Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Original Research Articles
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 13, Number 01, Pages 127–131 (2025)
DOI: https://doi.org/10.248437mifi.000630

Excess Body Weight Is Associated with Fall Risk Among Older Adults: A Cross-Sectional Study

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Received 26 November 2024; Revised in revised form 18 December 2024; Accepted 20 December 2024; Published 01 January 2025

Abstract

Introduction: Aging is associated with various degenerative changes in bodily functions, which may increase the risk of health problems, particularly falls. Excess body weight is one of the primary contributors to fall incidents among older adults, as it negatively affects postural stability and balance. This study examines the relationship between excess body weight and fall risk among older adults in Labasari Village, Karangasem.

Methods: This study employed an analytical observational design with a cross-sectional approach, conducted in October 2022. Eighty-two older adults aged 60–75 in Labasari Village participated as subjects. The sampling technique used was simple random sampling.

Results: Spearman's rho correlation test was used to analyze the association between excess body weight and fall risk. The results showed a statistically significant correlation between excess body weight and fall risk ($p = 0.000$, $p < 0.05$).

Conclusion: The findings of this study indicate a significant relationship between excess body weight and the risk of falls among older adults in Labasari Village, Karangasem.

Keywords: excess body weight, fall risk, older adults

Introduction

Older adults are individuals who have entered the final stage of life. According to the World Health Organization (WHO), individuals aged 60 years and older are categorized as elderly (older persons).[1] Based on data from the 2015 Intercensal Population Survey (SUPAS), the elderly population in Indonesia reached 21.7 million (8.5%), comprising 11.6 million women (52.8%) and 10.2 million men (47.2%). The distribution of the elderly population across provinces indicated that population aging had occurred in four provinces in 2015, with Bali being one of them. According to the Central Bureau of Statistics (BPS) in 2016, the elderly population in Bali was 10.4%. Based on aging index projections, by 2035, there will be 73 elderly individuals for every 100 people, a significant increase from 2015, with 31 elderly individuals per 100.[2]

With the increasing elderly population each year, numerous health-related challenges may arise. The aging process in older adults leads to physiological decline and various health conditions. One such decline includes deterioration in the musculoskeletal system and metabolic function, which may result in excess body weight.[3]

Overweight is when an individual's body weight exceeds the normal range.[4] This condition typically results from excessive energy intake and insufficient physical activity. [5] Overweight can be classified based on the Body Mass Index (BMI), where a BMI of >25 kg/m² is considered overweight.[6] In older adults, excess weight can interfere with balance during daily activities such as walking and increase the risk of falling. Specifically, fat accumulation in the abdominal region may elevate the risk of falling by altering postural alignment and shifting the body's center of mass.[7] Additionally, excess body weight in older people may lead to a collapsed medial longitudinal arch in the foot, which can affect gait patterns and further impair balance, thereby increasing fall risk.[8]

Falls in older adults may result in severe consequences such as injury, disability, or death. According to 2014 WHO data, the average fall-related mortality rate in the United States was 36.8 per 100,000 population—46.2 per 100,000 for men and 31.1 per 100,000 for women. In 2018, [9] the Indonesian Ministry of Health (Kemenkes RI) 2018 reported that the prevalence of fall risk among the elderly ranges from 30% to 50% annually. Falls are a significant health concern related to impaired balance and postural control, which can lead to loss of stability.[10]

While numerous studies have investigated the relationship between overweight and fall risk, few have been conducted in Bali. Therefore, this study aims to determine the correlation between overweight and fall risk among Labasari Village, Karangasem Regency older adults. Labasari Village was chosen due to its relatively high elderly population—192 individuals according to local demographic data—and a strong level of community cooperation.

Moreover, no research has specifically examined overweight as a contributing factor to fall risk among older people in Labasari. This study will provide meaningful insights for physiotherapy by analyzing the correlation between body weight and fall risk in older adults. It may also serve as a reference for planning appropriate interventions for elderly individuals who have experienced falls, thus enhancing knowledge and understanding in physiotherapy.

Methods

This study employed an observational analytic design with a cross-sectional approach. Observations and measurements of variables were conducted only once for each participant. The independent variable was overweight status, while the dependent variable was fall risk. The study was conducted in Labasari Village, Karangasem, in October 2022. The study sample comprised 82 elderly individuals aged 60–75, selected based on inclusion and exclusion criteria.

The inclusion criteria were: age between 60 and 75 years, willingness to participate, and no cognitive impairment as assessed by the Mini-Mental State Examination (MMSE), which required approximately 5–10 minutes to complete via interview. The exclusion criteria included: elderly individuals using assistive devices or needing assistance to walk, individuals with a body mass index (BMI) below 22.99, and those with a known history of stroke, hypertension, diabetes mellitus, cardiovascular disease, or other comorbidities as determined using a standardized assessment form.

Overweight status was determined using BMI categories defined by Dwijayanti (2017), which require weight and height measurements to calculate BMI.[11] BMI is a widely used anthropometric parameter to assess nutritional status. The overweight categories used in this study were: overweight (23–24.9), obesity type I (25–29.9), and obesity type II (>30).[6]

Fall risk was assessed using the Timed Up and Go (TUG) test, which has a reliability score of 0.99, indicating it is a valid and reliable tool for evaluating fall risk in older adults. TUG scores were interpreted as follows: <10 seconds indicates complete independence, 10–20 seconds indicates low fall risk, 20–30 seconds indicates moderate fall risk, and >30 seconds indicates high fall risk.

Data was collected using a single-masked method in which trained research team members performed measurements to minimize bias. All collected data were analyzed using SPSS software version 25.0. Univariate analysis was conducted to describe the sample characteristics, including sex, BMI, age, overweight status, and fall risk. Bivariate analysis using Spearman's rho test examined the correlation between overweight status and fall risk among elderly individuals in Labasari Village, Karangasem. This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Udayana University/Sanglah General Hospital Denpasar (No. 2446/UN14.2.2.VII.14/LT/2022).

Results

Of 192 elderly individuals in Labasari Village, Karangasem, 90 met the inclusion and exclusion criteria. From this pool, 82 participants were randomly selected using Excel-based random sampling. Both univariate and bivariate analyses were conducted on the sample, and the results are presented in the following tables. Table 1 presents descriptive data on the characteristics of participants based on age and Body Mass Index (BMI). This information provides an overview of the range, mean, and variability of age and nutritional status among the elderly participants.

Table 1. Distribution of Sample Characteristics Based on BMI and Age

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Age (years)	82	60	75	67.57	4.47
BMI (kg/m²)	82	23.28	34.27	26.24	2.55

Table 1 shows that the minimum age of the participants was 60 years, and the maximum was 75 years. The mean age was 67.57 years with a standard deviation of 4.47. The lowest BMI recorded was 23.28, and the highest was 34.27, with a mean BMI of 26.24 and a standard deviation of 2.55. Table 2 displays the frequency distribution of sample characteristics, including sex, overweight status, and fall risk levels. These data highlight the proportion of participants in each observed variable category.

Table 2. Frequency Distribution of Sample Characteristics

No	Variable	Category	N	%
1	Sex	Male	25	30.4
		Female	57	69.5
2	Overweight Status	Overweight	37	45.1
		Obesity Type I	34	41.4
		Obesity Type II	11	13.4
3	Fall Risk	Fully Independent	17	20.7
		Low Fall Risk	54	65.8
		Moderate Fall Risk	7	8.5
		High Fall Risk	4	4.8

Table 2 indicates that most of the sample were female (69.5%), with the remaining 30.4% male. In terms of overweight status, 45.1% were categorized as overweight, 41.4% as obesity type I, and 13.4% as obesity type II. Regarding fall risk, most elderly participants had a low fall risk (65.8%), followed by fully independent individuals (20.7%),

moderate fall risk (8.5%), and high fall risk (4.8%). Table 3 presents the bivariate analysis results using Spearman's Rho correlation to assess the relationship between overweight status and fall risk among older people. The correlation coefficient and p-value are provided to indicate the strength and statistical significance of the association.

Table 3. Spearman's Rho Correlation Between Overweight Status and Fall Risk

Variables	Correlation Coefficient (ρ)	p-value
Overweight – Fall Risk	0.636	0.000

Table 3 demonstrates a statistically significant correlation between overweight status and fall risk among elderly individuals (p = 0.000), with a Spearman correlation coefficient of 0.636, indicating a strong and positive relationship.

Discussion

Sample Characteristics

The study included 82 elderly individuals who met the inclusion and exclusion criteria. Participants ranged in age from 60 to 75 years, with the youngest elderly individual found in Labasari Village. The mean age was 67.57 years, with a standard deviation of 4.47. Aging is associated with a decline in the body's metabolic capacity, which may lead to increased difficulty in weight management and, consequently, fat accumulation [12]

Regarding gender distribution, the sample was predominantly female, comprising 57 participants (69.51%), while 25 participants (30.49%) were male. There are known differences in body composition between men and women; females typically have a normal body fat percentage of 20–25% of total body weight, while males generally have 10–15%.[13]

Regarding body weight, most participants were classified as overweight, with 37 elderly individuals (45.1%). In addition, 34 participants (41.4%) were categorized as having obesity type I, and 11 participants (13.4%) had obesity type II. A study by Trisia (2021) similarly reported a higher prevalence of overweight among elderly respondents, which is associated with an increased risk of falling.

In this study, most elderly participants (54 individuals, 65.8%) were identified as having a low risk of falling. Aging contributes to the deterioration of physical functions and muscle strength, increasing the risk of falls among older people.[14]

Relationship Between Overweight and Risk of Falling

Spearman's rho correlation test (Table 3) revealed a significant relationship between overweight status and fall risk in elderly individuals. The findings indicate that overweight elderly individuals in Labasari Village, Karangasem, have a higher risk of falling compared to those with normal body weight. Previous studies have also identified overweight status as a contributing factor to increased fall risk. Excessive body weight in older adults may lead to abdominal fat accumulation, elevated postural pressure, and balance disturbances, elevating the likelihood of falls.[15]

Febriyani (2019) also found that Body Mass Index (BMI) was correlated with fall risk in older adults. According to the study, elderly individuals with higher BMI levels tend to experience fatigue more easily during physical activity, which disrupts balance while walking. Overweight in older people can lead to increased postural pressure and impaired balance, ultimately shifting the body's Center of Mass (COM) away from the Base of Support (BOS), thus compromising postural stability and increasing fall risk [7]

A study by Yuliadarwati (2021) similarly concluded that increased BMI is associated with higher fall risk. Age-related physiological changes, such as reduced muscle strength, diminished reflex orientation, and decreased stride length and height, reduce responsiveness in avoiding sudden falls. Overweight individuals often experience difficulty shifting body weight or taking rapid steps, making falls more likely and impairing balance.[16] As a defensive mechanism, elderly individuals take smaller steps when walking.

Excess body weight may also increase joint pressure, particularly in the knees and hips.[17] This excessive load can damage ligaments and supportive tissues, reducing joint stability. Joint instability affects the ability of elderly individuals to control joint movement accurately, increasing their risk of falling.[18] Overweight status can also impair motor coordination and control. Changes in body mechanics resulting from excess weight can hinder the body's ability to make quick and accurate motor responses to maintain balance. Poor coordination may result in stumbling or losing balance, leading to falls.[19]

Pringadani (2020) reported a significant association between BMI and fall risk in three overweight elderly participants. The study also noted that recurrent falls can lead to mild to severe injuries, affecting daily activities and quality of life. Therefore, overweight elderly individuals are at greater risk of experiencing falls.[15]

This study has several limitations, including difficulty obtaining a sample representative of the broader elderly population. The cross-sectional design, which assesses variables at a single point, also limits the ability to establish causal relationships. Future studies are encouraged to employ different methodologies and consider additional risk factors related to both variables.

Elderly individuals are advised to maintain a healthy weight to reduce fall risk. The use of assistive devices may also be beneficial for those with a high risk of falling. Researchers are encouraged to explore alternative research methods and expand upon the variables examined in this study.

Conclusion

This study, conducted among 82 older adults in Labasari Village, Karangasem, demonstrates a statistically significant relationship between excess body weight and fall risk. Elderly individuals classified as overweight or obese were found to have a higher risk of falling compared to those with normal body weight. These findings emphasize the importance of maintaining a healthy body weight in older populations to reduce fall-related incidents.

Given the limitations of the cross-sectional design, future research should employ longitudinal approaches and explore additional contributing factors, such as muscle strength, balance ability, and environmental hazards. Health professionals should consider regular weight monitoring and fall prevention interventions—including assistive device use and balance training—as part of comprehensive geriatric care.

Author Contribution

Ni Luh Putu Citra Mahadewi: Conceptualization, methodology, data collection, data analysis, and manuscript drafting.

Nila Wahyuni: Supervision, guidance on research design, and critical review of the manuscript.

Ni Luh Nopi Andayani: Supervision, validation, and manuscript editing.

I Made Niko Winaya: Supervision, methodological consultation, and final manuscript review.

Acknowledgments

The authors would like to express their gratitude to the Faculty of Medicine, Universitas Udayana, for providing the academic support and facilities necessary for conducting this study.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was not required as the study involved only non-invasive procedures (blood pressure measurement and questionnaire surveys) and posed minimal risk to participants. Informed consent was obtained from all participants prior to their inclusion in the study, and confidentiality was strictly maintained.

References

1. World Health Organization. Ageing and health [Internet]. Geneva: WHO; 2021 [cited 2025 May 19]. Available from: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health
2. Cicih LHM. Info Demografi BKKBN [Internet]. Jakarta: BKKBN; 2019 [cited 2025 May 19]. Available from: https://www.bkkbn.go.id/po-content/uploads/info_demo_vol_1_2019_jadi.pdf
3. Utami FY. Hubungan indeks massa tubuh dan kecepatan jalan dengan risiko jatuh pada lanjut usia [undergraduate thesis]. Yogyakarta: Universitas Gadjah Mada; 2015.
4. Miftakuljanah HS. Tingkat obesitas dengan nyeri persendian lutut pada lansia [undergraduate thesis]. Surabaya: Universitas Airlangga; 2018.
5. Pratiwi AI. Diagnosis and treatment. J Majority. 2015;4(4):10–17.
6. Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan RI. Hasil utama Riset Kesehatan Dasar 2018. Jakarta: Kementerian Kesehatan RI; 2018.
7. Febriyani RW. Hubungan indeks massa tubuh terhadap risiko jatuh pada lansia [undergraduate thesis]. Yogyakarta: Universitas Respati Yogyakarta; 2019.
8. Tini DS. Hubungan bentuk telapak kaki dan indeks massa tubuh dengan risiko jatuh pada lansia di RSI Sultan Agung Semarang [undergraduate thesis]. Semarang: Universitas Sultan Agung; 2020.
9. World Health Organization. WHO global report on falls prevention in older age [Internet]. Geneva: WHO; 2014 [cited 2025 May 19]. Available from: https://www.who.int/ageing/publications/Falls_prevention7March.pdf
10. Noorhidayah D. Hubungan postur tubuh dengan risiko jatuh pada lanjut usia [undergraduate thesis]. Jakarta: Universitas Esa Unggul; 2016.
11. Dwiyanti D, Yuliana IAJ. Analisis status gizi lansia dengan beberapa teknik pengukuran tinggi: tinggi lutut, panjang depa, dan tinggi badan di Padang. J Sehat Mandiri. 2017;12(2):10–16.
12. Fitria. Status nutrisi lansia dan risiko jatuh pada lansia [undergraduate thesis]. Bandung: Universitas Padjadjaran; 2013.
13. Permatasari G, Widiastuti T. Perbedaan pengaruh sepatu berhak wedge dan non-wedge terhadap gait dan keseimbangan. J Kedokt Diponegoro. 2017;6(2):576–82.
14. Aprilia SM, Lestari DRK. Hubungan fungsi kognitif dengan risiko jatuh pada lanjut usia di Panti Sosial Tresna Werdha Budi Sejahtera Banjarbaru. Din Kesehat J Kebidanan Keperawatan. 2020;10(1):402–13. doi:10.33859/dksm.v10i1.460
15. Pringgadani DJ, Wibawa AW. Hubungan antara indeks massa tubuh dengan risiko jatuh pada lansia di Denpasar. J Gizi dan Kesehatan. 2020;8(2):257–61.

16. Yuliadarwati NR. Hubungan indeks massa tubuh (obesitas) dengan risiko jatuh pada lansia [undergraduate thesis]. Padang: Universitas Andalas; 2021.
17. Septina L, Ginting R. Hubungan obesitas terhadap derajat nyeri pada pasien lansia dengan simtom osteoarthritis di Posyandu Lansia Puskesmas Kampung Baru Medan Maimun. J Ilm Simantek. 2020;4(4):87–92.
18. Sofa IM. Kejadian obesitas, obesitas sentral, dan kelebihan lemak viseral pada lansia wanita. Am Nutr J. 2018;2(3):228–36. doi:10.2473/amnt.v2i3.2018.228-236
19. Supriyono E. Aktivitas fisik keseimbangan guna mengurangi risiko jatuh pada lansia. J Terpadu Ilmu Kesehatan. 2015;11(2):1–11.