Original Research Article

Influence of gender on static balance in healthy community dwelling elderly: a comparison using posturography

Atiya A. Shaikh, Rutuja D. Joshi*

Department of Neuroscience Physiotherapy, DES Brijlal Jindal College of Physiotherapy, Pune, Maharashtra, India

ABSTRACT

Background: Background and need of study- Influence of gender on balance is still controversial. Previous researchers have done studies using traditional methods. These methods may fail to detect subtle changes in balance difference. A tool like posturography which is highly specific may help to for accurate assessment and hence precise conclusion. Aim was to compare balance scores of male and female elderly using modified Clinical Test of Sensory Interaction on Balance (CTSIB).
Methods: There were 56 healthy elderly ambulating without an assistive device and free from any neurological and orthopedic problems were assessed for their balance abilities using mCTSIB of balance master(standing on firm surface with eyes open, with eyes closed, standing on foam surface with eyes open and with eyes closed). Sway velocity was assessed using Unpaired t test.
Results: There was a no significant difference in scores of modified CTSIB between male and female elderly (p value>0.005).
Conclusions: Gender has no effect on static balance abilities between male and female elderly while performing modified clinical test of sensory interaction on balance.

Keywords: Balance, Elderly, Gender, Posturography

INTRODUCTION

Balance is basic prerequisite for all types of daily activities and sports.[1] It is an important factor for prevention and treatment of injuries.[2] The ability to maintain balance while standing requires the sensory detection of the body movements through information received by the vestibular, visual and somatosensory system; the integration of sensory-motor information in the central nervous system; an appropriate motor response; and the planning and execution of movements to control the center of gravity over the base of support.[3,4]

As age advances, the functioning of these systems deteriorates, and it leads to weakness, fatigue and slowing of movement resulting into increased susceptibility to falls. Known structural and physiological changes in elderly lead to several problems one of them is fall.[5,6] Many researchers have proved that, factors like strength, balance, vision, height, vestibular insufficiency, weight, bony deformities and proprioception have been found to influence balance in elderly.[7,8] Age related changes in all these parameters are gender specific.[9-11] Whether gender has influence on balance is still controversial.[12,13] By knowing such gender in which individual is more prone for balance affection can help a health care professional to tap hidden problems and start appropriate interventions in that gender individual before affected balance starts affecting functional independence for that individual.

Many of the previous studies used routine clinical tests like, Timed up and go test, Berg balance test, Functional

reach test, single limb stance test to assess this difference. Although these tests are reliable valid and have good specificity, and very effective in population with gross impairments, they may fail to detect minute subtle changes in balance abilities in healthy individuals as they rely mainly on observations or duration where the individual may do some minute compensations or sways and it may go unnoticed. An individual has to do multiple movements on different surfaces every day. These traditional tests are done on stable surface hence cannot provide information about balance on unstable surface which may detect the subtle changes in balance more precisely, especially in healthy community dwelling individuals. Hence use of some more specific and accurate outcome measure may help to put forth more light in this regard.

Computerized Posturography is an effective tool to evaluate postural sway and quantify balance. It is simple and efficient tool for objective assessment and comprehensive documentation of postural control. Sway velocity of A-P and M-L directions during standing on different surfaces and conditions can be measured using posturography. These computerized measures have a greater precision and potential to detect sub clinical balance impairments.[14] Hence may be more useful than traditional measures to clarify the difference in balance in case healthy community dwelling individuals. Current study was planned to tap this difference in balance in both genders during static tasks using mCTSIB.

Aim and objectives was to compare static balance using posturography in healthy male and female elderly.

METHODS

This was a cross sectional analytical study which was performed in balance lab of DES Brijlal Jindal College of PT, Pune, on 56 elderly individuals (decided by pilot study). Duration of study was 6 months. After taking

institutional clearance for the study elderly were approached and explained about the study. They were asked to give written consent and participate in study. The inclusion criteria were as follows: 1) Elderly ≥60 years of age moving independently in community in minimum 20 KM area; 2) Male and female elderly; 3) Able to stand without an assistive device; 4) With no cognitive impairments (MMSE Score >24); 5) Self willingness to travel to study center. The exclusion criteria were as follows: 1) Participant with known orthopedic conditions like- Lower limb deformities, unhealed fractures, arthritis; 2) Neurological condition (stroke, parkinsonism, Paraplegia, Motor neuron disease); 3) Unstable cardiovascular condition; 4) Perform regular exercise for >2 hrs/week; 5) Inability to follow commands.

All participants were assessed for balance using posturography test on Neuro-com Basic Balance Master from Natus balance and mobility.

Modified Clinical Test of Sensory Interaction on Balance (standing on firm surface with eyes open, standing on firm surface with eyes closed, standing on foam surface with eyes open, standing on foam surface with eyes closed) was chosen for assessment. Analysis of collected data was done using instat software. Mann-Whitney U test was used for analysis (as data did not pass normality).

RESULTS

Table 1 shows demographic data of study, representing age with percentage of participants in the study.

Table 1: Distribution of age.

Age	No of participants	%
60-64 years	20	36%
65-69 years	23	41%
70-74 years	6	11%
75-79 years	3	5%
80-84 years	4	7%

Table 2: Modified clinical test of sensory interaction on balance.

Sub tests of modified CTSIB	Male		Female			
	Mean	SD	Mean	SD	P value	Inference
Firm EO	0.3826	0.1240	0.5713	0.4077	0.0768	Not significant
Firm EC	0.3750	0.1135	0.5000	0.3459	0.0535	Not significant
Foam EO	1.0142	0.2759	1.1047	0.6729	0.9319	Not significant
Foam EC	1.7916	0.5278	1.5868	0.8651	0.1111	Not significant

Table 2 shows comparison between values of modified CTSIB with mean and standard deviation between male and female elderly. On analysis p value was found to be

not significant (p value >0.005) in both the groups . From this table we can infer that there was no difference in static balance abilities in both the groups.

DISCUSSION

All the elderly people who participated in this study were independent in their daily activities and were mobile in the community. Thus they represented a range of active elderly with good health in spite of the presence of some pathology. Study conducted by Bohannon et al have reported that balance ability decreased after 60 years of age and decreased markedly in elderly group older than 70 years of age.[15] It has been proven that there is positive correlation between age and balance performance i.e. as the age increases there is significant deterioration in the balance of the individual. Decline in balance performance between elderly males and female is similar with increasing age. Maximum participants of this study were from age group 60-64 yrs i.e. young elderly hence, age might not have affected their balance performance to any detectable level. This might be of the reasons why the results did not show positive statistical significance on balance performance.

The somatosensory system specially the proprioceptive system, is critically involved in the sensory control of balance. Impaired proprioception leads to less accurate detection of body position. Motor coordination and balance are abilities that decline during aging process, partially by the deterioration of proprioception. Colledge et al studied the relative contributions of vision, proprioception, and vestibular system to the balance in different age groups. They found that all age groups were more dependent on proprioception than on vision for the maintenance of balance.[16] It has been proven that, there is no significant difference in rate of decline of proprioception of young elderly male and females. Hence this could be one of the reasons why there is no specific gender difference on static balance in elderly.

According to the study by Sugimoto H et al, ms strength, ms endurance decreases with increasing age and they are superior in males as compared to females.[17] But, this study participants were young elderly hence might not have a great influence of age and may have similar abilities with regard to strength, endurance and other qualitative measures required for balance. Factors like reaction time, strength, endurance and agility have their impact on balance affection. As per the study by Kent, tapping speed showed an age related difference but not gender related difference.[18] Thus, may be the participants of this study may have similar reaction time hence similar balance abilities.

Wolfson L et al showed that, balance was affected in women when visual and proprioceptive inputs were changed together.[19] Women's scores were at par with that of men after their third trial i.e. they could score equal after practice. This means with adequate exposure women can perform as good as men on balance tests where vestibular, visual and proprioceptive systems are challenged together. Current outcome measures challenged all these systems and found men and women to have similar balance abilities.

Behavioral factors like inactivity, effect of medications, fear of fall have a huge impact on balance. These factors may be different in different genders but current study participants being young elderly may be similar on these parameters too due to their goof activity and balance capacity. Hence, may have similar balance abilities too.

Finding of this study were in accordance with those of Ganeswara Rao Melam. They studied gender differences in static and dynamic postural stability parameters in community dwelling elderly healthy older adults using one leg stance test, Sharpened Romberg (SR) and dynamic stability was assessed by asking participants to turn 180 degrees in both clockwise and anticlockwise directions and they found that there was no difference in static and dynamic balance abilities between male and female elderly.[20] Study by Daly R et al, also found similar results in performance on basis of gait velocity in both genders.[21] Wolfson L et al, tried to study influence of gender on balance using posturography and reported to have no difference in static balance abilities when the support surface or visual input were manipulated separately in both genders.[19]

The human body's postural control is a complex system of organs and mechanisms which controls the body's centre of gravity (COG) over its base of support. It was found that, motor strategy (MS) is depended significantly on height and BMI of subjects. There is inverse relation between MS and height and BMI. As the height and BMI increases the MS value decreases. There is a direct relationship between height and postural response latency. The postural response latency increases with height.[22] According to Hue O et al, stability decreases with increasing body mass, and a high body mass may be a risk factor in falls.[23] Unfortunately this study did not gather the data on height and weight of the individuals hence influence of these factors on results could not be commented on.

Effect of physical activity on regular basis and daily functional activities can also influence balance performance. Physical activity contributes to improve muscle strength, minimize existing balance disorders and reduces body sway due to its beneficial effect on sensory and motor systems. Care was take to exclude individuals on regular supervised exercises from more than 2 weeks but individuals may be doing some home exercises or other sports or physical activity influence of which was not analyzed in this study .Since this study included individuals who were functionally independent in home and community influence of this factors can be ruled out.

CONCLUSION

Gender does not influence static balance abilities in healthy community dwelling elderly while performing modified clinical test of sensory interaction on balance.

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