Effects of residential safety management to prevent falls in the elderly

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Abstract---The purpose of this quasi-experimental research was to investigate the effects of residential safety management among 60 elderly population in a 5-star elderly school. A simple random sampling method was employed to select 30 elderly people who voluntarily participated in the research with appropriate protection of rights. They were randomly assigned into an experimental group and a comparison group. Four activities were continuously organized in the experimental group for a total of 8 weeks. Data were analyzed by descriptive statistics, including frequency, percentage, and paired t-test. The results showed that 30.0% of elderly people experienced falls in the house; 40.0% had been injured from an accident in the house; 33.3% had slipped or tripped and 50.0% of them (15 people) were injured and hospitalized. The most common cause of falls was blurred vision (50.0%). After the residential safety management to prevent falls was carried out, the elderly people's knowledge, attitude, and behavior scores increased in all three areas. When comparing the mean scores before and after the residential safety management to prevent falls in the elderly, there was a statistically significant difference (p-Value = 0.05). In conclusion, the residential safety management to prevent falls in the elderly can help increase safety behavior, reduce the risk of accidents, and prevent falls in the elderly.

Keywords---management, safety, residential, elderly people, fall prevention.

Introduction

The world's population ageing is increasing rapidly. In 2022, our world has a total population of 7,795 million people, with 1,050 million "elders" aged 60 years and over, accounted for 14% of the total population. In ASEAN, there is a total population of 664 million people with 73 million elderly people aged 60 years and over, accounted for 11% of the total population. It is also expected that the rate of elderly population will increase from 12 million people (18.1%) to 20.5 million people (31.41%) in 2040 (Foundation of Thai Gerontology Research and Development institute (TGRI), 2022).

Thailand is entering an aged society according to the criteria of having more than 20% of elderly population aged 60 years and over. In 2005, elderly population was 10.4% of the entire country's population. In 2022, Thailand has a total population of 66,165,261 people with 12,116,199 elderly people (18.3%) (Data Statistics Service, Department of Provincial Administration, Ministry of Interior, 2022). The northeastern region has the highest number of elderly people in Thailand. There are 4,359,273 elderly people (31.6%). Ubon Ratchathani Province has the fifth highest number of elderly people in the country and the third after Nakhon Ratchasima Province and Khon Kaen Province. There are 343,286 elderly people: 178,588 males (52.0%) and 164,698 females (48.0 %) (Data Statistics Service, Department of Provincial Administration, Ministry of Interior, 2022).

From the epidemiological data, each year, the incidence of falls among elderly people over 65 years and 85 years of age is as high as 30% and 50%, respectively. Injuries caused by falls are approximately 12% to 42%. Approximately 44% are minor injuries such as bruises and abrasions or lacerations. Moreover, 4-5% of falls cause a serious injury such as broken hip bone or wrist bone or bleeding in the brain (Anothaisintawee, Thammakaison & Srisuwan, 2014). Severe injury from falls is the leading cause of death and disability in the elderly (SATTIN RW, 1990). In addition, elderly people who have experienced falls will develop a fear of falling again. Therefore, they avoid doing activities and socializing. This will lead to a loss of self-help ability and social isolation (The Office of Disease Prevention and Control 7 Khon Kaen, 2022).

Eyesight is a major cause of falls. Moreover, falls can also be caused by many factors. The intrinsic factors include deterioration of eyesight, muscle weakness from chronic diseases that reduce muscle power and strength, such as stroke and osteoarthritis, low blood pressure, poor vision, dementia, gait and balance disorders and use of certain medicines. The external factors include environments that increase the risk of falls such as different level floors, wet floor, narrow and steep stairs with no handrails and inappropriate footwear (The Health Intervention and Technology Assessment Program, 2014). Modifying the home environment to be appropriate and safe can significantly reduce the number of falls among elderly people compared to regular care (Anothaisintawee, 2014).

Currently, appropriately 1,600 Thai people die from "falls" each year. It is the leading cause of death among unintentional injuries second to injuries from road accidents. Moreover, 1 in 3 is found to be elderly people aged 60 years and over. The risk increases with age. Common problems caused by falls among elderly

people are hip fractures or brain accidents, resulting in high rates of disability and death. Therefore, elderly people must be taken care of closely by their children and family members (Iamsanpang,2023). These problems reduce the daily life skills. In addition, 20% of people with hip fractures are likely to die within 1 year. They also cause disability. Also, 10-30% of bedridden elderly people must rely on others for care and the daily activities. Their quality of life is also reduced due to disability. The most common causes of falls are slipping, tripping, or same-level falls (67%), followed by falls from steps (5%). From the survey, the most common places for falls are outdoors (60%), and indoors (40%). In addition, 93% of the elderly's homes are at risk for falls. Elderly people still spend their daily lives in unsafe environments. That is, 49% of them climb stairs every day and 31% walk on slippery floors while only 25% modify their homes to suit their physical conditions (Department of Disease Control, 2021).

As Thailand is entering an aged society, 1 in 3 or more than 3 million elderly people suffer a fall every year. The major cause is eyesight. Therefore, 66% of the elderly have experienced slips, trips, or same-level falls only 5.6% of them have fallen from stairs and steps (Bureau of Epidemiology, Department of Disease Control, 2019). From the statistics of the mortality rate from falls (W00 - W19) among elderly people aged 60 years and over per 100,000 people, classified by age group in the years 2008 - 2017, the rate was continuously increasing. The largest group of people was the elderly aged over 80 years, followed by those aged 70-79 years and 60-69 years (Bureau of Noncommunicable Diseases, Department of Disease Control, Ministry of Public Health, 2018a). In 2017, it was found that 2,018 people died from falls, or an average of one person per day. This included 1,046 elderly people, or an average of 3 people per day. When considering each province from the number and mortality rate from falls in people aged 60 years and over per 100,000 people, classified by province from 2011 - 2017, it was found that the mortality rate from falls in people aged 60 years and over per 100,000 people in Ubon Ratchathani Province in 2017 was 15.1 per 100,000 people which increased continuously from last year (Bureau of Noncommunicable Diseases, Department of Disease Control, Ministry of Public Health, 2018).

According to the report on the situation of elderly people and the increase in illnesses among elderly people in 2022, Social Welfare Development Center for Older Persons, Department of Elderly Affairs adjusted the environment and facilities for elderly people to be appropriate and safe in 3,020 homes. Moreover, 20 public stations were improved to be suitable and safe for the elderly and people of all ages. These must be continuously carried out (Foundation of Thai Gerontology Research and Development institute (TGRI), 2022). For this reason, the researchers are interested in studying the effects of residential safety management to prevent falls in the elderly in Ubon Ratchathani Province to promote fall prevention and policy planning for the elderly, making them healthy, safe and have longer lives in a response to the Sustainable Development Goal 3: To ensure healthy lives and promote well-being for all at all ages in Target 3.4: Reducing mortality from non-communicable diseases by one-third through disease prevention and treatment and promoting mental health and well-being by 2030.

Objective

To investigate the effects of residential safety management to prevent falls in the elderly

Research question

What are the effects of residential safety management to prevent falls in the elderly?

Research hypothesis

Residential safety management to prevent falls in the elderly can change safety behavior.

Research method

The quasi-experimental research aimed to investigate the effects of residential safety management among 60 elderly population in the elderly school. A simple random sampling method was employed to select 30 elderly people who voluntarily participated in the research through proper protection of rights. The research conceptual framework is presented in Figure 1.

Research methodology

The concept of quasi-experimental research was employed. This study was an experiment with the experimental group and the comparison group for a total of 8 weeks (W1-W8) through 4 main activities (X1-X4) that were continuously put into the experimental group to study residential safety management to prevent falls in the elderly. The program and research design are shown in Figure 2.

When
P1 refers to data collected before the experiment of the experimental group (Pretest).
P2 refers to data collected after the experiment of the experimental group (Posttest).
P3 refers to data collected data the experiment of the comparison group (Pretest).
P4 refers to data collected after the experiment of the comparison group (Posttest).
X0 refers to no safety program was applied to the comparison group.
X1 refers to 4 consecutive residential risk training activities.
X2 refers to visual acuity (VA)
X3 refers to residential safety knowledge communication activities using 4 knowledge posters.
X4 refers to safety communication activities with 2 home visits.
W1-W9 refers to the number of weeks implementing the residential safety program in the elderly.

Data collection

Data collection process started from setting the topics, objectives and conceptual framework for planning the implementation of the PDCA principles based on the interest and willingness of the target group in November 2022. The meeting of the research team was held to determine the research design and prepare a letter requesting permission to collect data in the study areas. The samples' rights were protected. The meeting with the samples was also held to clarify the research objectives, their roles in the research, the details of the research tools as well as asking for voluntary participation in the activities. Regarding the confidentiality, codes were used to represent the samples. The samples can withdraw from the research project anytime. The activities according to the established residential safety program were carried out. Data were collected by using a general questionnaire, including gender, age, persons living with, education level, monthly income, sufficiency of income, congenital diseases, experience of having accidents in the house, experience of tripping/slipping in the house, experience of falls in the house, experience of being injured and hospitalized, causes of falls and annual health care costs and a questionnaire assessing knowledge, attitude, and residential safety behavior among the elderly in the experimental group before and after the residential safety program was implemented. The samples were coded, and their personal data were categorized. All data were destroyed after the analysis was completed.

Data analysis

Data were analyzed by descriptive statistics, including frequency, percentage, mean and standard deviation and paired t-test.

Results

The findings revealed that of 30 samples, there were 15 males (50.0%) and 15 females (50.0%) with the average age of 64.8 years. Also, 29 of them were between 65-60 years old (96.7%), and 1 person was lower than 60 years (3.3%). The majority lived with their children (19 people or 63.3%), followed by a spouse (10 people, 33.4%), relatives and alone (1 person or 3.3%). All of them finished primary education level (30 people or 100.0%). The average monthly income was 3,500 baht per month. Most had the income in the range of 1,000 to 5,000 baht per month (15 people or 50.0%), followed by less than 1,000 baht per month (11 people or 36.7%), and more than 10,000 baht per month (4 people, 13.3%). Most of them had insufficient income with no debt (13 people or 43.3%), followed by having insufficient income (10 people or 33.3%) and having insufficient income with debt (7 people or 23.3%). Also, 17 people had congenital disease (56.7%) and 13 people did not have congenital diseases (23.3%). Most of them had never been injured from an accident in the house (18 people or 60.0%), followed by having been injured from an accident in the house (12 people, or 40.0%). They mostly had never slipped or tripped in the home (20 people or 66.7%), followed by used to slip or trip in the house (10 people or 33.3%). Most of them had never fallen in the house (21 people or 70.0%) and used to fall in the house (9 people or 30.0%). Moreover, they had been injured and hospitalized (15 people or 50%) and had never been injured and hospitalized (15 people or 50.0%). The most common

cause of falls was blurred vision (15 people or 50.0%), followed by other reasons (11 people or 36.7%), different level floors (3 people or 10.0%) and insufficient lighting (1 person or 3.3%). The causes of falls were resolved (17 people, or 56.7%), and still not resolved (13 people or 43.3%). When accidents and falls occurred, most of them went to the hospital (20 people, or 66.7%), followed by self-treatment (10 people or 33.3%). Most annual health care costs were 500 - 1,000 baht per year (24 people, 80.0%), followed by less than 500 baht per year (4 people or 13.3%) and more than 1,000 baht per year (2 people or 6.7%).

Results of knowledge, attitude and safety behavior before and after the residential safety management to prevent falls in the elderly

The results of knowledge before and after the residential safety management to prevent falls in the elderly revealed that after the residential safety management was carried out, the level of knowledge increased. Before the residential safety management was performed, the knowledge of most of the samples was at the moderate level (14 people or 46.7%), followed by at a high level (11 people or 36.7%) and at a low level (5 people or 16.7%). However, after the residential safety management was carried out, the knowledge of most of the samples was at a high level (22 people or 73.3%), followed by at a moderate level (7 people or 23.3%) and at a low level (1 person or 3.3%) as presented in Table 1.

The results of the attitude before and after the residential safety management to prevent falls in the elderly revealed that after the implementation of the residential safety management to prevent falls in the elderly, the samples' attitude improved as follows. Before the residential safety management was implemented, the attitude of most of the sample was at a moderate level (26 people or 86.7%), followed by at a high level (3 people or 10.0%) and at a low level (1 person or 3.3%). After the implementation of the residential safety management to prevent falls in the elderly, the attitude of 30 samples (100%) was at a high level as shown in Table 2.

The results of residential safety behavior before and after the residential safety management to prevent falls in the elderly found that after the residential safety management was carried out, the samples' safety behavior improved at a high level. Before the residential safety management was performed, most of the samples had the residential safety behavior at a moderate level (16 people or 53.3%), followed by at a high level (14 people or 46.7%). After the residential safety management was performed, most of the samples had the residential safety behavior at a high level (23 people, or 76.7%), followed by at a moderate level (7 people or 23.3%) as shown in Table 3.

The comparison results of the differences in mean scores before and after the implementation of the residential safety management to prevent falls in the elderly in 3 areas: knowledge, attitude, and behavior to prevent falls in the elderly of the samples in the experimental group and the comparison group revealed that the mean scores of the experimental group in all 3 areas were significantly different at the p-value < 0.05 level, as shown in Table 4.

Discussion and Conclusion

This quasi-experimental research aimed to investigate the effects of residential safety management among 60 elderly population in a 5-star elderly school in Ubon Ratchathani. A simple random sampling method was employed to select 30 elderly people who voluntarily participated in the research through proper protection of rights. They were randomly assigned into an experimental group and a comparison group. Four activities were continuously organized in the experimental group for a total of 8 weeks. Data were analyzed by descriptive statistics, including frequency, percentage and paired t-test.

The research results revealed that 30.0% of the elderly experienced falls in their homes. This is consistent with a study by Srichang & Kawee (2023) on the prediction of falls in elderly people (aged 60 years and over) in Thailand (2017 – 2021). It was found that in 2017, there were 3,030,900 - 4,714,800 elderly people (age 60 and over) experiencing falls each year. In addition, from 2017 - 2021, approximately 3,030,900 - 5,506,000 elderly people experienced falls each year. Of these numbers, 5,700 - 10,400 people died each year. The results of this study also showed that 40.0% of the elderly used to be injured from an accident in the house, and 33.3% of them used to slip or trip in the house. Moreover, 15 people (50%) had been injured and hospitalized. The most common cause of falls was blurred vision (50.0%). These findings are consistent with the Office of Disease Prevention and Control 7 Khon Kaen (2022), reporting that there are approximately 3 million elderly people experienced falls each year. Also, more than 60,000 injuries require hospital treatment per year. There is an average of 4 deaths per day from falls. Falls also cause disability in the elderly and affect their mind as they are afraid of falling. They have to depend on others. As a result, in their quality of life decreases while expenses increase. After providing the residential safety program, the knowledge, attitude, and behavior scores of the elderly improved in all three areas. This is consistent with a study by Wayo, Jitramontree & Wirojratana (2017) which found that the fall prevention behavior scores of older adults in the experimental group were significantly higher than those of the control group. The present study also found that there was a statistically significant difference between the mean scores before and after providing the residential safety program to the elderly (p-value = 0.05). This aligns with a study by Mahamad, P. (2020), investigating the effects of a fall prevention program on self-care for fall prevention among older adults in Sungaikolok Subdistrict, Narathiwas, which found that the experimental group had a significantly higher mean score on self-care for fall prevention than before the experiment. The findings are also in line with a study by Bo-yuan Chen a b, Yuan-zhe Chen a, So-hee Shin b, Chun-yang Jie a, Zhi-liang Chang a, Hui Ding a, Hong Yang a. (2023), investigating the effect of a moderate-intensity comprehensive exercise program on body composition, muscle strength, and physical performance in elderly females with sarcopenia which found that after the intervention, the samples' mean score was significantly higher. A study by Sadegh Arazi, Fatemeh Rashidi, Afsaneh Raiesifar, Yousef Veisani, Arman Azadi (2023) on the effect of a non-pharmacological multicomponent pain management program on pain intensity and quality of life in community-dwelling elderly men with chronic musculoskeletal pain also revealed that after the intervention, there was a significant difference in the samples' mean score.

In conclusion, the residential safety management to prevent falls in the elderly can increase safety behavior and reduce the risk of accidents in the elderly.

Recommendations

1. Educational institutions should promote visual acuity screening for the elderly.
2. Relevant organizations should provide additional support for health education regarding safety.

Implications of the research

The research results can be used by the government organizations to formulate policies to plan for visual acuity test among the elderly to promote their eye health and vision and reduce the risk of falls among them.

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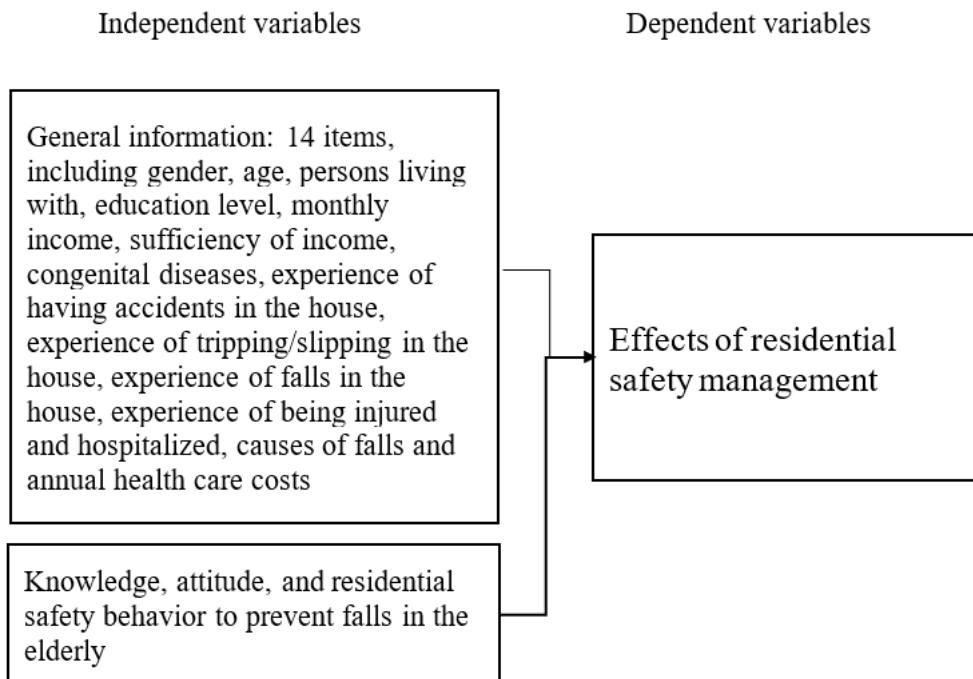
Figure 1

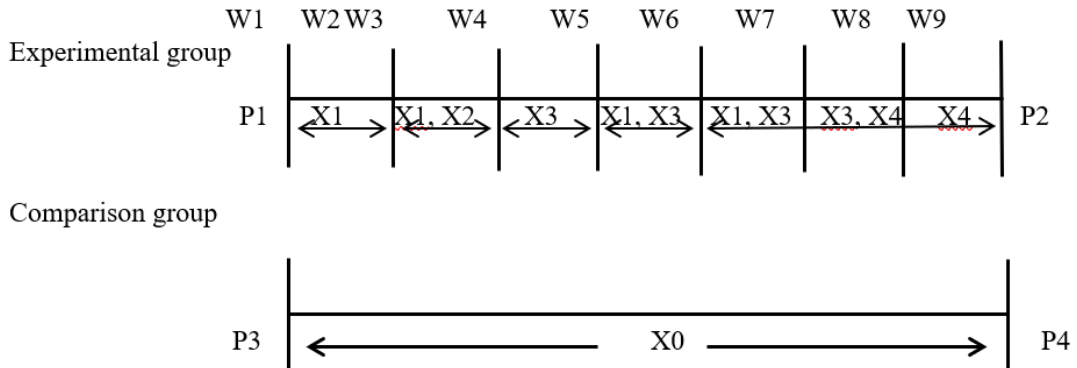Figure 1 Research conceptual framework

Figure 2

Figure 2. The program and research design

Table 1. Number, percentage and interpretation of knowledge levels before and
after the residential safety management to prevent falls in the elderly

Knowledge levels of the residential safety management to prevent falls in the elderly	Before			After		
	N	%	Interpretation	N	%	Interpretation
Below 60% (less than 9 points)	5	16.7	Low	1	3.3	Low
60 - 80% (9-12 points)	14	46.7	Moderate	7	23.3	Moderate
Higher than 80% (higher than 15 points)	11	36.7	High	22	73.3	High

Table 2. Number, percentage, and interpretation of attitude levels towards the
residential safety management to prevent falls in the elderly (n=30)

Attitude levels towards the residential safety management to prevent falls in the elderly	Before			After		
	N	%	Interpretation	N	%	Interpretation
1.00-1.66	1	3.3	Low	0	0	Low
1.67-2.33	26	86.7	Moderate	0	0	Moderate
2.34-3.00	3	10.0	High	30	30	High

Table 3. Number, percentage, and interpretation of residential safety behavior
levels to prevent falls in the elderly (n=30)

Residential safety behavior	Before			After		
	Number	Percentage	Interpretation	Number	Percentage	Interpretation
1.00-1.66	0	0	Low	0	0	Low
1.67-2.33	16	53.3	Moderate	7	23.3	Moderate
2.34-3.00	14	46.7	High	23	76.7	High

Table 4. The comparison results of the differences in knowledge, attitude and behavior scores of the experimental group and the comparison group before and after the implementation of the residential safety management to prevent falls in the elderly

Variables	$\overline{X}$		Mean Diff.	95%CI	t	p-Value
	Before	After				
Knowledge Comparison group Experimental group	12.9 11.83	13.1 12.90	0.12 0.46	0.02-0.49 0.12-2.00	1.88 2.83	0.07 0.028*
Attitude Comparison group Experimental group	2.82 2.56	2.82 2.71	0.00 0.04	0.00-0.00 0.08-0.23	1.48 4.05	0.14 0.001**
Behavior Comparison group Experimental group	2.62 2.29	2.62 2.45	0.00 0.04	0.00-0.00 0.09-0.25	0.49 4.23	0.62 0.001**

Note: * a statistical significance level at 0.05

** a statistical significance level at 0.01