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RESEARCH ARTICLE

TO STUDY FUNCTIONAL BALANCE WITH THE USE OF BERG BALANCE SCALE AND POMA: A COMPARISON WITH THEIR HISTORY OF FALL AMOUNG OLDER ADULTS FROM BHARTIMAIYA OLD AGE HOME

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ABSTRACT

Background: Human balance is a complex motor task. Its maintenance is essential in accomplishing daily tasks. The aging process and the chronic diseases that affect older adults lead to serious balance disorders, thus making such individuals more susceptible to falls. Physical mobility testing is an essential component of the geriatric Assessment .The BBS & POMA test measures basic mobility skills including a sequence of Functional manoeuvres used in everyday life. ***Method:*** 64 community-dwelling older adults with the age group of above 60 were selected on basis of inclusion & exclusion criteria from different old age homes in surat .Balance is assessed by BBS & POMA while mobility is assessed by POMA. ***Result****:* Data analysed by using t-test and pearson correlation which showed that there were significant difference of POMA scale and no significant difference of BBS between the groups with or without history of falls. ***Conclusion:*** The older adults with a history of falls performed poorly in the functional balance evaluation compared to those with no history of falls. These data demonstrate the importance of the balance tests in clinical practice as screening tools for older adults who are more susceptible to falls**.**

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INTRODUCTION

Postural control in humans depends on the interaction between the individual's intrinsic characteristics, his surroundings and the demands of the task he is performing (Gonclaves, 2009). It plays a major role in controlling balance. Postural maintenance is mediated by information from sensory system, by central nervous system programming & by execution of musculoskeletal system (Gonclaves, 2009). The aging process affects the components of postural control (Gonclaves, 2009). Postural control is no longer considered one system or a set of righting and equilibrium reflexes (Horak, 2006). Rather, postural control is considered a complex motor skill derived from the interaction of multiple sensorimotor processes (Horak, 2006). Balance is required for maintaining a position, remaining stable while moving from one position to another, performing acts of daily living, and moving freely in the community (Katherine et al., 1992). People with balance difficulties constitute a large proportion of all neurological, rehabilitation and geriatric workloads (Huxham, 2001). The causes of imbalance in older people are multifactorial. Improving postural control or balance is a primary goal in rehabilitation and geriatric medicine. As professionals, physiotherapists have a specific interest in recognising and treating balance problems (Huxham, 2001).

There is a need for a reliable and valid instrument for rating the ability of an individual to maintain balance while performing 14 movements required in everyday living (Berg, 1992). Alterations in body balance & mechanics reduces individuals compensatory capacity, increase instability & risk of falling (Berg, 1992). To be effective, physiotherapist therefore need ways to assess patients, measure the outcomes of treatment and predict which people, particularly amongst the older population are at higher risk of falling (Berg, 1992). Human ageing is in general characterised by random cellular error accumulation, by a corresponding predisposition to pathological change, by reduced adaptive reserve and by increasing inter-individual variability (Cameron). There are age-associated reductions in the reserve capacity of any or all of the entire spectrum of mechanisms involved in orthostatic control; at the same time, there is progressive vulnerability to a growing range of health-related perturbations (acute or chronic),perhaps especially those affecting central neurological control mechanisms (Cameron). Increase in aging also causes changes in visual, proprioceptive & vestibular system that slow down the person's ability to detect & respond appropriately to safety (Morris). The multi-disease phenomenon may significantly negatively affect functional dexterity in the elderly and result in gait and balance impairment (Adrianna Borowicz, 2016). Falls are one of the main cause of morbidity & mortality among older adult population (Huxham, 1992). Falls are common amongst older people and affect more than 30% of those over the age of 65years (Morris).

The annual incidence of falls among community-dwelling persons increases from 25% at 70 years to 35% over the age of 75 [1, 2]. The consequences of falls are serious. Falls are the major source of injuries in the elderly, and are the 6th leading cause of death in individuals over 65 years of age (Heike). Fall impacts heavily on health, well-being and quality of life of individuals and their families (Morris). They are the main cause of accidental death amongst older people (Morris).The National Health Interview Survey indicates that falls are the largest single cause of restricted activity days among older adults, accounting for 18% of restricted days. Moreover, fall-related injuries recently accounted for 6% of all medical expenditures for persons aged >65. The U.S. Public Health Service has estimated that two-thirds of deaths due to falls are potentially preventable, based on a retrospective analysis of causes and circumstances of serious falls (Laurence). Fear of falling affects psychological well-being and constitutes an independent risk factor for reduced mobility and lowered quality of life (Adrianna Borowicz, 2016). Falls that do not lead to injury often begin a downward spiral of fear that leads to inactivity and decreased strength, agility, and balance and that often results in loss of independence in normal activities of self-care (Adrianna Borowicz, 2016). Risk factors for falls have been classified as intrinsic (those related to individual) & extrinsic (those associated with environmental features) (Shumway-Cook, 2000). Other intrinsic factors include decrease vibratory sensation in feet, reduced cognitive function, lower extremity weakness, decrease functional skills & prior history of fall (Shumway-Cook, 2000). The following intrinsic *risk factors* have been described: previous history of falls, very old age, arthritis of knees, stroke, Parkinson's disease, postural hypotension (>20mm Hg), limitations in physical function, weak hand grip strength, motor weakness (e.g., difficulty in standing up from a chair), poor balance while standing, turning, changing position or walking, poor tandem gait, gait impairment, cognitive impairment, depressive symptoms, poor vision, the use of hypnotic, anti-depressants or tranquillisers and the use of 4 or more prescribed drugs (Chu, 2005). Other factors responsible are environmental hazards such as cultured walkways, loose mats & uneven pavements, dim lights contribute to fall in older people. The risk of falling increases from approximately 10% for those with none or 1 risk factor to approximately 70% for those with 4 or more risk factors. Fear of falling may also lead to a decrease in physical activity reduce muscle strength & a reduction in joint range of motion & physical endurance, thereby further increase the risk (Morris).

The goal of fall prevention programs is to modify risk factors & thereby reduce the likelihood for future falls in older adults who are determined to be at high risk. For example, patient with impaired balance & mobility skills can reduce their risk for falls through appropriate exercise (Shumway-Cook, 2000). People with balance problem need to be assess, measure outcome of treatment & predict which people, particularly amongst the older people are at risk of falling. However selecting an appropriate test is difficult, particularly to predict falls (Huxham, 2001). Functional scales such as Berg Balance Scale & POMA demonstrate good correlation with laboratorial & clinical measures concerning falls & instability. They point out differences between balance of fallers & non fallers. Present study aims to study functional balance with use of Berg Balance Scale & POMA: A comparison with their history of fall & no history of fall among community dwelling people from bhartimaiya old age home.

METHODOLOGY

This experimental study was conducted among 65 older adults with age of >60years from different old age centres in Surat. Adults with severe cognitive or any chronic illness, those who were using assistive device for walking were excluded. The informed written consent was obtained from participants regarding the procedure prior to study. All subjects have read the information letter and signed the consent form agreeing to take part in the study voluntarily. Total participants were divided into two group: history of fall and no history of fall. This division was accomplished after consulting the population study database which contained information about history of falls in past years of each individual.

All groups were submitted to the same research protocol composed of the functional balance evaluation tests, Berg Balance Scale (BBS) and Performance Oriented Mobility Assessment (POMA). These instruments were chosen due to their easy application, low cost and for being widely used in research and in clinical practice.

RESULT

The total sample consisted of 65 community-dwelling older adults distributed unequally among the two groups one with a history of fall and with no history of fall. Participants were distributed according to sex and age groups (above 60years). Due to the division by age groups, there were no statistical difference in mean age between two groups the correlation between Berg Balance Scale (BBS) and Tinetti Performance Oriented Mobility Assessment (POMA) is significant. The result also shows that both instruments showed significant correlation for both the groups with statistically significant differences. Both the test are equally significant (Table-1).There were group comparison according to the Berg Balance Scale (BBS) and Tinetti Performance Oriented Mobility Assessment (POMA) cut-off score. Mean value for POMA in a population with no history of fall is 24.8667 and with history of falls is 22.9000. Mean value for BBS in a population with no history of fall is 46.15556 and with history of fall is 42.5000. Standard deviation for POMA in population with no history of fall is 1.83906 and with history of fall is 3.71200. Standard deviation for BBS in population with no history of fall is 3.83735 and with history of fall is 9.21383 (Table-2).From the result we can say that there is significant difference of POMA scale between the groups with or without history of fall and there is no significant difference of BBS scale between the groups with or without history of fall.

Table 1. Relationship between Berg Balance Scale (BBS) and Tinetti Performance Oriented Mobility Assessment (POMA) scores in two groups: with history of fall and with no history of falls

History of fall			POMA/24
No	BBS/56	Pearson Correlation	.485(**)
		Sig. (2-tailed)	.001
		N	45
Yes		Pearson Correlation	.762(**)
		Sig. (2-tailed)	.000
		N	20

** Correlation is significant at the 0.01 level (2-tailed).

Table 2. Group comparison according to the Berg Balance Scale (BBS) and Tinetti Performance Oriented Mobility Assessment (POMA) cut-off scores

Descriptive Statistics

History of fall		N	Minimum	Maximum	Mean	Std. Deviation
No	POMA/24	45	21.00	28.00	24.8667	1.82906
	BBS/56	45	36.00	53.00	46.1556	3.83735
Yes	POMA/24	20	16.00	28.00	22.9000	3.71200
	BBS/56	20	16.00	53.00	42.5000	9.21383

Table 3. Group comparison between population with history of falls and with no history of falls using t test

	T	Df	p-value	Mean Difference	Std. Error Difference
POMA/24	2.251053*	23.20509	0.03414886	1.966667	0.873665
BBS/56	1.709629	21.98592	0.101412939	3.655556	2.138215

From the result we can say that there is significant difference of POMA scale between the groups with or without history of fall. And there is no significant difference of BBS scale between the groups with or without history of fall.

DISCUSSION

Evaluating and comparing the functional balance of older adults according to the history of falls can be a difficult task, especially when taking into account the great variety of risk factors associated with the aging process which result in functional loss and, consequently, increased risk of falls.

Thus, the present study gave equal importance to factors that could result in differences during the balance evaluation between groups, such as sex and age group. In general terms, the balance scale was more strongly associated with functional measures (the Barthel Index, the Tinetti sub-scale, timed Up-and-Go test) than with the laboratory measures of spontaneous sway and induced sway. Regarding the functional balance evaluation, the non faller group had the highest mean value in the BBS. Thus, there is a balance decline as falls occur and the BBS instrument was able to detect these differences in the postural control of the community-dwelling older adults. These data corroborate studies that show that older fallers score significantly lower when compared to older non-fallers. Shumway-Cook et al.21 verified that the community-dwelling older fallers performed poorly in the BBS evaluation, which indicates that older fallers have a balance decline.

Better the ability to maintain body balance, the better the performance in functional tasks, which corroborates the literature. Multiple fallers were predominantly older women and only 10% of multiple fallers reported extrinsic factors as the reason for falling. As well as advanced age, loss of balance, not paying attention, and dizziness, they also reported poor eyesight and mobility problems as contributory factors. Multiple fallers were much more likely to fall at home outdoors than were occasional fallers. Outdoor settings provide a challenging environment to negotiate, with uneven terrain, different support surfaces, obstacles on the ground and at hip and head height, and unexpected perturbations to the balance system. For people with eyesight, balance, and mobility problems, it is not surprising that environments such as this are hazardous. For the sample as a whole, the proportion of falls due to environmental factors was low, compared to other studies that have classified up to 55% of falls as being due to extrinsic factors (Lach *et al* 1991, Nyberg *et al* 1996).

This difference is likely to be related to different methodologies. When designing programs to reduce the population distribution of risk factors for falls it may help to take into account significant independent correlates of falls, such as female gender, age, back pain, poor vision, some difficulty walking, and the presence of concurrent medical conditions. The significant correlates may underlie key intrinsic risk factors identified by older people themselves, such as poor balance, muscle weakness, and dizziness. Intervention strategies need to consider intrinsic factors in addition to external risks (e.g. environmental hazards and ill-fitting shoes.) The intrinsic risks are particularly important to consider in multiple fallers, as they are both common and a major predictor of falling in this group. The needs of occasional fallers should not be under-estimated because each fall carries a similar risk of injury requiring medical treatment. Some falls prevention programs target muscle strengthening, balance training, and physical fitness programs as a method of preventing future falls (Campbell *et al* 1997, Day *et al* 2002, Lord *et al* 1995).

Others place emphasis on improving the safety of the home environment as well as teaching people how to avoid trips and slips (Cumming *et al* 1999, McMurdo and Johnstone 1995). In addition, multifactorial falls prevention programs such as advocated by Tinetti *et al* (1994a) and Hornbrook *et al* (1994) have been shown to have broad success. Close *et al* (1999) have also shown that when clinicians have access to individual assessment findings and a falls history, they are able to target effectively intrinsic and extrinsic factors found to be of particular risk. Thus, a range of options now exist that have been shown to reduce falls in older people, both as general strategies, or targeted to those identified as at high risk of falling. The correlation between BBS & POMA was significant in two groups: one with history of falls and with no history of falls. This indicates that the better the ability to maintain body balance, the better the performance in functional tasks, which corroborates the literature. BBS & POMA most useful tools to screen for balance and gait impairment in this population.. The scores decreases in the group with the history of fall in BBS & POMA but there is significant difference of POMA scale between the groups with or without history of falls compared to BBS.

CONCLUSION

Present study conducted between two groups: one with history of fall and with no history of fall according to BBS and POMA scale with a population size of 65 older adults states that there is significant difference of POMA scale between the groups with or without history of fall and no significant difference of BBS scale between the groups with or without history of fall.

LIMITATION OF THE STUDY: there were small sample size, population was not homogeneous and there were unequal age and gender group.

SUMMARY

BBS & POMA are most useful tools to screen for balance and gait impairment in the population with and without history of fall. Balance examination is necessary to prevent falls and secondary complication in older population.

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