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Correlation of Balance and Functional Ankle Instability in Elderly Women

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Author`s Contribution

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ABSTRACT

Objectives: To evaluate and find the correlation of balance and functional ankle instability in elderly women.

Methodology: A cross-sectional correlation study was conducted from June 2020 to December 2020, in which 61 participants (i.e., elderly women) were included. In the selected old age homes the self-reported questionnaire (Identification of Functional Ankle Instability [IdFAI]) had been distributed to the participants fulfilling the inclusion criteria as hand-outs and the performance-based questionnaire (Performance Oriented Mobility Assessment [POMA]) have been assessed and filled by the researcher. Chi square was used for associations and Pearson correlation for balance score and functional instability score.

Results: The mean age of the participants was 64.89±4.30 years. According to the result of Tinetti Balance score, 31.1% elderly women with low risk of fall, medium risk of fall was 32.8% whereas with high risk of fall was 36.1%. The IdFAI showed, elderly women with Ankle Instability 62.3% while elderly women with No Ankle Instability were 37.7%. There was negative (inverse) Pearson linear correlation (r = -0.550) between age and balance ($p \leq 0.05$) which means when the age increases, the balance decreases and also a weak association between age and functional ankle instability ($p \geq 0.05$).

Conclusion: This study concluded that there was not adequate evidence to propose an association between Balance and self-reported functional ankle instability.

Keywords: Balance, Functional ankle instability, Geriatric health.

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Introduction

The increasing in the risk of fall, which is the major cause of mortality and morbidity in elderly population, is resulted due to the impairment in the balance system of their bodies.[1] The rapidly rising population of people aged 65 and above is the main subject of matter in present society. According to a survey, 30-50% of population aged 65 years and above, all over world, has certain inconveniences with their ability of balance.[2] Over 11 million Pakistanis were aged 60 and above, in the year 2014, and this numerical figure is anticipated to grow more than 17 million by 2025. With advancing age there is declination in our balance which can ultimately leads to fall if not practised.[3] Falls and falls related injuries, such as fractures, can have a harmful effect on activities and function of daily living and in later life effecting walking around independently. There are several risk factors, such as muscular frailty, reduction in balance control, gait disorders, number of medications and environmental factors that are mostly associated with falls in elderly population.[4] There are many studies evidences that showed women have higher risk of falling incidence than men.[5]

Complexed phenomenon that is effected by several musculoskeletal and neural factors is proportionate balance through a complicated series of actions balance is being maintained which involves perception of body motion by sensations, acceptance of sensorimotor

information within central nervous system and performance of suitable musculoskeletal stimulus.[6] The increasing age gradually leads to impairment of vision, vestibular system and somatosensory system perception which results in less perceiving of environment around and accuracy in movements.[7]

Functional Ankle Instability (FAI) is a condition characterized by recurrent episodes of ankle sprains or feelings of giving way, even after the initial injury has healed. FAI is believed to result from impaired proprioception, strength, and postural and neuromuscular control, often in combination with ligamentous laxity.[8] The Identification of Functional Ankle Instability Questionnaire (IdFAI) is a self-report questionnaire developed by Donahue and Simon in 2013 to assess the presence of functional ankle instability (FAI) in individuals who have a history of ankle sprains. The questionnaire is designed to detect whether individuals meet a minimum criteria necessary for inclusion in an FAI population, based on the symptoms and functional limitations associated with the condition.[9] As elderly women with no health issues been recruited in this study so the rationale of this study will be to reduce the risk of fall by identifying the ankle instability which is the main cause of deteriorating proprioception and also find its relation with balance impairment with advancing age frailty and its adverse impact on the physical functioning and quality of life of older adults.

Methodology

Sequel to acquiring approval from Institutional Review Board (IRB) of Riphah International University, Lahore Pakistan vide letter number REC/RCRS/20/2021, subject correlation cross sectional study was carried out between June 2020 to December 2020. With a written informed consent, the sample was collected from Dar-ul-Kifala old age home and Bint-e-Fatima old age home, Lahore. Calculated sample size was n=61 by using WHO sample size calculator for observational studies and the following parameters were used; estimated true proportion 0.3, alpha error 0.05 and confidence level 0.95.[2] Non-probability convenience sampling was used to include the healthy elderly women, age between 60-80 year, and cognition level range 24-30 on mini-mental state exam (MMSE). While subjects with stroke, vestibular disorders, heart attack, uncontrolled hypertension, severe ankle edema, foot abnormalities and leg length discrepancies were excluded.

Data was collected through structured questionnaires (tools) as well as demographic details. For balance; Performance Oriented Mobility Assessment (POMA), for ankle instability; Identification of Functional Ankle Instability (IdFAI) and for cognition assessment; Mini Mental State Examination (MMSE) were used. In the selected old age homes the questionnaires were distributed to the participants fulfilling the inclusion criteria as hand-outs and the performance-based questionnaire was assessed and filled by the researcher.

Sterke et al established Tinetti Performance-Oriented Mobility Assessment (POMA) for measuring of balance.[10] The inter-rater reliability of the Tinetti Performance-Oriented Mobility Assessment (POMA) is good. The predictive validity is acceptable, with sensitivity and specificity and its subtests. Gurav et al thrives the consistency (reliability) of Identification of Functional Ankle Instability (IdFAI) questionnaire by obvious demonstration of extremely good test-retest reliability among different adult age groups.[11] This questionnaire comprises of ten questions ranking on the basis of severity of impairments. These questions address single ankle either left or right. The Mini-Mental State Examination (MMSE) is a widely used clinical tool that was developed as a method for grading cognitive impairment in individuals. It produces a score that can be used to follow the course of patients or as a case detection technique after cutoff scores are established. The total score of the Mini-Mental State Examination (MMSE) ranges from 0 to 30, with higher scores indicating better cognitive function. A low score on the MMSE is generally indicative of cognitive impairment or decline, and can be associated with a range of disorders including mental retardation, delirium, manic-depressive disorder, and schizophrenia, as described by Folstein et al in their pre-DSM-III study.[12]

SPSS statistical software version 21 was used to analyze the data. Chi square was used for categorical variables and one sample t-test was used for continuous variables. Pearson correlation was used between continuous variables and a p value ≤ 0.05 was considered as significant.

Results

The total numbers of participants were 61. The mean age of participants was 64.89±4.30 years. The classification of Tinetti Balance Score's percentage in elderly women with low fall risk, medium fall risk and high fall risk was, 31.1%, 32.8% and 36.1% respectively. Functional Ankle

Instability (FAI) Score's percentage in elderly women with ankle stability and no ankle stability was, 62.3% and 37.7% respectively (Table I).

We determine the association between two scales that were Tinetti Balance Score and Functional Ankle Instability (FAI) Score (Table II). The association was highly significant between two scales in elderly women. Pearson Eta (η test) was used for correlation between previous parameters to measure of the strength of the relationship (Table III).

Table I: Tinetti balance and functional ankle instability (FAI) in elderly women (n=61)

		Functional Ankle Instability Score		Total
		No Ankle Instability	Ankle Instability	
Tinetti Balance	Low fall risk	10	9	19 (31.1%)
	Medium fall risk	7	13	20 (32.8%)
	High fall risk	6	16	22 (36.1%)
Total		23 (37.7%)	38 (62.3%)	61
Chi value = 2.884, p-value = 0.236				

Table II: Association between Tinetti balance and functional ankle instability (FAI) scores

	Mean±SD	t*	p value
Tinetti balance score	19.62±6.42	629.38	0.011
Ankle instability score	21.67±13.28		
*: One sample t-test			

The above table showed t-test values for association between Tinetti Balance Score and Functional Ankle Instability (FAI) Score in elderly women. The likelihood ratio was 260.75.

The above table shows a statistically significant moderate negative Pearson correlation (r = -.550) with significant p value of .001 between increasing age and Tinetti balance. The directional measure of two Eta (η) variables, age is independent variable whereas functional ankle instability (FAI) is dependent (Eta η = 0.387). By taking the square of value of co-efficient of determination (r^2 = 0.1498) that suggested 15% variance of FAI which is moderately weak association between age and (FAI).

Discussion

Each year almost one-third of the elderly people living in the community fall, hence, causing the rise in fallen rates with age. Falls and falls related injuries, such as fractures, can have a harmful effect on activities and function of daily living and in later life effecting walking around independently. Certainly, even the addition of fear of falling can also lower quality of life by limiting physical as well as social activities.[13]

There are many studies evidences that showed women have higher risk of falling incidence than men. There are certain factors other than chronic health conditions contributing in declination of balance with advancing age in women that is decrease in proprioception and neuromuscular control which is affecting lower limb joint positioning and decrease in its laxity. Therefore, less accurate detection of body position changes increases the risk of fall, and abnormal joint biomechanics during functional activities so, over a period of time, degenerative joint disease may result.[5] In the previous studies the work regarding ankle ROM and balance was being done,[14,15] but how much role the total ankle instability plays in reducing balance was yet to figure out. According to Mecagni C, et al.,[16] by increasing ankle ROM we can improve balance in just one motion but if we improve the whole stability around the ankle was yet to discover which we have figured out in our study by finding the correlation among three variables i.e., advancing age, deteriorating balance and Functional ankle instability (FAI)

Table III: Correlation between age, Tinetti balance score and Functional ankle instability (FAI) score; (n=61)

			Age	Tinetti balance score	Ankle instability score
Pearson correlation	Age	Correlation	1.00	-.550	-.005
		Sig. (2-tailed)		.001	.972
	Tinetti balance score	Correlation	-.550	1.00	-.317
		Sig. (2-tailed)	.001		.013
	Ankle instability score	Correlation	-.005	-.317	1.00
		Sig. (2-tailed)	.972	.013	

According to the result of this study by taking the Tinetti balance score in elderly women with low risk of fall was 31.1%, medium risk of fall was 32.8% whereas with high risk of fall was 36.1%. The IdFAI showed ankle instability 62.3% while No ankle instability 37.7%. There was a negative (inverse) Pearson linear correlation between age and balance which means when the age increases the balance decreases and also a weak

association between age and Functional ankle instability observed. We determine the relation of Tinetti balance and Functional ankle instability (FAI) between percentage in elderly women. The corresponding p-value (0.236) of the test statistic which was greater than the significance level ($\alpha = 0.05$).

Conclusion

It was concluded that there was a negative (inverse) Pearson linear correlation between age and balance which means when the age increases the balance decreases and a weak association between age and functional ankle instability had seen. According to this study there was also not enough evidence to suggest an association between balance and self-reported functional ankle instability.

Limitations and recommendations of the study: During this study it was difficult to find and include elderly women without any health problem. Additional studies should focus on the early preventive measures of falls in the elderly population with less proprioception. Further research recommendation is to explore the therapeutic treatment for ankle instability and remediation of balance problems.

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