International Journal of Science and Healthcare Research
DOI: https://doi.org/10.52403/ijshr.20210763
Vol.6; Issue: 3; July-Sept. 2021
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Influence of Body Composition on Dynamic Balance in Older Adults

Padmanabhan Suresh Babu Roshan[1], Sanjay Eapen Samuel[2], Dhan Maya Saru[3], Anisha Sharma[4]

[1]Assistant Professor, [2]Professor and Principal, [3]Post Graduate Student and Presenting Author, [4]Post Graduate Student,
Laxmi Memorial College of Physiotherapy, Mangalore, India

Corresponding Author: Dhan Maya Saru

ABSTRACT

Objective: Aging causes major changes in body composition which is related with lower muscular strength and endurance, as well as mobility and walking. Increase in accumulation of adipose tissue and increase in body fat can cause a reduction in body balance, which is a key contributing factor to falls. Therefore, the purpose of this study is to find the influence of skin fold thickness on dynamic balance in older adults.

Methods: A total of 49 community dwelling older adults aged 65 years and older were recruited in this cross-sectional study. Skin fold calliper and time up and go (TUG) test was used to measure the skin fold thickness and dynamic balance respectively. The Karl Pearson's coefficient was used to estimate the relationship between the variables.

Results: The Karl Pearson correlation co-efficient showed moderate positive correlation between skin fold thickness and TUG (r=0.395), which was found to be statistically significant ($p<0.05$).

Conclusion: Our finding suggests that balance is significantly related to the skin fold thickness measurement. Thus, body composition assessment can be considered for prevention and management of fall risk among the older adults.

Keywords: Body composition, Dynamic balance, Elderly

INTRODUCTION

Natural biological, psychological, and physiological changes occur as people age, which can have a negative influence on their life.[1] As health complications increase, their self-sufficiency decreases and often results in increased falls with more severe outcomes. Fall-related injuries are a major source of mortality, morbidity, and disability and can lead to loss of independence among the older adults.[2, 3]

The ageing process entails a series of changes in functional autonomy, which has a significant impact on balance. [4] Balance is considered as an important component in many daily tasks, ranging from simple activities like silent standing to more complicated ones like walking while talking or changing directions.[5] The ability to control balance deteriorates with age as a result of alternations in the vestibular, visual, somatosensory, musculoskeletal, and central nervous systems.[6] Impaired balance is a major risk factor for falls among older people.[7,8] Detection of the level of impaired balance is important for the assessment of risk of falling, as well as for the evaluation of proper treatment.[9]

Aging is known to cause significant changes in body composition: Fat replaces fat-free mass, and fat redistribution increases the amount of abdominal fat associated with decreased muscular strength and endurance, as well as mobility and walking.[10,11] Accumulation of adipose tissue and increase in body fat can cause a reduction in body balance, which is a key contributing factor to falls, especially when

paired with low muscle mass, resulting in biomechanical failure of muscular responses and loss of stability mechanisms.[12] Individuals who are overweight and obese, particularly those with abdominal obesity, might be at a higher risk of falling than individuals with normal body weight, whose body mass is more centralized.[13, 14]

Body composition changes in older adults (increase BMI, adipose fat accumulation) along with decreased muscle strength and endurance found to be related to fear of fall. Increase obesity and fall related injuries are considered as the major health problem around the world. Considering the effect of changes in body composition on balance there is dearth of research on the effect of skin folds thickness on the balance and fall risk. Therefore, the purpose of this study is to find the influence of skin fold thickness on dynamic balance in older adults.

METHODS

This cross-sectional study was conducted among community living elderly at selected tertiary care hospital in Southern India. This study comprised 49 elderly people (24 male and 25 female) of age group 65 years and above. History of recurrent falls, visual and hearing impairments, severe systemic diseases, paresis or deformities in the upper limb and lower limb, surgeries of the upper limb or lower limbs during the last 6 months and any vestibular and neurological disorders were excluded from the study. Cognitive function was assessed by Montreal Cognitive Assessment scale (MOCA). Participants with MOCA score greater than 25 were recruited in this study. All participants were provided with written consent on locally translated informed consent forms.

Skin fold thickness measurement

The measurement was carried out by the use of baseline skin fold calliper. The measurement was performed in the standing position with arm relaxed to the side. A vertical fold of skin and subcutaneous tissue, 5 cm right to the umbilicus was firmly grasped with the thumb and fore finger following the recommendation of international standards for anthropometric assessment.[15] The calliper was placed 1cm below the fingers and the measurement was taken.

Dynamic balance measurement

The dynamic balance was assessed by TUG test. TUG was performed on a specific sequence of movements: getting up from the chair (height 41cm with back support), walking a distance of 3 meters then turn around, covering the distance back to the chair and sitting again. The test was carried out in three attempts. The sample with the shortest time (seconds) was recorded.

Statistical analysis

To analyse the relationships between skin fold thickness and TUG among older adults, we performed descriptive analyses, including frequency reporting and correlation analyses among the variables of interest. Keeping skin fold thickness (mm) as dependent variable and TUG as an independent variable, Karl Pearson's correlation coefficient was used for the assessment of skin fold thickness and TUG. Statistical package SPSS (IBM SPSS Statistics for Windows, ver. 21.0. Armonk, NY: IBM Corp.) was used to analyze the data. The level of significance was set at $p<0.05$.

RESULTS

A total of 49 older individuals were included in the study, among them 24 (48.98%) were female and 25 (51.02%) were male. The mean age of the study participants was 66.89±2.49 years. The mean skin fold thickness of male and female were 26.05±1.74mm and 27.12±1.75mm respectively.

Table 1: Correlation of skin fold thickness and TUG

		TUG
Skin fold thickness	Pearson correlation	0.395
	Sig. (2 – tailed)	0.005
N		49

The Karl Pearson correlation co-efficient showed moderate positive correlation between skin fold thickness and TUG (r=0.395), which was found to be statistically significant (p=0.005) (Table 1 & Figure 1).

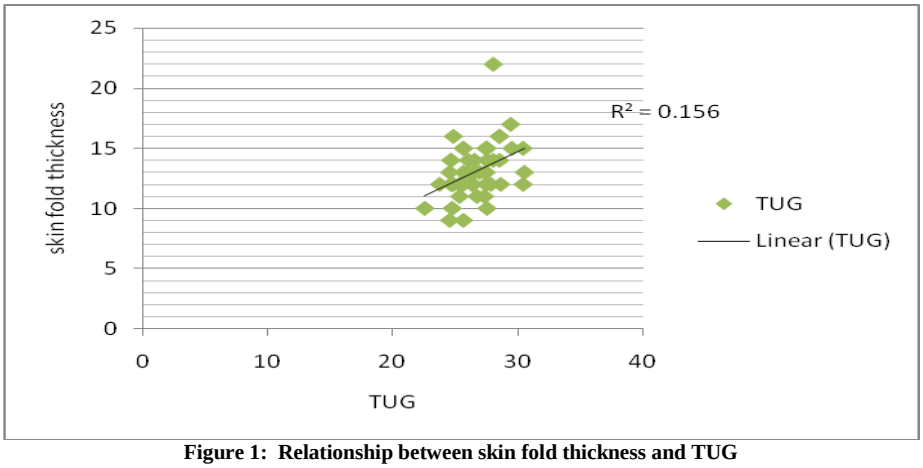

Figure 1: Relationship between skin fold thickness and TUG

DISCUSSION

The purpose of the present study was to find the influence of skin fold thickness on dynamic balance among the older adults. The findings of this study revealed that increase in skin fold thickness was associated with poor dynamic balance.

The analysis of the present study showed that females had high skin fold thickness (fat mass) compared to male individuals. Similar to this analysis, a study conducted by Hassinen M et al found out that women had a greater amount of adipose tissue and poorer balance walking ability compared with man, indicating that women could be at a greater risk of future limitations and disability.[16] They also discovered that among the elderly, overweight and central obesity, as well as muscle fitness, are related with decreased balance and walking abilities.

The extent to which the body composition components impact on balance is not well explained. Several studies have reported positive associations between increase in BMI or fat mass and poor balance and walking ability.[11,16] The present study showed a moderate significant correlation between body composition, that is, skin fold thickness measurement and dynamic balance test, supporting the previous studies. Similarly, a study stated that greater fat mass predicts poor performance on dynamic balancing tests, with lean mass accounting for just a tiny fraction of the variation.[17]

In contrast, a study conducted by Jeon BJ, found out that body composition was not significantly correlated with mobility and balance.[18] Static balance measures were used to examine the relationship between balance and BMI in their study. Though a study used dynamic balance measure to find the relationship between balance and obesity, yet the results were not significant.[19] They stated that although higher BMI is thought to affect balance in older individuals, various factors such as physical activity, muscle mass and muscle strength may also contribute to poor balance.

This study has several limitations. First is the small sample size, which may hamper the reliability of the results. Second, our study included only healthy community-dwelling older adults. Thus, may not be applicable to other populations such as older, more frail, and those with more disordered body composition, that is, sarcopenic and obese. Third, sample was heterogeneous, correlation between body composition and balance was not evaluated based on gender. There might be the effect of gender on relation between body composition and dynamic balance.

CONCLUSION

Our findings showed a significant correlation between increase in skin fold thickness and poor dynamic balance among the older adults. Thus, physical therapists and other health workers should consider the body composition during balance assessment and balance training.

Acknowledgement: None

Conflict of Interest: The authors declare no conflicts of interest.

Source of Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Okuyan CB, Bilgili N. Effect of tai chi chuan on fear of falling, balance and physical self-perception in elderly: a randomised controlled trial. Turk J Geriatr. 2017 Sep 1; 20(3): 232-241.
2. Tinetti ME, Doucette J, Claus E et al. Risk factors for serious injury during falls by older persons in the community. J Am Geriatr Soc 1995; 43:1214-1221.
3. Nevitt MC, Cummings SR, Kidd S et al. Risk factors for recurrent nonsyncopal falls. A prospective study. JAMA 1989; 261:2663-2668.
4. Hasson C, Van Emmerik R, Caldwell G. Balance decrements are associated with age-related muscle property changes. J Appl Biomech. 2014; 30(4):555-562.
5. Karimi MT, Solomonidis S. The relationship between parameters of static and dynamic stability tests. J Res Med Sci. 2011 Apr; 16(4):530-535.
6. Lord SR, Ward JA, Williams P, Anstey KJ. Physiological factors associated with falls in older community-dwelling women. *J* Am Geriatr Soc. 1994 Oct; 42 (10):1110-7.
7. Nelson RC, Amin MA. Falls in the elderly. Emerg Med Clin North Am. 1990; 8(2): 309-324.
8. Campbell AJ, Borrie MJ, Spears GF, Jackson SL, Brown JS, Fitzgerald JL. Circumstances and consequences of falls experienced by a community population 70 years and over during a prospective study. Age Ageing. 1990; 19(2):136-141.
9. Soto-Varela A, Faraldo-García A, Rossi-Izquierdo M, Lirola-Delgado A, Vaamonde-Sánchez-Andrade I, del-Río-Valeiras M, Gayoso-Diz P, Santos-Pérez S. Can we predict the risk of falls in elderly patients with instability? Auris Nasus Larynx. 2015 Feb 1; 42(1):8-14.
10. Beaufrere B, Morio B. Fat and protein redistribution with aging: metabolic considerations. Eur J Clin Nutr. 2000 Jun; 54(3):48-53.
11. Greve J, Alonso A, Bordini AC, Camanho GL. Correlation between body mass index and postural balance. Clinics. 2007; 62(6):717-20.
12. McGraw B, McClenaghan BA, Williams HG, Dickerson J, Ward DS. Gait and postural stability in obese and nonobese prepubertal boys. Arch Phys Med Rehabil. 2000; 81(4):484-489.
13. Winters KM, Snow CM. Body composition predicts bone mineral density and balance in premenopausal women. J Womens Health Gend Based Med. 2000; 9(8):865-872.
14. Corbeil P, Simoneau M, Rancourt D, Tremblay A, Teasdale N. Increased risk for falling associated with obesity: mathematical modeling of postural control. IEEE Trans Neural Syst Rehabil Eng. 2001; 9(2):126-136.
15. Stewert A., Jones MM. International Standards for Anthropometric Assessment. International Society for the Advancement of Kinanthropometry (ISAK); 2001.
16. Hassinen M, Komulainen P, Lakka TA, Väisänen SB, Rauramaa R. Associations of body composition and physical activity with balance and walking ability in the elderly. *J* Phys Act *Health*. 2005 Jul 1; 2(3):298-306.
17. Winters KM, Snow CM. Body composition predicts bone mineral density and balance in premenopausal women. J Womens Health Gend Based Med. 2000; 9(8):865-872.
18. Jeon BJ. The effects of obesity on fall efficacy in elderly people. J Phys Ther Sci. 2013; 25(11):1485-1489.

19. Mohammed R, Basha AS, Jungade S. Influence of Age, Gender, and Body Mass Index on Balance and Mobility Performance in Indian Community-Dwelling Older People. Phys Occup Ther Geriatr. 2021 Apr 3; 39(2):144-56.

How to cite this article: Padmanabhan Suresh Babu Roshan, Samuel SE, Saru DM et.al. Influence of body composition on dynamic balance in older adults. *International Journal of Science & Healthcare Research.* 2021; 6(3): 383-387. DOI: *https://doi.org/10.52403/ijshr.20210763*

******