

Prevalence of Ankle Dysfunction and Balance Impairment Among Obese Geriatric Individuals in The Community: An Observational Study

Dr. Ram Avtar¹, Amruta Thote², Shruti Jambhulkar³

¹Associate Professor, Ojas College of Physiotherapy, Jalna, Maharashtra, India

^{2,3}Inten, Ojas College of Physiotherapy, Jalna, Maharashtra, India

Abstract

Background: Ageing and obesity may influence lower-limb function, postural control and safe mobility. Assessment of foot/ankle function alongside balance may help identify functional difficulties in older adults living in the community. **Objective:** To assess balance impairment and foot/ankle-related functional ability among obese geriatric individuals and examine the association between these outcomes. **Methods:** This observational study included 130 participants from the community in Jalna, Maharashtra. Balance was assessed using the Berg Balance Scale (BBS), and foot/ankle-related function was assessed using the Foot and Ankle Ability Measure (FAAM). Descriptive statistics, the Shapiro–Wilk test, Spearman correlation and Mann–Whitney U tests were used as reported in the study analysis. **Results:** Participants had a mean age of 63.87 ± 3.69 years and mean BMI of 34.70 ± 2.95 kg/m². Mean BBS score was 29.04 ± 10.53 and mean FAAM score was 60.32 ± 14.19 . Balance impairment categories were reported as mild in 15 participants (11.5%), moderate in 81 (62.3%) and severe in 34 (26.2%). BBS and FAAM scores showed a significant positive correlation (Spearman's $\rho = 0.656$, $p < 0.001$). Age and BMI were not significantly correlated with either outcome, and no significant gender-wise differences were found. **Conclusion:** Balance impairment was frequent in this sample, and better self-reported foot/ankle function was associated with better balance performance. The prevalence of ankle dysfunction itself could not be calculated from the supplied results because participant-level FAAM classifications and a defined cut-off were not available.

Keywords: obesity; older adults; ankle function; balance impairment; Berg Balance Scale; Foot and Ankle Ability Measure.

1. Introduction

Ageing is associated with changes in muscle strength, joint mobility, sensory processing and postural control. These changes may affect walking, transfers and other everyday activities, making the maintenance of mobility and independence an important aspect of healthy ageing [1,2]. Falls in older adults are multifactorial and are associated with personal, physical and environmental risk factors [3]. Obesity can add to the physical demands of standing and walking by increasing the load that must be supported and moved by the lower limbs. Studies in older adults have reported associations between

obesity, balance performance and falls, although the relationship may vary with body composition and other individual factors [4–8].

The foot and ankle complex contributes to weight acceptance, forward progression and postural adjustments. Ankle mobility and plantar-flexor strength are associated with balance and functional ability in older adults [9,10]. Foot and ankle problems may also contribute to fall risk, supporting the value of assessing this region during geriatric evaluation [11,12]. The Berg Balance Scale (BBS) is a standardized measure of functional balance, while the Foot and Ankle Ability Measure (FAAM) captures self-reported difficulty with foot- and ankle-related activities.

Despite the clinical relevance of these factors, community-level information about balance impairment and foot/ankle-related functional ability among obese older adults remains useful for planning physiotherapy screening and prevention. This study therefore assessed BBS and FAAM scores in obese geriatric individuals living in the community and examined the relationship between the two measures.

2. Aim and Objectives

Aim: To assess ankle-related functional ability and balance impairment among obese geriatric individuals living in the community.

1. To assess balance performance using the Berg Balance Scale.
2. To assess foot/ankle-related functional ability using the Foot and Ankle Ability Measure.
3. To examine the relationship between BBS and FAAM scores.

3. Materials and Methods

3.1 Study design and setting

An observational study was conducted in a community setting in Jalna, Maharashtra, India. The study duration was reported as six months.

3.2 Participants

The results section reports 130 valid participants. Participants were described as obese older adults, including males and females, with difficulty maintaining balance. The project methodology states random sampling. The reported inclusion criteria were both sexes, age above 60 years and a complaint of difficulty maintaining balance. Exclusion criteria included recent lower-limb fracture or surgery, severe joint deformity affecting movement or balance, and uncontrolled systemic disease.

3.3 Outcome measures and procedure

After informed consent, demographic and anthropometric information was recorded. The FAAM questionnaire was used to assess self-reported foot/ankle function; higher scores indicate better function. The BBS consists of 14 functional balance tasks, each scored from 0 to 4, for a maximum total of 56. Assessments were conducted in a safe area using standardized instructions, and scores were recorded for analysis.

3.4 Statistical analysis

Descriptive statistics summarized participant characteristics and outcome scores. The Shapiro–Wilk test was used to assess normality. Since BBS and FAAM scores were reported as non-normally distributed,

Spearman's rank correlation was used to examine associations and the Mann–Whitney U test was used for gender-wise comparisons. Statistical significance was set at $p < 0.05$, as interpreted in the supplied analysis.

4. Results

A total of 130 participants were included in the analysis. Participant characteristics and outcome scores are summarized below.

Variable	n	Mean $\pm$ SD	Range
Age (years)	130	63.87 $\pm$ 3.69	56–75
BMI (kg/m ²)	130	34.70 $\pm$ 2.95	30.2–39.4
BBS score	130	29.04 $\pm$ 10.53	10–54
FAAM score	130	60.32 $\pm$ 14.19	28–89

Table 1. Demographic characteristics and outcome scores.

Balance impairment category	n	%
Mild	15	11.5
Moderate	81	62.3
Severe	34	26.2
Total	130	100.0

Table 2. Reported distribution of balance impairment categories.

The Shapiro–Wilk test indicated non-normal distributions for BBS ($W = 0.964$, $p = 0.002$) and FAAM ($W = 0.916$, $p < 0.001$). The median BBS score was 30 (IQR = 16), and the median FAAM score was 65 (IQR = 16). A significant positive correlation was found between BBS and FAAM scores ($\rho = 0.656$, $p < 0.001$). Correlations were not statistically significant for age versus BBS ($\rho = -0.024$, $p = 0.783$), age versus FAAM ($\rho = -0.110$, $p = 0.214$), BMI versus BBS ($\rho = -0.068$, $p = 0.440$), or BMI versus FAAM ($\rho = -0.166$, $p = 0.059$). Gender-wise differences were not significant for BBS ($p = 0.427$) or FAAM ($p = 0.251$).

5. Discussion

This study examined balance performance and foot/ankle-related functional ability among obese older adults living in the community. The most notable finding was that the moderate balance impairment category was the most frequently reported, accounting for 62.3% of the sample, while 26.2% were classified in the severe category. This pattern indicates that balance difficulties were common in the participants assessed and supports the value of routine balance screening in community-based geriatric physiotherapy.

The positive association between BBS and FAAM scores ($\rho = 0.656$, $p < 0.001$) suggests that participants reporting better foot/ankle function tended to perform better on functional balance tasks. This finding is consistent with literature describing relationships between ankle mobility, plantar-flexor strength, foot/ankle characteristics and balance in older adults [9–12]. However, the cross-sectional observational design does not establish that ankle function causes better balance, and other factors may contribute to both outcomes.

Age and BMI were not significantly associated with BBS or FAAM scores in this sample. This should not be interpreted as evidence that age or obesity never affect balance. The restricted sample characteristics, sample size, unmeasured factors and the absence of a non-obese comparison group may limit the ability to detect relationships. Previous research has reported associations between obesity and balance or falls in older populations, but findings can vary across samples and measurement approaches [4–8].

From a physiotherapy perspective, the findings support assessment that includes both balance and foot/ankle-related function. Depending on individual examination findings, rehabilitation may include ankle range-of-motion work, foot and calf strengthening, proprioceptive activities, balance training, gait practice and fall-prevention education. Intervention effectiveness was not tested in this observational study, so these approaches should be considered clinical implications rather than outcomes demonstrated by the present data.

Importantly, the available aggregated results do not provide a participant-level FAAM classification or a pre-defined threshold for ankle dysfunction. Therefore, an exact prevalence of ankle dysfunction cannot be calculated from the supplied data. The title and objective refer to prevalence; this should be addressed before submission by either providing a defensible operational definition and reanalysing the raw data or revising the title and stated aim to reflect the outcomes actually reported.

6. Limitations

- The study was conducted in a limited community setting, which may restrict generalizability.
- The observational, cross-sectional design cannot establish cause and effect.
- No non-obese comparison group was included.
- BMI alone does not describe body-fat distribution or muscle mass.
- FAAM is self-reported, and the BBS assesses performance on standardized tasks rather than every real-world community situation.
- The exact prevalence of ankle dysfunction could not be determined from the available aggregate results because participant-level FAAM classifications and a defined cut-off were not supplied.

7. Conclusion

In this sample of 130 obese older adults living in the community, moderate balance impairment was the most frequently reported category. Better foot/ankle-related functional ability was significantly associated with better BBS performance. Age, BMI and gender-wise comparisons were not statistically significant in the analyses provided. The findings support considering both balance and foot/ankle function during physiotherapy assessment of older adults. The prevalence of ankle dysfunction itself remains unconfirmed and requires a defined classification method and participant-level data.

Declarations

Ethics approval and consent to participate: The project file reports that ethics committee approval and informed consent were obtained; the approval reference number was not provided in the supplied document.

Funding: Funding information was not specified in the supplied project file.

Conflicts of interest: Conflict-of-interest information was not specified in the supplied project file.

Data availability: The participant-level dataset was not included in the supplied project file. Data availability should be confirmed by the authors.

Acknowledgements: The author acknowledges the study supervisor, faculty and participants for their guidance and cooperation.

References

1. World Health Organization. Ageing and health. Geneva: World Health Organization; 2024.
2. World Health Organization. WHO global report on falls prevention in older age. Geneva: World Health Organization; 2007.
3. Rubenstein LZ. Falls in older people: epidemiology, risk factors and strategies for prevention. *Age Ageing*. 2006;35 Suppl 2:ii37-ii41.
4. Lee JJ, Hong DW, Lee SA, Soh Y, Yang M, Choi KM, et al. Relationship between obesity and balance in the community-dwelling elderly population: a cross-sectional analysis. *Am J Phys Med Rehabil*. 2020;99(1):65-70. doi:10.1097/PHM.0000000000001292.
5. Melzer I, Oddsson LI. Altered characteristics of balance control in obese older adults. *Obes Res Clin Pract*. 2016;10(2):151-158. doi:10.1016/j.orcp.2015.05.016.
6. Frames CW, Soangra R, Lockhart TE, Lach J, Ha DS, Roberto KA, et al. Dynamical properties of postural control in obese community-dwelling older adults. *Sensors (Basel)*. 2018;18(6):1692. doi:10.3390/s18061692.
7. Mitchell RJ, Lord SR, Harvey LA, Close JCT. Associations between obesity and overweight and fall risk, health status and quality of life in older people. *Aust N Z J Public Health*. 2014;38(1):13-18. doi:10.1111/1753-6405.12152.
8. Fjeldstad C, Fjeldstad AS, Acree LS, Nickel KJ, Gardner AW. The influence of obesity on falls and quality of life. *Dyn Med*. 2008;7:4. doi:10.1186/1476-5918-7-4.
9. Hernández-Guillén D, Tolsada-Velasco C, Roig-Casasús S, Costa-Moreno E, Borja-de-Fuentes I, Blasco JM. Association ankle function and balance in community-dwelling older adults. *PLoS One*. 2021;16(3):e0247885. doi:10.1371/journal.pone.0247885.
10. Spink MJ, Fotoohabadi MR, Wee E, Hill KD, Lord SR, Menz HB. Foot and ankle strength, range of motion, posture, and deformity are associated with balance and functional ability in older adults. *Arch Phys Med Rehabil*. 2011;92(1):68-75. doi:10.1016/j.apmr.2010.09.024.
11. Menz HB, Morris ME, Lord SR. Foot and ankle risk factors for falls in older people: a prospective study. *J Gerontol A Biol Sci Med Sci*. 2006;61(8):866-870.
12. Schwenk M, Jordan DeHaven E, Honarvararaghi B, Mohler J, Armstrong DG, Najafi B. Effectiveness of foot and ankle exercise programs on reducing the risk of falling in older adults: a systematic review and meta-analysis of randomized controlled trials. *J Am Podiatr Med Assoc*. 2013;103(6):534-547.
13. Liang SG, Chow JCM, Leung NM, Mo YN, Ng TMH, Woo CLC, et al. The effects of ankle and foot exercises on ankle strength, balance, and falls in older people: a systematic review and meta-analysis. *Phys Ther*. 2025;105(1):pzae157. doi:10.1093/ptj/pzae157.
14. Waters DL, Qualls CR, Cesari M, Rolland Y, Vlietstra L, Vellas B. Relationship of incident falls with balance deficits and body composition in male and female community-dwelling elders. *J Nutr Health Aging*. 2019;23(1):9-13. doi:10.1007/s12603-018-1087-4.

15. Muir SW, Berg K, Chesworth B, Klar N, Speechley M. Quantifying the magnitude of risk for balance impairment on falls in community-dwelling older adults: a systematic review and meta-analysis. *J Clin Epidemiol*. 2010;63(4):389-406. doi:10.1016/j.jclinepi.2009.06.010.
16. Berg KO, Wood-Dauphinee SL, Williams JJ, Maki B. Measuring balance in the elderly: validation of an instrument. *Can J Public Health*. 1992;83 Suppl 2:S7-S11.
17. Viveiro LAP, Gomes GCV, Bacha JMR, Carvas Junior N, Kallas ME, Reis M, et al. Reliability, validity, and ability to identify fall status of the Berg Balance Scale, BESTest, Mini-BESTest, and Brief-BESTest in older adults who live in nursing homes. *J Geriatr Phys Ther*. 2019;42(4):E1-E8.
18. Vincent HK, Vincent KR, Lamb KM. Obesity and mobility disability in the older adult. *Obes Rev*. 2010;11(8):568-579. doi:10.1111/j.1467-789X.2009.00703.x.
19. Faber M, Bero J, Haanstra TM, et al. Does obesity increase the risk and severity of falls in people aged 60 years and older? A systematic review and meta-analysis of observational studies. *J Gerontol A Biol Sci Med Sci*. 2020;75(5):952-960.
20. Amaral-Natalio MA, et al. The influence of age and overweight or obesity on foot sensitivity and postural control: a systematic review. *Australas J Ageing*. 2020;39(4):e457-e469. doi:10.1111/ajag.12782.