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The Prevalence and Characteristics of Instability Using TUG and FRT in Elderly at RSUD Dr. Soetomo, Surabaya Period October 2023 – April 2024

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Abstract

Instability is one of the geriatric syndromes that can cause falls in the elderly. Instability in the elderly is something to be aware of because it can cause injuries that result in decreased activity, decreased quality of life, and even death. This study aimed to describe the prevalence and characteristics of the elderly with instability in the Medical Rehabilitation Clinic at Dr. Soetomo General Hospital in the period October 2023 - April 2024. This was a cross-sectional descriptives study with total of 33 patients were given instruments such as Functional Reach Test for static instability, Timed Up and Go Test for dynamic instability, and interviews to examine variables of age, gender, and nutritional status. The result of this study showed 60.6% patients experienced static instability and 57.9% patients experienced dynamic instability. Both instabilities were mostly found in young elderly age, female gender, and normal nutritional status. This study found that more than 50% patients experienced static and dynamic instability with a higher prevalence of static instability.

Keywords: Elderly; Instability; Static Instability; Dynamic Instability; Balance

1. Introduction

Instability is one of the leading causes of falls in the elderly. The prevalence of instability and falls increases with age[1]. This is also a key factors used as predictors of falls in the elderly. Another study found that 51% of elderly individuals aged 65–74 years with instability reported experiencing falls. This suggests that instability is a significant risk factor for falls in the elderly[2]. Fall risk increases with balance disturbances or instability[3].

Balance is the ability to maintain the center of gravity (Center of Gravity) so that it remains within the support base, both statically and dynamically. As people aging, the elderly experience a decline in balance function, which refers to the inability to control body posture balance, both in static and dynamic positions. Aging also leads to changes in posture, gait, postural sway, sensory systems, and functional mobility, all of which contribute to the risk of falls in the elderly. To assess instability in the elderly, this study conducted static and dynamic balance tests. Static balance refers to a person's ability to maintain or hold balance in a stationary position, such as sitting or standing for a period of time. Dynamic balance refers to a person's ability to maintain balance while in motion, such as walking, cycling, or running[4]. The mortality rate due to falls is very high among the elderly due to the aging process, which causes a general decline in body function. Approximately one-third of the population aged 65 and above experiences falls every year, and a quarter of this population experiences recurrent falls[5].

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Given the risks associated with instability and falls in the elderly, it is important for us to be aware of and address instability in this population. Preventing instability is a strategy with the aim of creating a safer environment for the elderly, thus improving their quality of life. The first step in prevention is to understand the prevalence and characteristics of instability in the elderly to raise awareness and reduce fall incidents. This study aims to describe the prevalence and characteristics of instability in elderly patients at Dr. Soetomo General Hospital, Surabaya with the hope that this study will increase knowledge and improve assessments related to instability in the elderly.

2. Material and methods

This was an descriptive cross-sectional study design with total of 33 patients elderly in in the Medical Rehabilitation Clinic at Dr. Soetomo General Hospital. It was conducted from October 2023 to April 2024. A cross-sectional study is an observational research method where the researcher simultaneously assesses both the outcome and the exposure in study participants. The sampling technique used in this study was total sampling, which included participants meeting the inclusion criteria during the specific period. Data analysis was conducted using SPSS and presented in table form. Correlation analysis was performed using multivariate tests for all study variables.

3. Results

This study was conducted from October 2023 to April 2024, a total of 33 elderly patients were selected as research samples from the Medical Rehabilitation Polyclinic at Dr. Soetomo Hospital, Surabaya. Data collection was conducted through interviews, the Timed Up and Go Test, the Functional Reach Test, and the MNA questionnaire. The results are presented in tabular form based on the characteristics that were studied. The characteristics examined include age, gender, and nutritional status.

Based on Table 1, the characteristics based on age were divided into three categories. The majority of elderly patients were in the young elderly category, with 19 patients (12.1%), 10 patients (30,3%) of middle-aged elderly, and 4 patients (12,1%) of the old elderly. The next characteristics based on gender, the majority of patients were female, with 21 patients (63.6%) and 12 patients (36.4%) is male. For nutritional status, patients were assessed using the MNA (Mini Nutritional Assessment Short-Form). Based on the MNA results, no patients were classified in malnoutrition. However, 15 patients (45.5%) were categorized as at risk of malnutrition, while 18 patients (54.5%) were classified as having normal nutritional status. The category with the highest frequency was normal nutritional status.

Table 1 Characteristics of Total Elderly Subjects

Variable	**N (%)**
Age	
Young Elderly (60 – 69 years)	19 (57.6%)
Middle-Age Elderly (70 – 79 years)	10 (30.3%)
Old Elderly (80 – 89 years)	4 (12.1%)
Sex	
Woman	21 (63.6%)
Man	12 (36.4%)
Nutrition Status	
Malnutrition (0 – 7)	0 (0%)
At Risk of Malnutrition (8 – 11)	15 (45.5%)
Normal (12 – 14)	18 (54.5%)

Based on Table 2, the Variance Inflation Factor (VIF) values for all variables were less than 10, indicating that no multicollinearity was present in the regression model. Therefore, the variables are not excessively correlated with each

other, and the logistic regression model can be considered reliable. This study found that there was no significant relationships between age, gender, and nutritional status, as their p-values were greater than 0.05.

Table 2 Correlation and VIF Analysis of Variable of Static and Dynamic Instability

Variable	**VIF**	***p-value* Static Instability**	***p-value* Dynamic Instability**
Age	1.23	0.653	0.628
Sex	1.20	0.389	0.434
Nutrition Status	1.82	0.874	0.421

Based on Table 3, the results for the standard deviation indicate variability in the FRT (Functional Reach Test) times. A higher value of time variability suggests that some elderly individuals in this group required significantly more or less time to complete the test. This indicates significant differences in mobility levels. Conversely, a smaller standard deviation suggests that the time taken by elderly individuals to complete the test is relatively stable, meaning their mobility abilities are more consistent within that age group. From the table 3, it can be observed that the average FRT result for females aged 60–69 years is below the normal range, indicating that they are more likely to experience static instability. In females over 70 years of age is above normal, suggesting they are less likely to experience static instability. For males, the average FRT results for both the 60–69 years and >70 years age groups are below normal, indicating that both age groups are more likely to experience static instability. Regarding the TUG (Timed Up and Go) test, the average results for females across all age categories indicate below-normal performance, suggesting that they tend to experience dynamic instability. For males, the average TUG results for the 60–69 years and 70–79 years age groups are also below normal, indicating that these groups are more likely to experience dynamic instability.

Table 3 Descriptive Analysis FRT and TUG Results

Category	**Sex**	**Age**	**Min**	**Max**	**Mean ± SD**
FRT	Woman	60 - 69	23	49	33.91 ± 8.28
		>70	24	34	28.14 ± 4.27
	Man	60 - 69	20	48	33.11 ± 11
		>70	16	40	28 ± 12
TUG	Woman	60 - 69	9	16	11.6 ± 2.39
		70 - 79	10	33	18.22 ± 8.69
		80 - 89	15,4	17	16.2 ± 1.13
	Man	60 - 69	8	42	20.71 ± 12.48
		70 - 79	10	18	13.33 ± 4.16
		80 - 89	0	0	0

Based on Table 4, the results of the study on elderly patients with static instability were measured using the Functional Reach Test. The findings showed that the majority of elderly patients experienced static instability, with 20 patients (60.6%) affected. Meanwhile, 13 patients (39.4%) did not experience static instability. Static instability dominantly occurred in the young elderly category, with 13 patients (65%), followed by the middle-aged elderly category with 6 patients (30%), and the older elderly category with 1 patient (5%). In terms of gender, 14 females (60%) and 8 males (40%) were found to have static instability. These results indicate that the majority of patients with static instability were female. Based from the nutritional status, no patients were categorized in malnoutrition. Nine patients (45%) were at risk of malnutrition, while 11 patients (55%) were categorized as having normal nutritional status. In summary, static instability was predominantly observed in young elderly age, females, and those with normal nutritional status.

Table 4 Characteristics of Static Instability Patients

Variable	**N (%)**
Static Instability	
Yes	20 (60.6%)
No	13 (39.4%)
Age	
Young Elderly (60 – 69 years)	13 (65%)
Middle-Age Elderly (70 – 79 years)	6 (30%)
Old Elderly (80 – 89 years)	1 (5%)
Sex	
Woman	12 (60%)
Man	8 (40%)
Nutrition Status	
Malnutrition (0 – 7)	0
At Risk of Malnutrition (8 – 11)	9 (45%)
Normal (12 – 14)	11 (55%)

Based from the table 5, the study results on elderly patients experiencing dynamic instability were measured using the Timed Up and Go Test. The findings showed that the majority of elderly patients experienced dynamic instability, with 19 patients (57.6%) affected. Meanwhile, 14 patients (42.4%) did not experience dynamic instability. Based on age, young-old individuals accounted for 12 patients (63.2%), followed by middle-old with 6 patients (31.3%), and oldest-old with 1 patient (5.3%). Based on gender, it was reported that dynamic instability occurred more frequently in females, with 11 patients (57.9%), compared to males with 8 patients (42.1%). Based on nutritional status, the results showed no patients in the malnutrition category, while 8 patients (42.1%) were at risk of malnutrition, and 11 patients (57.9%) had normal nutritional status. Dynamic instability predominantly occurred in young-old individuals, females, and patients with normal nutritional status.

Table 5 Characteristics of Dynamic Instability Patients

Variable	**N (%)**
Dynamic Instability	
Yes	19 (57.6%)
No	14 (42.4)
Age	
Young Elderly (60 – 69 years)	12 (63.2%)
Middle-Age Elderly (70 – 79 years)	6 (31.5%)
Old Elderly (80 – 89 years)	1 (5.3%)
Sex	
Woman	11 (57.9%)
Man	8 (42.1%)
Nutrition Status	

Malnutrition (0 – 7)	0 (0%)
At Risk of Malnutrition (8 – 11)	8 (42.1%)
Normal (12 – 14)	11 (57.9%)

4. Discussion

4.1 Age Characteristics in Patients with Static and Dynamic Instability

This study utilized primary data, including interviews for age, gender, the Timed Up and Go Test to assess dynamic instability, the Functional Reach Test for static instability, and the MNA questionnaire for nutritional status. The results indicated that both static and dynamic instability were predominantly observed in young elderly age (aged 60–69 years). Aging leads to degeneration, reduced muscle function and strength, and decreased flexibility, increasing fall risk in older adults[6]. In this study, the predominance of young elderly age patients at Dr. Soetomo General Hospital reflects the patient demographics of the Rehabilitation Medicine Clinic, which primarily consists of young elderly age individuals. Moreover, according to data from the Central Statistics Agency, the majority of the elderly population in Indonesia falls within the young-old category, accounting for 63.59%[7]. BPS also reported that the life expectancy in Indonesia in 2022 was 71.85 years, indicating that individuals are expected to live up to 71–72 years. These data align with the findings of this study, which show that the majority of patients with static and dynamic instability belong to the young-old category (60–69 years).

4.2 Sex Characteristics in Patients with Static and Dynamic Instability

In static instability assessed through the Functional Reach Test (FRT), reported that 12 females (60%) and 8 males (40%) showed static instability. For dynamic instability evaluated using the Timed Up and Go Test (TUG), reported that 11 females (57.9%) and 8 males (42.1%) experienced dynamic instability. This indicates that both static and dynamic instability are more prevalent in females. Women are more prone to balance disorders and fall risks due to gender-specific aging processes. Women undergo more significant aging-related changes than men, including menopause, which reduces estrogen levels, leading to bone mass loss through decreased osteoclast activity[8]. Furthermore, anatomical differences in lower extremities, where women's wider pelvic bones result in greater hip adduction and knee abduction, increasing instability risks[9]. Psychological changes in aging women, such as Fear of Falling (FoF), caused by reduced confidence in weight-bearing during movement, further exacerbating balance issues and instability[10].

4.3 Nutritional Status Characteristics in Patients with Static and Dynamic Instability

The findings on both static and dynamic instability revealed that the majority of patients had normal nutritional status, followed by those at risk of malnutrition. Poor nutritional status is associated with a higher risk of falls[11]. This is because inadequate nutrition reduces muscle strength and increases fatigue due to lower energy intake, which in turn can impair balance and mobility in the elderly[12]. In this study, most elderly patients were classified as having normal nutritional status. Nutritional status assessed using the MNA questionnaire reported that malnutrition causes balance disorders or instability and muscle function decline, making nutritional status a predictor of fall risk in the elderly. Factors that can influence nutritional outcomes include comorbidities, depression, taste preferences, and dental issues. Elderly individuals who struggle with chewing and swallowing due to missing teeth may have reduced food intake, leading to poor nutritional status[13].

5. Conclusion

Based on the results, it can be concluded that this study found that more than 50% patients in Dr. Soetomo General Hospital, Surabaya, Indonesia experienced static and dynamic instability with a higher prevalence of static instability. Both static instability and dynamic instability was predominantly observed in young elderly age, females, and those with normal nutritional status.

Compliance with ethical standard

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Disclosure of Conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This study had received ethics approval from the Health Research Ethics Committee, Dr. Soetomo General Hospital, Surabaya, number: 0792/KEPK/X/2023 on October 4th 2023.

Statement of informed consent

All subjects involved in this study had signed informed consent and were willing to participate in this study for Timed Up and Go Test (TUG) Assessment, Functional Reach Test (FRT), and interviews for examine variables of age, gender, and nutritional status

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