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By 1119 1119

Postural Balance among Elderly with Diabetes Mellitus: A Descriptive Study in the Geriatric Polyclinic of Level II Udayana Hospital

Abstract

Background: The advance of age, which is followed by physical degradation of the elderly, resulted in the change of balance. One of the most dangerous effects of this impairment is falling. The health problem of diabetes mellitus is suspected as the predictive condition that contributes to postural imbalance.

Objective: This research aims to analyze the postural balance among elderly with diabetes mellitus in Geriatric Polyclinic of Level II Udayana Hospital

Method: This study is quantitative research with a cross-sectional approach, involved 94 elderly patients diagnosed with diabetes mellitus in the Geriatric Polyclinic of General Hospital Level II Udayana Denpasar. Data collection was conducted through direct observation by the researcher to assess postural balance using the Berg Balance Scale. The analysis used was univariate analysis with descriptive analysis.

Result: Based on demographics, this study found that 68 respondents (72,34%) were aged 60-74, 54 respondents (57,45%) were men, graduated from senior high school amount 38 respondents (40,42%), and the duration of diabetes was more than 5 years were 62 respondents (65,96%). The main data of postural balance reveal that 60 respondents (63,83%) were independent, but 32 respondents (34,04%) were walking assisted. The mean score of Berg Balance Scale was 31,3 (walking assisted).

Conclusion: The elder with diabetes mellitus potentially experienced postural imbalance due to the disease process and advanced age. The findings may serve as an early detection reference and support the development of fall prevention intervention for diabetic elderly.

Keywords: Elderly, postural balance, diabetes mellitus, postural imbalance, Berg Balance Scale

INTRODUCTION

Balance defined as the individual ability to maintain the center of body gravity within the limits of the base of support, refers to postural stability and control ⁽¹⁾. The impairment of balance is caused by multiple factors depending on the structures affected and other underlying diseases ⁽²⁾. The negative impacts of postural balance impairment are the possibility of falling and decreasing mobility ^(2,3). It is important to measure postural balance, specifically lateral stability, because it may be influenced by high levels of fear of falling ⁽⁴⁾. National Institute of Aging stated that if the balance impairment is getting undetectable and chronic, it is a consequence of disruptions of relationships, declining work performance, and lowering the ability to carry out daily activities ⁽⁵⁾.

Bally, the elderly are found to be the highest prevalence victims due to falls. In America, 20 to 30% of elders who fall experience moderate to severe injuries, such as bruises, hip fractures, or head trauma, with the level of seriousness based on advanced age, loss of balance, and more common in women ⁽⁶⁾. The previous study found that the elders with type 2 diabetes mellitus have a 59% possibility to fall higher than nondiabetic elders. Linked to insulin use, the likelihood of falls among insulin users is 162 higher compared to those without insulin ⁽⁷⁾. Based on time to reach stability, the age after 60 needs 17% longer compared with the under ⁽⁸⁾. The research that compared the postural balance due to gender found that male elders have better stability than females when tested by opening and closing their eyes on hard or soft areas to step ⁽⁹⁾. In the research that compared active older adults, inactive older adults, and younger adults, the center of pressure sway and velocity of older

Commented [RV1]: Abstract

1) In the results section of the abstract, it would be helpful to explicitly include key findings related to postural balance, such as the mean or range of scores from the Berg Balance Scale (BBS). I think this will give readers a clearer picture of the outcome.
2) Consider revising the final sentence to: "The findings may serve as an early detection reference and support the development of fall prevention interventions for diabetic elderly." This version is clearer and more academically appropriate.

Commented [RV2]: Introduction

1) The background is generally strong, effectively connecting aging, diabetes, and postural balance issues. However, there are a few incomplete or awkwardly phrased sentences, such as: "The elderly (upper 60 found as the highest prevalence..." which disrupt clarity. Please review the manuscript for sentence structure and revise unclear or non-academic wording to ensure clarity and consistency throughout.
2) To better emphasize the research gap, consider adding an explicit statement at the end of the introduction, such as: "Despite the high prevalence of diabetes among the elderly, limited studies in Indonesia have explored postural balance using standardized measurement tools like the Berg Balance Scale."
3) Since the main objective of this study is to assess postural balance in elderly individuals, the research aim should be clearly focused on that. Avoid placing too much emphasis on demographic characteristics in the aim statement. Please revise accordingly to better reflect the study's primary goal.

adults was greater than that of younger adults. It is reflected that older adults tend to be physically inactive and present a high risk of falling due to balance impairment⁽¹⁰⁾. The study to measure anticipatory postural adjustment based on age found that older adults were unable to adjust their postural responses. It is indicated that the elderly faced the problem in transition for the change from standing to walking⁽¹¹⁾.

Losing balance in the elderly induces faintness, nausea, or unsteadiness. The following symptoms, like spinning when standing, dizziness without explanation, or feeling like floating, may persist after 50 years old. In elders with diabetes, low blood sugar may contribute to dizziness and sudden dizziness⁽¹²⁾. The balance problem in the elderly with diabetes mellitus may be caused by several factors, such as neuropathy related to diabetes, degradation of sensory and motor skills ability, and cognitive problems⁽¹³⁾. The review about age-related balance and gait impairment reveals that the elderly have a dependency on vision to maintain posture that increases the risk of falls⁽¹⁴⁾. It may increase gradually due to advanced age, specifically in overweight and obese elderly compared to the elderly with a normal body mass index. Overweight, obesity, and underweight were related to a higher proportion of dynamic balance impairments⁽¹⁵⁾.

The exercise to increase the capability of elders to maintain balance and prevent falls needs to be performed routinely. A lifestyle such as healthy food consumption, exercise, sleep, and good rest may ensure the elders stay active in their old age⁽¹⁶⁾. The research in Indonesia proved that balance exercise for institutionalized elderly with a risk of falling is able to improve the postural balance after evaluation using the Berg Balance Scale⁽¹⁷⁾. The activities for older adults that help them to maintain their body's strength and stability are tai chi, yoga, one-foot standing, heel-to-toe walking, balance walking, sideways walking, and other changing-position training. By combining three types of physical activities as a combination of aerobic, muscle strengthening, and balance as weekly activities⁽¹⁸⁾.

Despite the high prevalence of diabetes among the elderly, limited studies in Indonesia have explored postural balance using standardized measurement tools of the Berg Balance Scale. The study performed in Level II Udayana Hospital which never performed the balance function specifically in diabetes mellitus elders. This study aims to identify the demographic characteristics and postural balance in elderly with diabetes mellitus. The balance of elderly measure by using the Berg Balance Scale as the effort to screen the balance impairment specifically in diabetes mellitus elderly.

METHOD

This study uses a quantitative research method with a cross-sectional approach to determine the postural balance in elderly patients with diabetes mellitus. The research was conducted in March 2025 at the Geriatric Polyclinic of Level II Udayana Hospital with the sampling technique was purposive sampling. The population in this study consists of 156 respondents, calculated based on the average number of outpatients over the past 3 months. The sample calculation found 94 people who were involved in this study based on the inclusion and exclusion criteria.

The inclusion criteria in this study are being at least 60 years old, having diabetes for at least 1 year, being able to read and write, and being willing to be a respondent. The exclusion criteria are not routinely undergoing examinations and inadequate health conditions such as blind.

The postural balance was assessed by using the Berg Balance Scale as the valid and reliable instrument which used globally. The Berg Balance Scale proved has a high relative reliability with inter-rater reliability estimated at 0.97 (95% CI 0.96 to 0.98) and intra-rater reliability estimated at 0.98 (95% CI 0.97 to 0.99). The result categorized into three categories, there are 0-20 (wheelchair bound), 21-40 (walking assisted), and 41-56 (independent).

Commented [RV3]: Methods

- 1)The explanation of inclusion and exclusion criteria is generally clear, but it would benefit from being presented in a more organized manner—preferably in separate, clearly structured paragraphs.
- 2)It's important to include information on the validity and reliability of the measurement tool used (Berg Balance Scale).
- 3)Please add details about the cut-off scores or the score range of the BBS to help readers better interpret the balance levels.
- 4)Specify the type of data analysis performed. Was it based on frequency distribution, or did it include measures of central tendency such as mean, standard deviation, or median? Ideally, the actual BBS scores should be analyzed—not just their categorical groupings.

During performing the step of balance measurement, three nurse are guarding the patient on the right and left sides as well as the back, while the researcher is at the front of the chair where the patient holds on when moving. All participants involved in this study have voluntarily signed the informed consent after receiving a proper explanation of the research. This research has been deemed ethically acceptable by the Health Assessment Ethics Committee of Stikes Kesdam IX/Udayana with the number: 06/EC-KEPK-SK/II/2025.

RESULT

The result was conducted at Level II Udayana Hospital as a military hospital and the highest referral hospital within the Kodam IX/Udayana area. This hospital is located at Jalan P.B Sudirman No.1, Dauh Puri, Denpasar Barat, Kota Denpasar. The main facilities provided include inpatient care, outpatient care, treatment rooms, a pharmacy, and other adequate support services to deliver professional care, accompanied by a fairly comfortable waiting area. Elderly patients with diabetes mellitus receive professional care from Internist and polyclinic nurses. The respondents in this study numbered 94 out of a total of 112 samples based on the sample calculation formula. The excluded respondents were 8 people with severe vision impairment, 4 people diagnosed with diabetes for less than 1 year, 6 individuals who were first-time patients referred to the geriatric polyclinic at Level 2 Udayana Hospital. The demographic data of the respondents show that the majority are aged 60-74, with 68 people (72.34%), 54 men (57.45%), 38 people (40.42%) with a high school education and 62 people (64.04%) having diabetes for more than 5 years, as shown in Table 1.

Commented [RV4]: Results

- 1)The results section is overly lengthy and includes institutional descriptions that would be more appropriately placed in the introduction or methods section. This section should focus solely on presenting the study's findings, not on describing the hospital or setting.
- 2)There is no quantitative description of the Berg Balance Scale (BBS) scores, only categorical results are provided. If available, consider including descriptive statistics such as the mean, standard deviation, and score range to offer a more complete picture of the data.

Table 1. The Demographic Distribution of Elderly with Diabetes Mellitus in Geriatric Polyclinic of Level II Udayana Hospital

Categories	Frequencies (f)	Percentage (%)
Age		
60-74	68	72,34
75-90	26	27,66
Sex		
Male	54	57,45
Female	40	42,55
Level of education		
None	36	4,26
Elementary	12	12,76
Junior high school	30	31,91
Senior high school	38	40,42
University	10	10,65
Duration of diabetes		
1-5 years	32	34,04
>5 years	62	65,96

Table 1 reveals that 68 respondents (72.34%) were between 60-74 years old, 54 respondents (57.45%) were male, 38 respondents (40.42%) were high school graduated, and 62 respondents (65.69%) were experienced diabetes more than 5 years.

Table 2. Distribution of postural balance in elderly in Geriatric Polyclinic at Level II Udayana Hospital

Categories	Frequencies (f)	Percentage (%)	Mean
1 (wheelchair bound)	2	2,13	31,33
2 (walking with assistance)	32	34,04	
3 (independent)	60	63,83	
Total	94	100,00	

Tabel 2 reveals that 60 respondents (63.83%) were independent, while 32 respondents were walking with assistance (34.04%). The mean result of balance by using the Berg Balance Scale is 31.33 which categorized as walking with assistance.

DISCUSSION

According to the research's findings, the elderly are predominantly 60-74 years old, which is in line with the report from the Endocrine Society that those 65 or older are more at risk of developing diabetes mellitus. Most of them experienced complications such as hypoglycemia, kidney failure, and heart disease more than the younger ⁽¹⁹⁾. The retrospective study found that one of five elderly (≥ 65 years old) people have diabetes mellitus, and it is higher among overweight participants. Male respondents in the current study found a greater percentage of diabetes mellitus. In the United States, male and older adults also found a higher prevalence of type 2 diabetes mellitus ⁽²⁰⁾. Based on the level of education, the respondents are predominantly in senior high school. The previous study found that the average years of study was 8 years. The participants with low levels of education may have low access to information and find it difficult to follow the recommended treatments (21). According to the duration of being diagnosed, this study found the respondents have more than 5 years of experience as patients of diabetes mellitus. The study in Indonesia found that almost all of the

Commented [RV5]: Discussion

The discussion section is generally well-structured, but it could be further strengthened with the following improvements:

- 1) Add a more critical analysis—for example, why were the majority of elderly participants still able to walk independently despite having diabetes? What are the broader implications of this finding?
- 2) Explore potential confounding factors in more depth, such as advanced age, diabetic neuropathy, physical inactivity, and gender. These variables are commonly known to be associated with diabetes and may influence balance outcomes.
- 3) Incorporate relevant theoretical frameworks, such as postural balance theories and sensory compensation systems (vestibular and somatosensory). Then, relate these to geriatric balance models and preventive interventions to give the findings a stronger scientific grounding.

respondents with diabetes mellitus ≥ 5 years had peripheral neuropathy (77.4% of 31 respondents) that may impact the balance and stability⁽²²⁾. Therefore, the American Diabetes Association recommends assessing for neuropathy on the first day of diagnosis of diabetes mellitus type 2 and after 5 years for type 1. It may benefit as early detection for the risk of imbalance⁽²³⁾.

The current study reveals that elderly respondents with diabetes mellitus, based on postural balance measurement, are elderly who are dependent and require assistance to walk using aids. During the assessment, the movements that respondents found difficult included standing on one leg and alternating placing their feet on a bench, while the movements that all respondents were generally able to perform well included sitting to standing and standing without support. The category of walking with assistance is experienced by respondents who need help walking and climbing stairs, using canes, walkers, or crutches, or holding onto handrails installed in the room. Respondents in the independent category are generally able to perform daily activities independently, but aspects of balance such as climbing stairs and standing on one leg still require assistance. After conducting a more detailed data collection regarding demographic data and health history, several supporting factors for the condition were found, including that the respondents were predominantly female, over 70 years old, had a history of recurrent falls in the past year, had very minimal physical activity, and had a more frequent history of pain-relief medication use. Some of these conditions greatly affect the elderly's ability to achieve good postural balance. The results of this study indicate that diabetes and postural imbalance conditions are very likely to occur in the elderly, accompanied by various other risk factors due to aging.

Postural balance may be affected by several factors besides disease condition. The frailty, handgrip strength, unintentional weight loss, level of physical activity and fatigue also contribute to postural instability⁽²⁴⁾. The previous research in Indonesia, the demographic data that may worsen postural balance were female gender, the age over 80 years old, the history of frequent falls, osteoarthritis with pain, irregular activity, and history of pain⁽¹⁷⁾. In elderly individuals with diabetic neuropathy, there is a possibility of experiencing postural and gait instability. Neuropathy conditions will impact daily activities as they increase the risk of falls⁽²⁵⁾. The latest research in 2024 compared the balance among diabetic and non-diabetic persons in the group. It is found individuals with diabetes without neuropathy had shorter tandem on unstable surfaces and worse anticipatory postural adjustments and reactive postural responses than individuals without diabetes⁽²⁶⁾. It is also in line with the research in China that compared the postural static among different age groups. It was suggested that the individuals with diabetes mellitus and older age had worse static postural balance. The poorer balance function was found to correlate to advanced age. It may happen due to the worsened function of the visual, somatosensory, and central nervous system levels⁽²⁷⁾. The previous study in community-dwelling older adults that linked diabetes mellitus with gait and falls found that vision and cognition were mediators of DM and gait speed impairment. It is a consequence of balance problems and increasing risk of falling⁽²⁸⁾.

Based on the research findings, while most of the elderly still independent reveals that the elderly still productive physically. The cognition status contribute to the higher balance among elderly⁽²⁹⁾. The elderly who perform routine activity or regular exercise such as tai chi

also have higher balance performance⁽³⁰⁾. The elderly who have good vision and hearing, and no history of cerebrovascular disease show better static or dynamic balance although they have advance age⁽¹⁵⁾.

CONCLUSION

The demographic data of elderly were between 60-74 years old, high school graduated, experienced diabetes more than 5 years. Based on the postural balance, the elderly mostly experienced postural balance which categorized by walking with assistance. By assessing the postural balance as early detection in elder with diabetes mellitus, it is beneficially as the fall prevention among elders. The measurement of balance by using the Berg Balance Scale is applicable as the early detection for the elderly or health care provider to enhance the fall prevention intervention especially in elderly patient with related disease.

RECOMMENDATION

The result of postural balance measurement is the basic data for the other research to develop programs for fall prevention or improve balance that may be performed independently. This measurement is recommend to apply in clinical setting specifically in geriatric clinic and beneficially to develop program community-based health promotion that may reduce the admission due to fall.

ACKNOWLEDGEMENT

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Commented [RV6]: Conclusion

1)The concluding paragraph is too brief and does not fully reflect the scope of the study's findings. A strong conclusion should clearly answer the research objective and synthesize the key results, rather than simply repeating descriptive data.
2)It would be helpful to include the practical implications and contributions of the study. For instance, how can these findings be applied by healthcare professionals such as nurses, physiotherapists, or doctors? Additionally, how might the results serve as a foundation for future intervention research?

Commented [RV7]: Recommendation

The recommendations are too general and lack specificity, offering little practical direction for key stakeholders such as researchers, clinicians, and policymakers. It is suggested to include more actionable recommendations, such as how the study's findings could inform hospital-based geriatric clinic policies or be used to develop community-based health promotion programs for the elderly.

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