RELATION BETWEEN VERTIGO AND HISTORY OF FALLS OF NURSING HOME FOR ELDERLY PEOPLE IN SURAKARTA

Yulisna Mutia Sari[1,*], Enny Fauziah[2]

[1] Department of Physiotherapy, Faculty of Health Science, Universitas Muhammadiyah Surakarta, Central Java, Indonesia
[2]Department of Physiotherapy, Politeknik Unggulan Kalimantan, South Borneo, Indonesia

Yulisna.Mutia@ums.ac.id (Yulisna Mutia Sari)

Abstract

Vertigo is a symptom of a disease caused by a disturbance in the vestibular system. Elderly people have decreased vestibular system and this could cause disruption balance. This occurs because of changes in the progressive fragmentation of statoconia utricle and saccule response that causes reduction of the acceleration gravity which results in a fall. The aim of this study was to determine the relation between vertigo and history of falls of elderly people in Surakarta. The design of this study was observational with cross sectional approach and purposive random sampling was applied to select 71 nursing home for elderly people from 927 populations in 10 sampling points. The occurrence of vertigo was assessed by using Vertigo Symptom Scale-Short Form (VSS-SF) while measuring a history of falls using a questionnaire. The correlation was identified by using Chi Square test with a degree of confident by 95%. The majority of the samples were women (70.42%) and their mean age was 67.45 ±5.70 years old. The correlation analysis indicated that vertigo was statistically and significantly associated with the history of fall (Adj.OR=9.24; 95%CI; P-value 0.01). It can be concluded that there was a relation between vertigo and the history of falls of the elderly people in Surakarta.

Keywords: Vertigo, History of Fall, Elderly People

Presenting Author Biography

Yulisna Mutia Sari. A physiotherapist and a lecturer at Department of Physiotherapy, Faculty of Health Science, Universitas Muhammadiyah Surakarta, Indonesia. She graduated from Master of Science, Gerontology and Rehabilitation Studies, University of Wollongong, New South Wales, Australia. She focused on geriatric physical therapy and improving physical ability for older people .

INTRODUCTION

The world's average life expectancy of elderly people increases every year and causes to the increasing number of elderly people from year to year. In 2010, according to the Central Bureau of Statistics in Indonesia, it was predicted that the percentage of elderly population will reach 11.34% in 2020 [1]. Meanwhile, according to the World Health Organization or WHO, they stated that the elderly population in Indonesia in 2020 will reach 11.34% or 28.8 million people [2].

The aging process of the elderly people can cause a variety of problems or setbacks in different aspects of the physical, biological, psychological, social, spiritual and economical. The decline in organ function causes the elderly people to become more susceptible to various diseases, especially degenerative diseases such as vascular disorders due to hardening of the arteries, metabolic disorders include diabetes mellitus, easy to fall because of musculoskeletal disorders and other health problems. Fall is a problem that is caused by disruption of the musculoskeletal system and other factors [3].

Falls is a condition mostly occurs in the elderly. Fall is the event of a sudden condition of someone was lying or sitting on the floor with or without loss of consciousness or injury [4]. In Indonesia, about 30% of elderly people living in the community experienced fall each year. The incidence of fall increased from 25% at age 70 years old to 35% after age> 75 years. One cause of the fall is vertigo, which ranks fourth compared to other causes with a percentage of 13%; however, this problem still has no attention enough from older people [5].

Vertigo is a symptom that refers to the sensation of moving either rotational movement or linear movement that was not there [6]. Vertigo is caused by a disturbance in the vestibular system that is divided into peripheral vertigo (due to interference in the end organ) and central vertigo (due to disturbances in the vestibular nerve or central relationship to the brainstem or cerebellum) [7]. Vertigo is a form of orientation disorder in which the feeling of spinning or undulating moves towards the surrounding space (subjective vertigo) or the surrounding space to move against him (objective vertigo). It is often associated with disorders of the body's balance system [8]. In the elderly, there is a change of anatomy and physiology, the musculoskeletal system, neurological and sensory systems. In the musculoskeletal system, there is a decrease in muscle mass and strength as well as a large percentage of body fat that can inhibit the balance and increase the risk of falls [9]. In the vestibular system of the elderly people, the changes otoconia the utricle and saccule, as well as the progressive fragmentation of the utricle and saccule statoconia response that causes the acceleration of gravity is reduced; therefore, the equilibrium is disturbed that later would result in a fall [10].

Moreover, the neurological system happens to cell death and progressive fragmentation of statoconia utricle and saccule, causing the response to gravity and linear acceleration is reduced which results on the disturbed equilibrium where the occurrence of vertigo. Besides, the release of otoconia into the posterior semicircular canal will cause positional balance disorders. In all cells contained lipofuscin deposits (pigment wear and tear) formed in the cytoplasm, presumably derived from lysosomes or mitochondria. These changes lead to disturbances of perception, analysis, integrity, and sensory input. Morphological changes that lead to a reduction in the amount of choline receptors will cause a predisposition of temperature regulation in response to heat or coolness on the circulating autoregulation, which disturbed the broken cerebral; therefore, causing the occurrence of fall [10]. Structural changes can cause functional disorders such as postural disorders and impaired balance with decreased visual acuity and cause propioception abnormalities on the elderly, and they are not able to maintain their position until finally falling.

The researchers used Vertigo Symptom Scale- Short Form (SF VSS-) as the parameter to determine the occurrence of vertigo. This research was conducted in Surakarta since according to the data from the Census Survey Meter, the population of elderly people in Surakarta was quite high at 9%. The percentage was higher than the national average of only 7%. Additionally, Surakarta launched Friendly City Seniors 2030 [11].

Vertigo may be associated with falling, which is mainly caused by musculoskeletal disorders and vestibular neural disorders that causes impaired balance, which will cause

movement disorders or musculoskeletal system is supported by a process of degeneration that occur in the elderly people. Vertigo is closely related to vestibular neural which cannot be separated from brain function which will give you all the innervations, since especially for musculoskeletal, neural and muscular relationship is very close. This fact encourages the researchers to investigate further the relationship between vertigo with the history of falls in the elderly people in the city of Surakarta.

METHOD

An observational with analytical cross-sectional study was conducted to assess the vertigo and the history of falls among the nursing home for elderly people in Surakarta. This study used purposive random sampling technique to select the elderly people who had the inclusion and exclusion criteria from the total number of 927 elderly people from 10 *Posyandu Lansia* at the study areas (Surakarta city). The study population were elderly people who lived in Laweyan district, Serengan district, Pasar Kliwon district, Jebres district and Banjarsari district. The inclusion criteria were (1) elderly aged ≥ 60 years old; (2) had a history or symptoms of vertigo based VSS-SF; (3) the respondents were willing to be the objects of the research. The exclusion criteria (rejection) were as follows: (1) respondents who were not able to communicate; (2) paralyzed elderly people; and **(**3) had other condition which could be the risk factors of fall, such as heart disease, postural hypotension, syncope, and consuming particular drugs (tricyclic antidepressants, sedative, and antipsychotics). Seventy-one nursing homes for elderly people has been chosen as the respondents of this study.

The occurrence of vertigo was assessed using Vertigo Symptom Scale-Short Form (VSS-SF) by adding up the value of each number while measuring the history of falls by using a questionnaire by identifying the history of falls. The correlation was identifed by using Chi Square test with a degree of confident by 95%.

The categorical data such as sex was reported as number and percentages. Mean, standard deviation, median and range (minimum:maximum) were used to describe the continuous variables such as age. The correlation between variables, Adjusted Odds ratio (Adj.OR) and their 95% confident intervals (CI) were estimated by using Chi Square test.

RESULT AND DISCUSSION

A total of 927 elderly people who stayed in the nursing homes were selected by implementing purposive randomly sampling from the study areas. Their mean age was 67.45 ±5.70. The majority members of Posyandu Lansia in Surakarta who were between 60-75 years old were 64 people. There were seven persons who were nine years older (between 76-90 years old). In addition, there were both frequent and infrequent occurrences of fall in the classification of age with the history of falls in the elderly age (60-75 years old) in a year on average. This was different from the age range between 76-90 years old, who had a tendency to fall infrequently.

The number of female (70.42% or 50 persons) was two times higher than elderly men, which only reached 21 people. If it was associated with the history of falls, men who had the history of falls infrequently (once a year) was 23.8% and women who had the history of falls infrequently (once a year) was 28%. The results showed that women had more history of

falling than men. It showed that elderly women were more vulnerable to falls than men. Based on the results of the study, there were 16 respondents (elderly women) or 80.0% who had symptoms of vertigo with positive categories; and there were four elderly men (20.0%) for the similar category. The results showed that female respondents were four times more susceptible than men vertigo.

The results of vertigo data analysis with the history of falling in the *Posyandu Lansia* in Surakarta was presented in Table 1.

Tab. 1 Distribution of respondents based on the relationship between vertigo with the history of falls

Vertigo	Fall history						Total		*p-value*	Adj.OR
	Always		Rare		never					
	n	%	n	%	n	%	N	%		
Negative	3	5,9	7	13,3	41	80,4	51	100,0	0,001	9.24
Positive	4	20,0	12	60,0	4	20,0	20	100,0		
Total	7	9,9	19	26,8	45	63,4	71	100,0		

Based on Tab.1 above, it showed that the respondents with symptoms of vertigo positive category had the history of frequent falls (falls> 1 time a year) four times more than the negative categories with a percentage of 5.9%. On the contrary, the respondents with negative vertigo category had a history of falls less than four times than any other category of positive vertigo. The multivariate analysis by Chi Square test identified that those who had vertigo had more history of falls (Adj. OR=9.24; 95% CI; P-value 0.001). Therefore, it could be concluded that there was a correlation between the two variables.

Based on the results of statistical analysis, it showed that vertigo was associated with the history of falls in the category that it was rarely ever experienced ups once a year to reach 60%. The case where vertigo experienced by the elderly people was more dominant leading to peripheral vestibular vertigo (peripheral vertigo is a disorder that comes from the inner ear or vestibular nerve). The duration of vertigo attacks or duration lasted differently on each episode (attack), which could last a few seconds, minutes, or hours, it could even last up to several days to several weeks. Whereas, vertigo itself is a form of orientation disorder in which the patient had a feeling of spinning or undulating towards the surrounding space (subjective vertigo) or the surrounding space to move against him (objective vertigo). It is associated with the body's balance system that results in falls [8].

Vestibular system (balance) is an important part of the inner ear (labyrinth), where the non-auditory portion of the inner ear (vestibular apparatus) consisting of the semicircular canals (two vertical and one horizontal) and the otolith organs (utricle and saccule) exist. In elderly people, neurological changes occur in cell death and progressive fragmentation of statoconia utricle and saccule; utricle function implies a position where the head relative to gravity. Thus, when saccule is damaged, it will cause a reduce of the response to gravity and linear acceleration, it will also reduce saccule function respond to a high level of vertical acceleration, which causes motor response that is required for an optimal landing when falling [12].

Vertigo is caused by the migration of calcium carbonate crystals (otoconia) to the posterior semicircular canal in which the function of the semicircular canals feel the round head and feel the otolith organs linear acceleration of the head. Movement or change of the head and the body will cause fluid displacement endolymph in the maze and will bend the

hair cell cilia. Flex cilia cause cell membrane permeability changes; therefore, it will bring calcium ions into the cell causes which causes depolarization process, which will stimulate the release of excitatory neurotransmitter, which will in turn forward afferent nerve impulses to the balance centers in the brain; when cilia are pushed in the opposite direction, it will cause hyperpolarization. This will cause the positional balance and be sensitive to changes in gravity that accompanies the head position changed circumstances [13].

In all cells contained lipofuscin deposits (pigment wear and tear) formed in the cytoplasm derived from lysosomes or mitochondria. These changes lead to disturbances of perception, analysis, integrity, and sensory input. Morphological changes that lead to a reduction in the amount of chorine receptors will cause a predisposition of temperature regulation in response to heat or coolness on the circulating autoregulation, which disturbed the broken cerebral; therefore, causing the occurrence of fall. Structural changes can cause functional disorders such as postural disorders and impaired balance with decreased visual acuity and cause propioception abnormalities on the elderly, and they are not able to maintain their position until fall [10]

CONCLUSION

Based on the findings, it can be concluded that there was a relation between vertigo and the history of falls in the elderly in the city of Surakarta. People who suffered from vertigo were with 9 times higher in risk rather than people who did not have it. Therefore, examining the ears, vertigo, and balance as early as possible was important to prevent the occurrence of falls in the elderly. It was also expected that this study would provide fall risk prevention education and information regarding the factors causing the fall to reduce falls in the elderly and would become a reference for further research in order to reduce the fall risk and manage fall prevention program.

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