

Balance Identification to Reduce the Risk of Falls in the Elderly

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ABSTRACT

Introduction: Balance disorders are a major factor in influencing some elderly disability rates in Indonesia. Especially the incidence of falls that can cause a decrease in quality of life. Therefore, it is important to take preventive measures in the form of identifying the risk of falling in the elderly group with the Time Up and Go Test (TUG) balance test. **Methods:** A quantitative study with a descriptive cross-sectional approach was used in the Tridadi elderly group, Sleman Regency, Special Region of Yogyakarta. The TUG test results were grouped into two; high risk of falling if the respondent completed the TUG test in more than 13.5 seconds and the normal category if the respondent was able to do the test in less than 13.5 seconds. The data were analyzed and presented based on a frequency table with sampling using the purposive sampling method. **Results:** From a total of 29 Tridadi elderly group populations, the average total test duration was 10.68 seconds. Male respondents were on average faster in completing the test than female respondents 9.3:10.84. A high risk of falling was found in 4 out of 29 respondents (13%) all of whom were female with an age range of 48-69 years. **Conclusion:** The level of risk of falling in the Tridadi elderly group shows that the female elderly group tends to have a higher risk of falling with a longer TUG test duration than men. By identifying the risk of falling figures, further steps need to be taken related to the analysis of risk factors and preventive and rehabilitative steps in the population at risk of falling.

Keywords: *Elderly, Risk of Falls, and Balance*

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INTRODUCTION

Indonesia has begun to enter the aging population period, which is interpreted as an increase in life expectancy followed by an increase in the number of elderly people. Elderly is the final stage in the journey of human life, which begins from infancy to childhood, adolescence, adulthood to old age. Based on Law Number 13 of 1998 concerning the Welfare of the Elderly, an elderly person is someone who is over 60 years old. According to WHO (2013), the elderly are classified into 5 age groups, namely; middle age in the age group 45-54 years, elderly (elderly) in the age group 55-65 years, young elderly (young old) in the age group 66-74 years, old elderly (old) in the age group 75-90 years,

very old elderly (very old) in the age group over 90 years.

The aging population has become a global phenomenon, almost every country in the world is experiencing a drastic increase in the elderly population both in number and proportion in the population. Globally, there were 727 million people aged 65 years or older in 2020 (Central Bureau of Statistics, 2021). This number is projected to double to 1.5 billion by 2050. In addition, in 2050 it is predicted that there will be 33 countries with more than 10 million elderly people, with 22 of them being developing countries (Central Bureau of Statistics, 2021). In 2013, Indonesia recorded the number of elderly people reaching 8.9% which is predicted to



increase to 21.4% by 2050 (Ministry of Health of the Republic of Indonesia, 2016).

Elderly people are identical to non-productive age and are susceptible to physical disorders and risk of injury. One of the risks of injury that increases with age is the incidence of falls. According to Ikhsan et al., (2020) in Indonesia, the prevalence of fall injuries in the population over the age of 55 years reached 49.4%, and over the age of 65 years reached 67.1%. The incidence of falls each year among the elderly living in the community increases from 25% at the age of 70 years to 35% after the age of 75 years. The prevalence of falls in the elderly on a regional or regional scale in Indonesia, namely D.I Yogyakarta at the Tresna Werdha Social Home Unit Abiyoso Pakem Sleman D.I Yogyakarta, the incidence of falls in one year was recorded at 22.2% (Adihapsari, 2013).

The risk of falling is caused by several factors such as cognitive decline, sarcopenia, musculoskeletal disorders, to gait and balance disorders. Gait and balance disorders are the most common causes of falls in the elderly, causing injury, disability, limitations in daily activities, and decreased quality of life (Cuevas-Trisan, 2017). Balance is the body's ability to maintain the body's center of mass by maintaining the stability limits determined by the center of support. Balance is influenced by sensory, vestibular, proprioceptive, and musculoskeletal system factors (Pramadita et al., 2019).

Loss of balance and fatigue in the elderly are forms of decreased function and ability in the elderly that are interrelated and cause various impacts of falls in the elderly (Ngamsangiam & Suttanon, 2020). Based on the American Geriatric Society, the British Geriatric Society, and The Nordic Geriatricians Meeting, the measurement that can be done in this condition is the Timed up-and Go test (TUG). TUG is a series of tests to detect balance problems in the elderly by paying attention to aspects of walking speed and balance during the test to review the performance of the

elderly in carrying out daily activities (Beauchet et al, 2011).

The purpose of this study was to identify the level of balance as an initial step to reduce the risk of falls in the elderly and the implementation of promotive and preventive actions to review further rehabilitation steps and reduce the incidence of falls in the elderly.

METHODS

The research method is a descriptive cross-sectional study during October - November 2023. Located in the Denggung Sleman field with the Tridadi elderly community, Sleman. The total respondents in this study were 29 elderly people who were collected using purposive sampling techniques based on inclusion criteria. The inclusion criteria for respondents are; elderly men and women aged 45 - 75 years, able to communicate and take tests, and willing to be respondents (table 1).

Table 1. Respondent Characteristics

Characteristics	n(29)
Age*	
Middle age	18
Elderly	9
Young Elderly	2
Gender	
Male	3
Female	26

Respondents will be identified by filling out a form containing their name, age, and gender. Respondents were previously explained and given a thorough example regarding the purpose of the study and the tests to be carried out and then signed an informed consent.

Timed up and Go Test (TUG) is conducted with standard chair preparation (chair height 46 cm, 65 cm for armrests), a 3-meter test track, and a turning place marked with cones. The test is conducted with the respondent standing from the chair then walking as far as the route turning at the marked place and sitting back down. The



instructions given to the respondent are; when the physiotherapist gives the command "start" the mother/father can walk at normal speed (not running) on the prepared route and turn the sign that has been given to turn back and sit back down in all positions.

The physiotherapist will calculate the travel time using a stopwatch when saying the word "start" until the respondent sits back down. Respondents can use glasses if they have visual impairments. Physiotherapy also monitors the test to ensure that respondents are safe from the risk of falling during the test.

The test score is categorized as good if the test travel time is less than 13.5 seconds and at risk if above 13.5 seconds. The data will then be collected and analyzed with a computer device. The results of the study will show the frequency of elderly people at risk of falling.

RESULTS

This study was conducted on 29 respondents, with 26 females and 3 males. In Table 2, among the 29 respondents, 4 respondents were found to have a high risk of falling and 25 of them were still in the good/normal category. The achievement of TUG results for male respondents showed seconds faster than for female respondents. Meanwhile, among the respondents with a risk of falling, all were female respondents. The age range of patients with a risk of falling was 48-69 years.

Table 3 shows the results of respondent characteristics based on age group. The results obtained were that respondents with middle-aged

elderly numbered 18, the elderly group 9 people, and the young elderly group numbered 2 people. The majority of respondents with a high risk of falling with TUG results above 13.5 seconds were in the middle-aged group (48-49 years in 2 respondents), elderly (60 years in 1 respondent), and young elderly (69 years in 1 respondent).

Table 2. TUG test results

Gender	Age Group	TUG Score	Risk of Falling
Men	Middle-aged =0		
	Older =2		
	Young elderly =1	8	Normal
Woman	Middle-aged = 18	12	Normal
	Seniors = 7	10.61	Normal
	Young aged = 1	11	Normal
		14	High Risk

Table 3. TUG results and age groups

Gender	TUG Score (Sec)	Risk of falling	
		High risk	Normal
Men	9.3	0	3
Woman	10.84	4	22



DISCUSSION

The characteristics of the fall risk of the elderly Tridadi group showed that 4 respondents (13.7%) out of 29 respondents had a high risk of falling with an average TUG test time of 14.75 seconds.

The Timed Up and Go (TUG) test is a simple tool developed by Podsiadlo and Richardson, an adaptation of the "Get Up and Go test." This test has been proven to be a valid and reliable tool for measuring balance in various positions, as well as being able to measure mobility and movement in the elderly population (Setiowati, F.E. (2015). As explained by Ramlis, R. (2018) in his research, TUGT is used to assess dynamic balance ability before and after intervention, highlighting the usefulness of this test in evaluating changes in balance function in certain populations.

The results of the study showed that the risk of falling was high in the middle-aged elderly group in the young elderly group (48 years - 69 years). With an average age that is almost the same in both groups, it can be concluded that the degeneration and aging processes tend to be similar among respondents. The aging process in the elderly is often followed by changes in the nervous system, including a decrease in the chronology of sensory perception and motor responses. There is a decrease in proprioceptive responses and disorders in the musculoskeletal system which results in decreased body stability, impaired posture control mechanisms, and decreased antigravity power. This can ultimately result in decreased balance and movement in the elderly (Supriyono, E. 2015; Munawwarah, M., & Nindya, P. 2015).

The frequency distribution of respondents who underwent the Screening Time Up and Go Test (TUG) showed a significant difference between the female and male gender groups. Of the total 29 respondents, 26 respondents were female, while only 4 respondents were included in the male gender group. It is important to note that this finding indicates a significant disparity in participation between the two genders in this study. This was followed by a higher average

TUG result in female respondents. Previous studies have revealed that biological, psychological, and social factors can influence responses to movement tests such as TUGT in the elderly.

According to the literature, differences in gender distribution in the TUGT respondent population can be associated with differences in physical and hormonal features between men and women that can affect test performance. Several studies have shown that women tend to have lower bone density and a higher risk of osteoporosis than men, which can affect body stability and balance. In addition, hormonal differences such as menopause in women can also affect motor responses and muscle function (Pradana, A. 2014).

The risk of falling itself is multifactorial. Starting from internal and external aspects, one of which is musculoskeletal conditions. This difference can be attributed to decreased muscle strength in the elderly, which is in line with the findings of research conducted by Vieira W (2017). The study found that the increase in time required for the elderly TUG test occurred due to decreased muscle strength (Vieira W de O et al., 2017). Decreased muscle strength in the elderly occurs due to decreased muscle mass, which generally begins after the age of 35 years. The decrease in muscle mass is around 1-2% per year and the decrease in muscle strength is around 1.5% per year (Vitale G. et al., 2016).

Decreased muscle mass caused by increased muscle catabolism and inflammatory conditions exacerbated by increased interleukin-6 (IL-6) (Elizabeth E et al., 2016). IL-6, which is secreted in response to infection or tissue damage, is involved in age-related diseases and low-grade inflammation and plays a role in the pathogenesis of sarcopenia. IL-6 is known to cause muscle atrophy by reducing muscle anabolism and disrupting energy homeostasis (Nelke C et al., 2019).

Among the various factors that can cause a high risk of falls in the elderly. Identification of balance in the elderly is key in efforts to prevent



and reduce the risk of falls. Balance monitoring through the TUG test can help health workers identify individuals at high risk and direct more specific preventive efforts, such as muscle strength training programs, balance training, and management of medical conditions that may affect balance.

Coordinated interventions, including regular health monitoring, education, and environmental modification, can help reduce these risk factors. At the same time, family and community involvement is also important to create a safe and supportive environment for older adults. Overall, identifying balance in older adults provides a foundation for a proactive preventive approach to improve quality of life and minimize the risk of falls that can compromise older adults' well-being.

CONCLUSION

Based on the results and discussions that have been presented, the results of the study found a high risk of falling with a population of 13% of the total respondents with an average risk of falling higher in female respondents. The age group of respondents with a high risk of falling is in the age range of 48 - 69 years. Knowing the level of risk of falling, further studies are needed on the risk factors that influence the risk of falling in the elderly group to take steps forward in realizing intervention and prevention of the conditions that have been identified.

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