken in Indonesia, especially the Jambi region. Inconsistencies in the findings were found regarding the different characteristics and culture for the elderly population. In the Jambi area, researchers that reflected on the fall risk factors in the multifactorial cause's model were still limited. Identifying the factors of falls risk within this model was a requirement to devise guidelines in developing interventions to improve physical functions, perceived fall risk factors, the environment in elderly people who had a higher risk of falls in the Jambi area. Consequently, the current study should be clarified with the highest correlation from these factors with falls risk with cultural differences by guiding the fall risk model as a framework of the study. The aim of this study was to examine the relationship between physical function, perceived falls risk factors, and environment and falls risk among elderly people in Kota Jambi District, Jambi, Indonesia.

MATERIALS AND METHODS

Research design and sample

A cross-sectional study was employed in this study. The sample of this study was estimated by using sample size calculation formula, $n = P(1-p) z^2/d^2$. Where "d = the degree of precision (assumed to be 10%)", "z = the value of an error (assumed to be 90%), and prevalence of falls of (*p*) 50%. The estimation sample was 138 and by adding 20% allowance made up for the drop out of incomplete data. Finally, 166 elderly people participated in this study. The participants were selected by using a systematic random sampling technique. The inclusion criteria consisted of people aged 60 years old and over, male or female, registered for health examinations in five public health centers in Kota Jambi District, Jambi, Indonesia, and agreed to participate in the study. The exclusion criteria included elderly people who were suffering from cognitive impairment. A face-to-face interview method was used to compile questionnaires of falls risk, perceived fall risk factors and the environment, and the Timed Up and Go Test was conducted.

Research tools

Four instruments were employed to collect data for demographics, physical functions, perceived falls risk factors, environment and falls risk. The instruments were adapted to Indonesian culture and it was translated to the Indonesia language. The permission to use the instruments was also approved. The demographic sheet was developed by the researcher composing age, gender, educational level, living arrangement, and occupation.

1. The Perceived Falls Risk Factors Questionnaire (PFRFQ) was adopted in this study to assess the perception of falls risk factors which

Table 1 General characteristics among elderly people (n = 166)

General characteristics	Number	%
Age (years)		(Mean = 67.16 years, SD = 5.52) (Range = 60 - 80)
Gender		
Male	84	50.6
Female	82	49.4
Education level		
Elementary school	96	57.8
Junior high school	30	18.1
Senior high school	33	19.9
Bachelor degree	7	4.2
Living arrangement		
Alone	61	36.7
Spouse	48	29.0
Children	53	31.9
Relatives	4	2.4
Occupation		
Labour	33	19.9
Farmer	38	22.9
Trader	54	32.5
Private employee	22	13.3
Retirement	19	11.4

consisted of 14 items [6]. The PFRFQ asked that how they perceived falls risk (6 items) and the risk factors of falls (8 items) in their age group by using scoring on a 7-point scale from 0 to 7. A higher score of the PFRFQ indicated a greater perception of falls risk factors. The Cronbach alpha of PFRFQ in this study was 0.89.

2. A Home Safety Questionnaire (HSQ) was used to ask how composed the housekeeping and furniture management of environmental conditions potentially caused the risk of falls [8]. The HSQ consisted 21 items of environment condition, by assessing of 12 items unfavourable and 9 items favourable. In data analysis, for favourable items converted if "yes = 0", "no = 1" and unfavourable items also converted if "yes = 1" and "no = 0". The minimum score is 0 and the maximum score is 21. In this study, the researcher asked the participant's for their housekeeping and furniture management. Higher scores represented a higher risk of home environmental hazards among elderly people. The Cronbach's alpha of the HSQ of this study was 0.96.

3. A Fall Risk Assessment Tools (FRAT) consisted of 6-items to measure the posture and stability as interference risk during activities of daily living [10], covering falls history, medication history, any symptoms of musculoskeletal disorders or cardiovascular diseases such as, arthritis rheumatoid, stroke, and Parkinson's, any balance problems and the inability of chair rising. There are two descriptions of risk assessment as follows: 0 (no) or 1 (yes). The total score of participants indicated that high falls risk (≥ 3), and low falls risk (< 3). In this study, the FRAT assessed the interference risk during six months at years 2014. For each item, the researcher checked for a positive response to three or more of the questions on the form, then the researcher was guided for further assessment, referral options and interventions for certain risk factors. A higher score of the FRAT indicated a higher risk of the elderly activities during the first six months of 2014. FRAT used Kuder Richardson (KR 20) coefficient of reliability test, reporting (KR-20) by of this study was 0.88.

4. Physical functional conditions among elderly people were examined using the Time Up and Go Test (TUGT) [15]. In several studies, TUGT had been shown to have a high inter-rater and intra-rater reliability test for elderly people (ICC = 0.99). The longest time of seconds indicated a high risk of falls arising out of mobility disorder among elderly people.

Data collection

Data were collected on July to August 2014. After getting approval from the Review Board Committee for Research Involving Human Research Subjects, Boromarajonani College of Nursing Nopparat Vajira Ethics (ERB No. 37/2014) and permission letters from the Health Department of Kota Jambi, after that the researcher was allowed to follow the activity of the PHC especially in the elderly care room for giving explanations of the information study. For elderly people who met the inclusion criteria, they were selected by every 3rd participant in

Table 2 The relationship between physical function, perceived falls risk factors, environment and falls risk among elderly people (n = 166).

Variables	Falls risk level		r	*p-value*
	High n (%)	Low n (%)		
Physical function	129 (77.7)	37 (22.3)	.439	< .001
Perceived falls risk factors	86 (51.8)	80 (48.2)	.430	< .001
Environment	84 (51.8)	82 (48.2)	-.429	< .001

the list of names. Then, the researcher had a face to face interview among elderly people to compile the questionnaires (50-60 minutes) and TUGT performing (3-5 minutes). The researcher puts the questionnaires into a sealed envelope after finishing the interview and taking them to secure place also used for ensuring the confidentiality of participants' data. The results would be reported as group data and were to be destroyed after two years.

Data analysis

Statistical analysis was performed by using Statistical Packages for the Social Science (SPSS) version 16.0 (SPSS Inc., Kasetsart University, Thailand). Descriptive and inferential statistics were employed to characterize the sample and to examine the distribution of the variables. The Cronbach's alpha coefficient was used to examine the reliability of the instruments. The Spearman Rank correlation was used to analysis the relationships between physical function, perceived fall risk factors, environment and falls risk among elderly people.

RESULTS

Demographic characteristics

All of the 166 participants were male (50.6%) and female (49.4%). The results showed that the average age among the participants were 67.16 years old ranging from 60 to 80 years, around (36.70%) of elderly people lived alone, and (33.50%) of elderly people were traders. In terms of the level of education, 57.80% of the participants graduated from elementary school. However, only (11.40%) of them were retired from their work. The general characteristics were presented in Table 1.

As shown in Table 2, the results showed a statistically significant correlation between physical functions (r = .439), perceived falls risk factors (r = .430), environment (r = -.429), and falls risk among elderly people at *p-value* < 0.01.

DISCUSSION

The findings of this study suggested that physical function, perceived falls risk factors and environment were correlated with falls risk among elderly people. There was a significantly positive correlation between physical function and falls risk among elderly people. The findings showed that elderly people who had any impairment of physical functions were susceptible to the risk of falling. The musculoskeletal system was pointed out to include the most risk factors influencing physical function changes into functional ability, sensory impairment, gait, and balance instability [10]. Hiura et al [11] mentioned the abnormal mobility performances were more likely to result in an unsteady step length and muscle weakness. In fact, people who were more active in mobility had a greater risk of falling by 2.8 times than the passive person did [16]. Accordingly, this study used the Time Up and Go Test (TUGT) for the early detection of gait and balance disorders. To help them, monitoring their mobility was needed to identify early signs of unsteadiness, as well as physical interactions with elderly people.

The results of total second runs in completing TUGT tended to be high among elderly people in this study, with the average seconds being 20.50 seconds, and individual times ranging from 11 seconds to 34 seconds. TUGT performances taking more than 14 seconds were associated with high falls risk [16]. In this study, the TUGT performance was related to multiple factors. Any symptoms of rheumatoid arthritis increased the risk of balance problem during the TUGT so the total seconds to complete the mobility test tended to be high. Elderly people who had balance impairments performed the test in longer time periods than unimpaired elderly people. In fact, the elderly people walked without gait speed disorder, they also showed the longest time of TUGT. Chair type (standard arm chair, armless chair and easy chair) did not affect gait speeds. There was a tendency for TUGT times to increase with a participant's age. However, using an assistive device such as a cane or walker also increased the TUGT time. Additionally, females who suffered from knee pain took longer times than healthy ones without knee pain, followed by males who took more than 14 seconds to complete the TUGT performing just as long as the females. As a result, the TUGT measurements identified aspects of balance positions, such as positions that involved

rising, walking, turning, and sitting.

The results were consistent with Maia Ribeiro et al. [7], indicating that there was a positive correlation between physical function changes and falls risk. In other words, it is necessary to assess any impairment of the bones, joints, muscles and tendons that had an adverse effect on stability [8]. Elderly people with poor mobility displayed more gait and balance problems [9]. On the other hand, balance and health conditions were used to identify physical function levels. In this study, elderly people were at high risk regarding balance problems when involved in the sitting, walking and moving positions along with standing on a chair with a straight-leg position. Consequently, these interesting findings needed further investigation for health care providers to improve physical functions among elderly people as well as focusing on balance exercises in the fall risk prevention program.

Perceived fall risk factors also showed a positive correlation with falls risk among elderly people. The results of this study identified that among elderly people who had higher levels of perceived fall risk factors, were those that were more likely to have an increase in care with regards to falls risk. With regard to Rubenstein and Josephson's model [12], how the elderly people perceived falls risk and fall risk factors were positively correlated with falls risk. When elderly people perceived their age was as part of the falls risk group, they showed more attention to take care against fall risk factors and it was easier engaging them to be a more active person in their fall risk strategies [17]. Among people aged more than 65 years, they were at a lower level of falls risk than those of 85 years [17]. For this reason, if the elderly people had a greater awareness of falls risk as a common problem for their age, they would be working to take greater care of their mobility as well [18].

Falls risk of elderly people is an important health issue and it needs to prevent because a risk can disturb during their activities. Concerning falls risk and fall risk factors among elderly people in this study, they were suggested to have a higher perception of fall risk factors. Elderly people felt falls risk was a more crucial problem for their age group than other health problems, that this problem was needed to be discussed with family members or health care providers. In fact, they also perceived falls risk as a "preventable problem". With this perception of falls risk, they would be able to have concern for their own care of falls risk. Strong communication with family members and health care providers in this study helped the elderly become encouraged to lower risk factors of falls. In this study, elderly people also agreed that falls risk were caused by lacking attention or walking obstacles, any injuries or swelling in the legs, feeling dizziness when standing up, and uneven floor surfaces. These conditions resulted in elderly people increasing their vigilance against fall risk factors. Furthermore, elderly people who had a high concern of fall risk incidence would be more easily engaged to implement a fall risk prevention strategy.

It was surprising that there was not an empirically study that was found to relate perceived falls risk factors among family members with the fall risk problems in the Kota Jambi District. Some previous studies supported this result. Hughes's study [22] found that there was a significant association between better awareness of falls risk factors of family members and fall risk prevention strategies. In fact, the family members would be worried about the falls risk factors after elderly people frequently had fall risk experiences [16]. Therefore, enabling family members was necessary to support a fall preventing strategy.

However, environment was also a significantly negative correlation with falls risk. The results revealed that an unfavorable environment would be subjected to increased hazards of falls risk. One factor to consider in managing falls risk was the ability of the elderly in performing a favourable environment [16]. The housekeeping and furniture management influenced mobility within their home, such as poor lighting and uneven floor surfaces [17]. Accordingly, one or more environmental hazards in the home were more likely to have been reported on falling in the last three months. In Japan, female elderly who lived alone and who lacked awareness of housekeeping management were more likely to have environmental hazards compared to those who were not receiving household help [18]. Those who had living arrangements with their spouse had a 32% lower chance of experiencing a fall risk case than those who lived alone in a house [19]. In other words, elderly people were known to have proper housekeeping management when they were aware of furniture hazards [20].

Elderly people in this study were at a high risk of falling based on the unfavourable environment. The results suggested that the floor condition, furniture and housekeeping management were the factors of environmental hazards, such as having any items in the way of indoor floors or slippery porch outside. These conditions increased walking obstacles when the elderly were doing their activities in the kitchen, bedroom or living room. In the Jambi area, 36.70% of elderly people lived alone, so they were less likely to have the ability to

manage any items on these floors as well. This finding had been found to have different results in previous studies that related to environmental hazards. Therefore, it is a necessity that items be rearranged in a proper position on the floor. This finding was interesting for further investigation in environmental safety to reduce the consequences of falls risk among elderly people. Therefore, environmental hazards should be a concern of health care providers in order to promote environmental safety among elderly people living alone in the community and among family members who live with elderly people.

CONCLUSION

In this study, physical function, perceived fall risk factors, and the environment had relationships with falls risk. These results suggested that the use of a fall risk model was needed to find the highest association between fall risk factors among elderly people. In conclusion, elderly people who had a chance to improve physical function, perceived falls risk factors and environment were more likely to report lower levels of falls risk.

LIMITATION

It was necessary to acknowledge the limitations of the study. The participants in this study who came to the public health center for the treatment of falls and other health services, such as health checkups, were more likely to perceive the risk of falls than elderly people who did not come to the Public Health Center. The subjective data of environments assessment were less accurate than the observation technique.

RECOMMENDATION

The findings of the study have contributed to nursing practices and nursing research. A community health nurse should establish the Time Up and Go test as gait and balance screening. To promote environmental safety by contributing time to evaluating the items that are in the way or on the surface kitchen floor and learning how to use a toilet riser or a toilet safety frame for elderly people. Additionally, to engage family members in order to communicate the risk of falls prevention strategy with health care providers. A Longitudinal study should enhance a fall risk prevention strategy for improving the balance exercise and environmental safety for elderly people.

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