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CORRELATION BETWEEN BALANCE, MOBILITY AND FEAR OF FALL IN GERIATRICS

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ABSTRACT

The aim of this study was to find out correlation between balance, mobility and fear of fall in geriatrics. Sixty geriatric participants were included in this study according to inclusion and exclusion criteria. Balance and mobility was assessed using (CB and M Scale) Community balance and mobility scale. Fear of fall was assessed using (FES-I) Falls efficacy scale International. Spearman's correlation test was done for correlation analysis. Spearman's correlation showed strong negative correlation between balance, mobility and fear of fall ($r = -.653$; $p < 0.000$) which is statistically significant. This study concluded that there is strong negative association present between balance, mobility and fear of fall in geriatrics hence a proper improved assessment of static, dynamic balance and advance balance and mobility could be added and accordingly the treatment could include advance balance and mobility improvement measures in geriatrics.

KEYWORDS

Correlation, Balance, Mobility, Fear of fall and Geriatrics.

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INTRODUCTION

According to WHO India is "AN AGEING NATION" with 7.7% of its population being more than 60 years, the size of geriatric population in India has increased from twenty million to fifty seven million from year 1951 to 1991, Eighty four million in 2001 and is expected One hundred and seven million in 2010, one hundred and ninety eight million in 2030, Rapid increase in number of

geriatric population also increases number of health issues¹ because in healthy aging there is slower cognitive processing, slower postural reaction and decreased muscle strength and mobility and all of which are associated with balance problems² other health issues are impaired cognition, urinary incontinence, impaired mobility and falls etc. out of which falls are the commonest in the life of geriatrics¹, fear of falling was ranked first among geriatrics living in community when compared with other fears³.

Fall can be defined as loss of balance which is unintended or sudden and which leaves the individual in contact with the floor or any other surface¹. Falls occur when center of mass (COM) falls out of alignment with base of support (BOS) and also when there is failure to regain balance after destabilization⁴.

Fall is a very serious health related issue among geriatric population worldwide with global incidence which ranges from 224 to 809 per 1000 persons-years, recent studies have found out that 52% of geriatrics in north India have fallen last year (2002), In this subsequent study they have founded that 71 (13%) participants have reported fall in 2016. The prevalence of fall was higher in geriatric women (17%) then in men (8%) ($p=0.003$). From total 71 fallers, 44 (62%) have reported single fall and 27 (38%) reported recurrent falls. Recurrent fallers fell on average 2.5 times⁵ Factors for fall are mainly two that are Intrinsic and Extrinsic risk factors, recent studies suggest that there is interaction between these two risk factors (Intrinsic and Extrinsic factors) and also reported that there are almost 400 risk factors for fall¹.

People at high risk are the ones who are frail older but on the other side of the spectrum, healthy geriatrics who engage in large quantities of diverse and perform challenging physical activities also do have a disproportionately high risk of fall¹ Geriatrics who have fear of fall often in them changes are seen in their daily activities, such as change in their gait pattern, reduced speed in their daily chores, use of an assistive device these are the worst consequences of fear of fall what a geriatric faces and these are the factors which causes deconditioning and reduces

strength and affects balance¹ Balance is defined as the condition in which all the forces acting on the body are balanced such that the center of mass (COM) is within the stability limit, the boundaries of the base of support (BOS)⁶ basically balance is an activity rather than a mere state⁽⁴⁾ Balance activity in human body is controlled and managed by three systems i.e. by Sensory, Motor and central processing any impairment in any of these three systems can result in impaired balance control⁴.

If balance and mobility are affected and which results in fear of fall then it ultimately requires a special attention by health professional that assists both the rehabilitation and the community participation. Hence an attempt to reduce this significant health hazard. Previous studies have used Berg balance Scale for assessing balance and mobility in geriatrics¹ but recent studies have shown that Berg Balance scale has a ceiling effect in individual who can ambulate independently in the community, including those with mild knee OA⁷ hence there is a need for an outcome measures that are available sensitively to evaluate advance balance and mobility in geriatrics.

Community Balance and Mobility Scale (CB and M) is reliable and valid tool to evaluate gait, balance, and mobility in community-dwelling older adults⁷⁻¹¹. There are no such studies which have used CB and M scale as an outcome measure and correlated it with Falls Efficacy scale -International on geriatrics hence the need of study and these are some components of CB&M scale which evaluate advance balance and mobility i.e. Unilateral stance, Tandem pivot, hopping forward, Lateral foot scooting, Lateral dogging, running with controlled stop, stairs descent. Falls Efficacy Scale- International (FES-I) is a valid tool to assess fear of fall in geriatrics¹²⁻¹⁴. FES-I finds out varying concern about fear of fall across different circumstances.

MATERIAL AND METHODS

Materials

Consent form, Self-made Evaluation form, Community Balance and mobility scale and falls efficacy scale-International.

Methodology

An explorative study on geriatric participants was conducted after approval of Institutional ethics committee. 60 geriatric participants were selected which include young old and middle old age group geriatric men and women i.e. between 60 to 79 year of age group.

Inclusion criteria were geriatric men and women in the age group of 60-79 years with or without history of fall and without using ambulatory device and Exclusion criteria were geriatrics with any neurological disorder (e.g., Stroke, Parkinson disease) with residual impairment, with any respiratory condition requiring oxygen supplementation or frequent use of inhalers, Unstable Cardiac disease (e.g., Angina), Any recent trauma or fracture within previous 6 months (especially spinal or hip fracture), Recently (within previous 6 months) any history of myocardial Infarction, Coronary artery bypass or other cardiac surgery, subjects with diagnosed known psychological disorder, Dementia or Depression, Severely limiting arthritis or any other inflammatory joint disease, Any recent total joint replacement within 6 months, Radiation therapy, surgery, chemotherapy for cancer within 6 months, Any injury or illness on the day of assessment clinic.

Assessment of subjects was taken to evaluate range of motion, Static - Sitting, standing balance and Dynamic- sitting, standing balance. The selected subjects were explained about the need and the purpose of study and a consent form was taken before their participation in the study. The demographic data was collected which included the name, age, sex, occupation, past medical and past surgical history, pain history - onset, site, side, type of pain, aggravating, relieving factor and previous history of fall.

Balance and mobility was assessed using Community balance and mobility scale. CB and M SCALE is a validated tool to assess balance and mobility in Geriatrics⁷⁻¹¹. CB and M Scale comprises of 13 tasks and measures Intact balance control and Impaired balance control which include bending, turning or looking while walking, Single leg standing, hopping forward, lateral dodge and stair

descent. Each component is rated on a scale of 0 ("unable to perform") to 5 ("proficient") exception for stair descent which can earn a maximum of 6 points while carrying a load, lower scores are given if participants are not able to meet the time requirement or there is any discontinuous movement. Total CB&M Score is calculated out of 96. Higher the scores lesser is the balance and mobility affected. CB and M score accurately distinguish between "Intact balance control" (CB and M score $\geq 60.7 - 69.2$ for 60 - 69 age group) and ($\geq 38.7 - 60.8$ for 70 - 79 age group) and "Impaired balance control" (CB and M score $< 60.7 - 69.2$ for 60 - 69 age group) and ($< 38.7 - 60.8$ for 70 - 79 age group). CB and M Scale is reliable and valid to evaluate gait, balance, and mobility in community-dwelling older adults, Rater reliability (ICC > 0.95) and internal consistency ($\alpha = .97$) of the CB and M Scale were high⁸.

Fear of fall was assessed using falls efficacy scale International. FES-I is a Validated tool to assess fear of fall in geriatrics¹²⁻¹⁴. FES-I can be self-administered or interview-administered and takes less than 10 minutes. FES-I comprises of 16-item questionnaire of fall related with 4 categories in each component and each component is rated on a scale of 1 ("not at all concern") 2 ("somewhat concern"), 3 ("fairly concern") and 4 ("very concern about falling"). Total FES-I score is calculated out of 64. lesser the score less is fear of fall. FES-I scores accurately distinguish between "Low concern about fall" (FES-I score 16-19), "Moderate concern about fall" (FES-I score 20-27), "High concern about fall" (FES-I score 28-64). Test retest reliability of the FES-I was good to excellent (Range for Cronbach $\alpha = 0.925 - 0.957$) ICC – 0.58 to 0.92¹².

Data Analysis

Collected data was recorded in an Excel 2010 spreadsheet and was analyzed using Statistical Package for the Social Science (SPSS) software (version 20). Qualitative variables were expressed as absolute number and percentage, and the Quantitative variables were expressed as mean and standard deviation. Shapiro-wilk test was used to analyze normality of Quantitative data which analyzed that the data was not normally distributed. So, the non-parametric test i.e. Spearman's

correlation test was used for the data analysis in software.

RESULTS AND DISCUSSION

Sixty geriatric participants were included in this study out of which 42 (70%) participants were from young old age group and 18 (30%) participants were from middle old age group, there were 34 (56.66%) male and 26 (43.33%) were female.

Out of sixty geriatric participants 17(28.33%) had previous history of fall and 43 (71.66%) were without history of fall. The total CB and M Score of all the sixty participants were, 23 (38.33%) had intact balance control and 37(61.66%) were having impaired balance control. The total FES-I Score of all the sixty participants were, 26 (43.33%) had Low concern about fall and 32 (53.33%) had Moderate concern about fall and 2 (3.33%) had High concern about fall.

The mean value and standard deviation of individual component of CB and M Scale suggest that there is major affection in running with controlled stop (1.48 ± 0.88), Lateral foot scooting left (1.83 ± 1.42), Lateral foot scooting right (1.95 ± 1.23), Walking and looking left (2.01 ± 0.67), Walking and looking right (2.03 ± 0.65), Walk, look and carry right (2.03 ± 0.70), Walk, look and carry left (2.06 ± 0.72), Hopping forward right (2.2 ± 1.42) and hopping forward left (2.16 ± 1.48).

The mean value of individual component of FES-I suggest that in geriatrics the activities which are most feared are Walking on a slippery surface (2.31 ± 0.49), Walking on an uneven surface (1.98 ± 0.64), Getting dressed or undressed (1.73 ± 0.54), Walking in a place with crowd (1.5 ± 0.64), Walking up or down a slope (1.46 ± 0.64) and going up or down stairs (1.36 ± 0.57).

The result of this study showed that there is Strong negative correlation between balance, mobility and fear of fall in geriatrics. This study has used CB and M Scale for assessment of balance and mobility in geriatrics and also this scale is more specific to functional activities of daily life. Which demands intact balance control and which is mostly affected in geriatrics⁷⁻¹¹. Berg balance scale is also an instrument for assessing balance and mobility but

recent studies have shown that the Berg Balance scale has a ceiling effect in individual who can ambulate independently in the community, including those with mild knee OA⁷ BBS is implicating on the basic static and dynamic balance where as in CB&M scale there are component which is assessing advance balance and mobility which is important for geriatrics in living independently in community and also to reduce risk of fall⁷.

For assessing fear of fall in geriatrics we have selected the instrument FES-I. It comprises of different components of daily activity and through which we can easily find out which activity is most feared in geriatrics¹³⁻¹⁵.

The result of this study showed that there is Strong negative correlation between balance, mobility and fear of fall in geriatrics This finding suggested that individual who has higher scores in CB and M scale has scored less in FES-I scale which signify that balance, Mobility and fear of fall have direct correlation which was matching with previous studies in which the first one was "Relationship Between Fear of Falling, Balance Impairment and Functional Mobility in Community Dwelling Elderly" which is done by Kumar S, Vendhan G, Awasthi S, Tiwari M, sharma V P in which they have used (BBS) Berg Balance Scale as a tool to assess balance and mobility¹ In the other study such as "Factors associated with balance confidence in older adults with health conditions affecting the balance vestibular system, which is done by Marchetti G F, Whitney SL, Furman JM also showed the same result in which they have used ABC, TUG and DGI as a tool to assess balance and mobility¹⁶. The other study such as "Prevalence of fear of falling among a population of older adults and its correlation with mobility, dynamic balance, risk and history of falls which is done by KT Lopes, DF costa, AC Bastone, also showed the same result in which they have used (FIB) FES-I-BRAZIL, (TUG) Time Up and Go, (FRT) functional reach test and (TGT) Tandem gait test as a tool to assess balance, mobility and fear of fall¹⁷. the other study such as "A study on correlation between depression, fear of fall and quality of life in elderly individual" which is done by Mishra N, Mishra A K, Bidija M,

also showed the same result in which they have used GDS, FES -I and WHOQOL-BREF Questionnaires¹⁸.

This finding suggests that geriatrics who had fear of fall might have balance deficit, and also, they are fearful that they are likely to fall due to impaired balance and mobility. Balance while performing functional activities could be present irrespective of previous fall and fear of fall. The other study such as “Does fear of falling relate to low physical function in frail elderly persons” which is done by Higuchi Y, Sudo H, and Hayashi Y, also suggest that Fear of falling did not differentiate with low physical activity and high physical activity¹⁵.

Geriatrics with fear of fall might avoid fall by limiting the activity which demands for advance balance and mobility due to impaired balance control¹.

From the data that we obtained it showed that 28.33% of geriatrics had previous history of fall, it also found out that geriatrics who had history of fall also had moderate to high concern for fall. The percentage of history of fall was 28.33% and fear of fall was 56.66% this clearly suggest that geriatrics with or without history of fall develop fear of fall.

Table No.1: Descriptive Statistics for Distribution of AGE

S.No	AGE	N=60	%
1	Young old	42	70%
2	Middle old	18	30%

Table No.2: Descriptive Statistics for Distribution of Gender

S.No	GENDER	N=60	%
1	Male	34	56.66%
2	Female	26	43.33%

Table No.3: Descriptive statistic for Distribution of History of fall

S.No	History of fall	N=60	%
1	With history of fall	17	28.33%
2	Without history of fall	43	71.66%

Table No.4: Distribution of Interpretation of total CB and M Score

S.No	Total CB and M Score	N=60	%
1	Intact Balance Control	23	38.33%
2	Impaired Balance Control	37	61.66%

Table No.5: Distribution of Interpretation of total FES-I Score

S.No	Total FES-I Score	N=60	%
1	Low Concern	26	43.33%
2	Moderate Concern	32	53.33%
3	High Concern	2	3.33%

Table No.6: Correlation between balance and mobility and fear of fall in geriatrics

S.No	Value	Balance and mobility	Fear of fall
1	Spearman's correlation coefficient (r)	-.653	-.653
2	Sig.(2-tailed) (p)	.000	.000

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

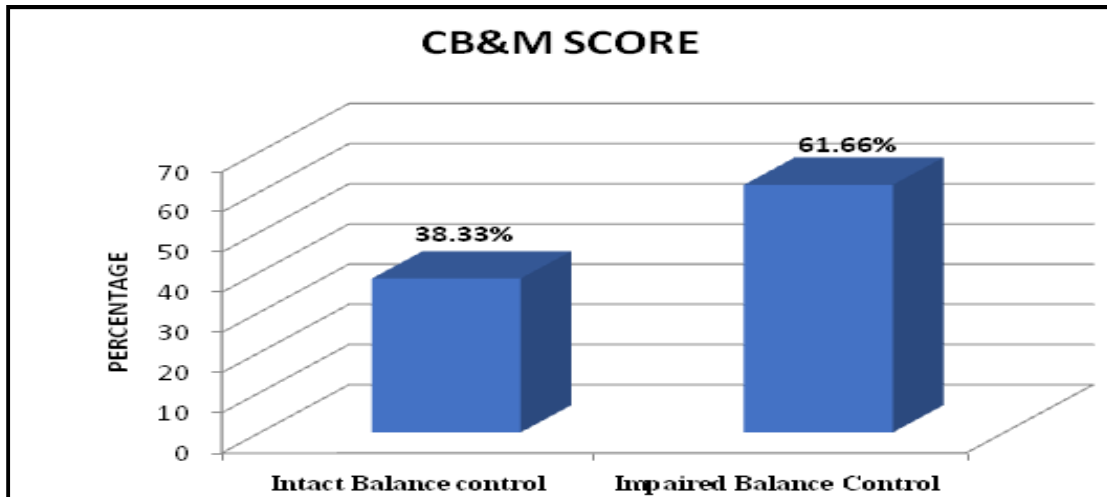


Figure No.1: Distribution of total CB and M Score

Graph represents that 38.33% had intact balance control and 61.66% had impaired balance control

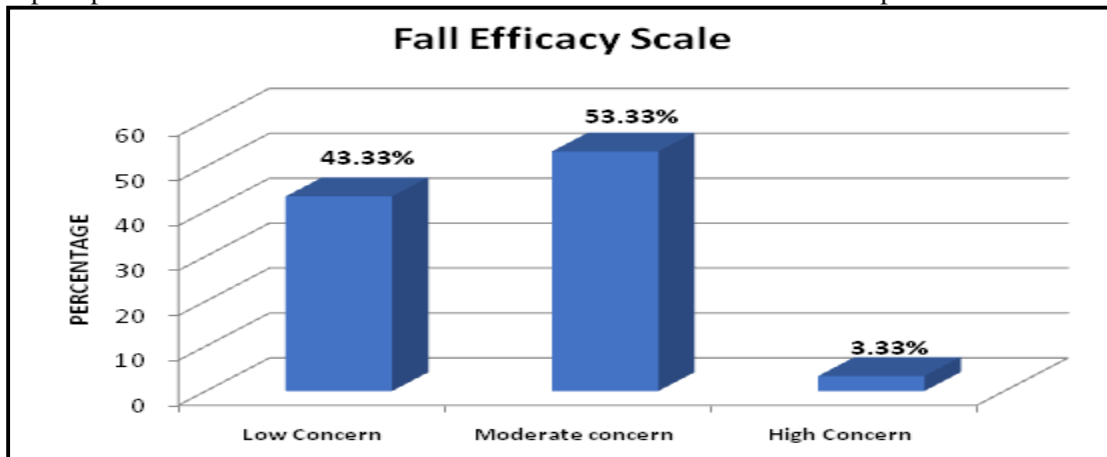


Figure No.2: Distribution of Interpretation of total FES-I Score

Graph represent that 43.33% had Low concern about fall and 53.33% had Moderate concern about fall and 3.33% had High concern about fall

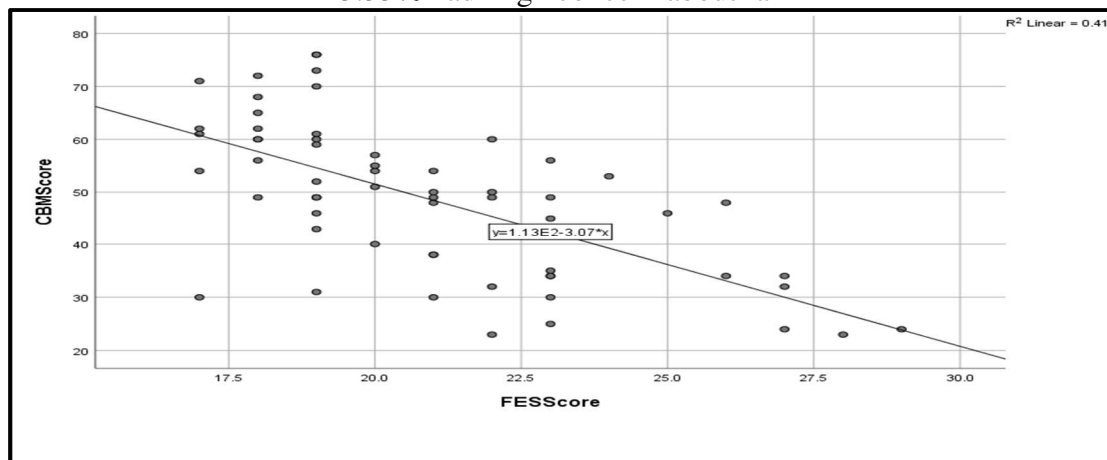


Figure No.3: Correlation between balance, mobility and fear of fall in geriatrics

Scatter plot shows strong negative correlation between balance, mobility and fear of fall ($r = -.653$; $p < 0.000$) which is statistically significant ($p < 0.005$)

CONCLUSION

This study concluded that there is strong negative association present between balance, mobility and fear of fall in Geriatrics hence a proper improved assessment of static, dynamic balance and advance balance and mobility could be added and accordingly the treatment could include advance balance and mobility improvement measures in geriatrics to reduce the risk of fall.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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