DOI: 10.7860/JCDR/2025/78728.21526

Original Article

Physiotherapy Section

Relationship between Physical Fitness, History of Falls and Depression with Fear of Falls among Institutionalised Elderly Population: A Cross-sectional Study

SHEETAL KHANDERAO AURANGABADKAR[1], SANDIP KUMAR PAREKH[2]

ABSTRACT

Introduction: Institutionalised elderly are more prone to falls and depression due to their functional dependence and social isolation. Physical fitness plays an important role in falls prevention. Fear of Falls (FoF) can be described as an anxiety or a patient's concern about falling that can lead an individual to avoid activities that they are capable of performing, thus reducing their physical activity and overall fitness. The consequences of FoF include an increased risk of falling, reduced physical activity, decreased social interaction and lower quality of life. FoF is one of the potentially modifiable risk factors where intervention could be effective in preventing falls. Knowledge of and relationships between risk factors and FoF will be useful in developing strategies to reduce FoF and improve the quality of life in the elderly population.

Aim: To explore the relationship between physical fitness, history of falls and depression with FoF in the institutionalised elderly population.

Materials and Methods: This cross-sectional study was carried out at institutional old-age homes in the Kalyan-Dombivli area, Mumbai, Maharashtra, India. The total duration of the study was four months, from August 2024 to November 2024. After obtaining permission from the old-age homes, participants were approached and screened according to inclusion criteria. The inclusion criteria were institutionalised elderly aged 60-85 years, ambulatory with or without an assistive device, both male and female. Those participants who voluntarily agreed to participate were recruited by convenience sampling. After screening 130 participants according to the inclusion criteria, 124 participants agreed to be part of the study. Demographic data such as age, gender, education, number of years residing in the old-age home, number of co-morbidities, medical and surgical history and medication history were collected. History of falls in the last 12 months was also documented. The outcome measures assessed were the Senior Fitness Test for physical fitness, history of falls, Falls Efficacy Scale-International (FoF) and Geriatric Depression Scale. Spearman correlation was used to assess the relationships between physical fitness, depression and FoF. The Chi-square test (p-value ≤0.05) was used to determine whether there was a significant difference between the history of falls and FoF.

Results: The mean age of the participants was 71.4±5.8 years. Of the 124 participants, 64 had a history of falls. Concerns about falls were higher among fallers than among non fallers. The Chi-square test showed no significant difference between these two groups (p-value=0.843). Among physical fitness parameters, there was a negative correlation between the arm curl test (upper limb strength) and FoF in the fallers group. There was a significant positive correlation between the back-scratch test (left side) and FoF score (p-value=0.0156). There was no correlation between lower-limb strength, agility, or aerobic capacity and FoF. There was no significant correlation between depression and FoF among study participants (p-value=0.5879).

Conclusion: There was no correlation between physical fitness parameters and history of falls except for upper-limb flexibility and strength. All participants, irrespective of fall history, showed high concerns about falls. Depression in the participants also showed no significant relationship with FoF.

Keywords: Functional Dependence, Social isolation, Strength, Upper-limb flexibility

INTRODUCTION

India would only take three more decades to double its 60-plus population, which is projected to reach 289.5 million in 2050 from 139.6 million in 2020 [1]. This growing ageing population poses a significant challenge in improving their quality of life [2]. The elderly population can be classified by age as young-old, middle-old and old-old and by living arrangement as institutionalised elderly or community-dwelling elderly. Indian older adults predominantly reside with their immediate family members and they receive the greatest social support and care from them when needed [3,4]. Rapid urbanisation and children relocating overseas due to globalisation have been affecting the family system and the living arrangements of older adults in India [5,6].

Falls risk factors may vary between community and institutional settings because of different environmental and demographic characteristics. The incidence of falls in nursing homes is estimated to be twice that in the community [7]. Falls are multifactorial and result from age-related physiological changes as well as extrinsic factors. Falls cause reduced functional independence and affect multiple aspects of life, including the psychological and cognitive domains [8]. Falls are associated with negative outcomes in all ages, but the consequences for older adults could be worse [9]. Literature suggests that FoF is also an important risk factor for falls in the elderly population [10].

When an individual falls, especially an older adult, psychological changes may occur, described as FoF; it can lead to loss of confidence and increased fear of engaging in physical activities or even leaving the house [11]. FoF is an emotional state in older adults. It is defined as a person's anxiety about usual or normal walking or mobilising, with the perception that a fall will occur [12]. Some studies have shown that FoF influences walking and suggests that FoF indirectly affects the occurrence of falls [13-15]. Supporting

this research, FoF is considered a significant predictor of falls in community-dwelling older adults [16,17]. A systematic review has shown that individuals with FoF have more than double the risk of falling than those without FoF [17]. Fall history is another strong predictor of future falls, affecting the development of FoF in older adults [15,16]. Studies comparing multiple fallers with non fallers and with single fallers have reported significant differences in health outcomes [18-20].

A recent trend in geriatric research has seen a shift from successful ageing to healthy ageing. The World Health Organisation (WHO) defines healthy ageing as the process of developing and maintaining the functional ability that enables wellbeing in older age [21].

Physical fitness is a dynamic state of energy and vitality that enables people to perform everyday chores, engage in active leisure and cope with unforeseen situations without becoming exhausted [22]. Physically active individuals may exhibit a reduced risk of falls and fractures due to their higher levels of physical fitness [23,24]. Sedentary older adults with poor physical fitness must exert greater effort to perform activities necessary for independent living, which increases their risk of falling [25]. At the same time, a positive association between Physical Activity (PA) and Physical Fitness (PF) is supported by previous findings, which linked PA with lower BMI, better aerobic endurance and strength [26] and better balance capacity in older adults [27].

A clinical review by Laboni A and Flint AJ, stated that depression and falls have a significantly bidirectional relationship, but it has been inadequately studied. An excessive FoF, which is associated with depression, also increases the risk of falls [28]. As the institutionalised elderly are more vulnerable to the risk of falls, it becomes necessary to assess the risk factors of falls and PF components for falls management. An integrative review by Queiros AM et al., has suggested that healthcare professionals should implement regular screening for depressive symptoms and a multidimensional and multidisciplinary approach is needed to address the complex needs of the institutionalised elderly population [7].

A study done by Demircioglu-Karagoz A et al., has shown that screening for FOF should be priortised to detect high-risk older adults, along with fall history [29]. Thus, this study was conducted with the aim of exploring the relationship between physical fitness, history of falls and depression with FoF among the study participants.

The aim of the study was to assess the correlation between physical fitness, history of falls and depression with FoF in the institutionalised elderly population.

Primary objective: To study the correlation between physical fitness and FoF in institutionalised elderly.

Secondary objective:

i To study the correlation between the history of falls and FoF in institutionalised elderly;

ii To study the correlation between depression and FoF in institutionalised elderly.

Null hypothesis: There is no correlation between physical fitness, history of falls and depression with FoF among the institutionalised elderly population.

Alternate hypothesis: There is a correlation between physical fitness, history of falls and depression with FoF among the institutionalised elderly population.

MATERIALS AND METHODS

This cross-sectional study is part of a PhD project on the effectiveness of an exercise programme on the physical fitness of the institutionalised elderly population. The clinical trial registry for this study is CTRI/2023/11/059476. Ethical clearance was obtained (IEC Ref No. DYP/IECBH/2023/067). The study was conducted at institutional old-age homes in the Kalyan-Dombivili area, Mumbai, Maharashtra, India. The study lasted four months, from August 2024 to November 2024. After obtaining permission from the old-age homes, participants were approached, informed consent obtained and screened according to the inclusion criteria.

Inclusion criteria: Institutionalised elderly individuals aged 60-85 years, ambulatory with or without an assistive device, both male and female participants were include in the study.

Exclusion criteria: Severly cognitive impairment, score of 0-9 on Mini Mental Status Examination (MMSE) any unstable or acute medical condition where exercise is contraindicated. Acute musculoskeletal condition with pain on the Visual Analog Scale greater than 6/10 [30]. Neurological diseases such as stroke or Parkinson's disease.Severe depression scores of 20-30 on the Geriatric Depression Scale or those taking antidepressants were excluded from the study.

Data collection sheet: The data collection sheet consisted of two parts.

- Part I (demographic information): age, gender, education, Body Mass Index (BMI), number of years residing in the old-age home, history of co-morbidities, medical and surgical history and history of medication use.
- Part II: recent falls in the last 12 months, MMSE score, Berg Balance Scale, Senior Fitness Test [31], Falls Efficacy Scale-International (FES-I) and Geriatric Depression Scale. Falls Efficacy Scale—Marathi version [32] and Geriatric Depression Scale—Marathi version [33] were used as applicable.

Sampling and sample size: The study used non probability convenience sampling; participants were recruited by convenience sampling. After screening 130 participants according to the inclusion criteria, 124 agreed to participate. No formal sample size calculation was performed due to the non probability sampling method. Consequently, data were collected from and analysed for 124 participants.

Procedures and measures: Falls history, including history of recent falls in the last 12 months, number of falls, number of medications and FoF, was assessed by asking the question, "Are you afraid of falling?".Physical activity level and anthropometrics (height and weight) were recorded to calculate BMI. Cognition was screened using the MMSE [34] and balance was assessed using the Berg Balance Scale. Physical fitness was assessed using the Senior Fitness Test [31]. FoF was assessed using the Marathi version of the Falls Efficacy Scale [32] and depression was assessed using the Marathi version of the Geriatric Depression Scale [33].

Outcome measures:

1. Senior Fitness Test (SFT) [31];
2. Fear of Falling scale/Falls Efficacy Scale-International (FES-I) - Marathi pre-translated version used [32];
3. History of falls;
4. Geriatric Depression Scale (GDS) - Marathi pre-translated version used [33].

Descriptions of measures:

1. **Senior Fitness Test [31]**: It is one of the simplest and best tools for assessing six important functional fitness parameters in the elderly, comprising body composition, lower- and upper-body strength, aerobic endurance and lower- and upper-body flexibility, as well as agility/dynamic balance [Table/Fig-1].

Assessment category	Test item
Lower body flexibility	Chair sit and reach test
Upper body flexibility	Back scratch test
Lower body strength	30 second chair stand test
Upper body strength	30 second arm curl test
Agility/dynamic balance	8 foot up and go test
Aerobic endurance	2 minute step test

Test item	Test description
Chair sit and reach test	From sitting position at front of chair, with arms extended and hands reaching towards toes, number of inches from extended fingers to tip of toes.
Back scratch test	With one hand reaching over shoulder and one up middle of back, number of inches between extended middle fingers.
30 second chair test	Number of full stands in 30 seconds with arms folded across the chest.
30 second arm curl test	Number of bicep curls in 30 seconds holding hand weights, women – 5 pounds, men – 8 pounds.
8 foot up and go test	Number of seconds required to get up from seated position, walk 8-foot turn, return to seated position on chair.
2-minute step test	The number of full steps completed in 2 minutes raising each knee to point midway between patella and iliac crest.

[Table/Fig-1]: Senior fitness test [31].

2. **Fear of Falling (FoF) scale [32]**: The Marathi version of the Falls Efficacy Scale-International was used to measure confidence in avoiding falling during daily activities, based on the level of concern about falling. The direct question asks whether participants have FoF. The scale has 16 items, each scored from 1 to 4, for a total score of 16-64.
3. **History of falls:** A fall was defined as an event that resulted in the participant unintentionally coming to the ground or to another lower level [35]. Participants were asked about the number of falls experienced in the last 12 months. Those with zero falls were classified as non fallers and those with one or more falls as fallers.
4. **Geriatric Depression Scale (GDS) [33]:** The Marathi version was used. The GDS long form is a 30-item questionnaire in which participants respond yes or no regarding how they felt over the past week. The GDS has approximately 92% sensitivity and 89% specificity when evaluated against diagnostic criteria.

STATISTICAL ANALYSIS

Descriptive and inferential statistics were performed. Results for continuous variables are presented as mean±SD and results for categorical variables as frequencies and percentages. Normality of the data was assessed using the Kolmogorov-Smirnov test. Spearman's rank correlation coefficient was used to assess correlations between physical fitness, depression and FoF. The Chi-square test was used to determine if there were significant differences between history of falls and FoF. A p-value <0.05 was considered statistically significant.

RESULTS

[Table/Fig-2] shows descriptive statistics for age, years in the old-age home, BMI, MMSE score and Berg Balance score. The mean age was 71.4±5.8 years. The mean duration of residence in the old-age home was 7.4±2.5 years. The BMI was 22±2 kg/m^2. The Berg Balance Score [36] was 36.7±10.3. [Table/Fig-3] shows gender-wise distribution: 61 females (49.2%) and 63 males (50.8%). [Table/Fig-4] shows education levels: 20 uneducated (16.1%), 41 primary education (33.1%), 35 secondary education (28.2%) and 28 higher education (22.6%). [Table/Fig-5] shows assistive-device use: 63 participants (50.8%) used an assistive device and 61 (49.2%) did not. [Table/Fig-6] shows history of falls: 64 participants (51.6%) reported a history of falls. [Table/Fig-7] shows out of total number of participants, 81 participants complained of high concern for falls, 31 (25%) participants reported to have moderate concern for falls and 12 (9.7%) reported to have low risk of falls.

[Table/Fig-8] presents falls history by sex. Among the 64 participants with a history of falls, 30 were female (24.2%) and 34 were male (27.4%). Among non fallers (n=60), 31 were female (25.0%) and 29 were male (23.4%). The concern for falls was high among fallers (42 participants, 33.9%) compared with non fallers (39 participants, 31.5%). The Chi-square test showed no significant difference between fallers and non fallers with respect to FoF, p-value=0.8403.

[Table/Fig-9] shows descriptive statistics of SFT components, GDS depression scores and FoF on FES. [Table/Fig-10] shows the correlation between physical fitness (SFT) and FoF (FES) for all

Descriptive statistics	Age (years)	No. of years residing in old age home	BMI	MMSC Score	BBS
Mean	71.4	7.4	22.0	27.9	36.7
Standard deviation	5.8	2.5	2.0	1.3	10.3
Median	70	7.5	21.66	28	40
Mode	70	8	20.83	28	46
Minimum	62	1	17.36	25	17
Maximum	88	14	27.70	30	50

[Table/Fig-2]: Descriptive statistics of the age, number of years residing in old age home, Body Mass Index (BMI), Mini mental examination score and Berg balance score.

Sex	n (%)
Female	61 (49.2)
Male	63 (50.8)

[Table/Fig-3]: Gender wise distribution of participants.

Assessment category	n (%)
Uneducated	20 (16.1)
Primary	41 (33.1)
Secondary	35 (28.2)
Higher	28 (22.6)

[Table/Fig-4]: Education level of participants.

Usage of assistive device	n (%)
No	61 (49.2)
Yes	63 (50.8)

[Table/Fig-5]: Usage of assistive device by participants.

History of falls	n (%)
No	60 (48.4)
Yes	64 (51.6)

[Table/Fig-6]: Total number of participants with history of falls.

Concern falls	n (%)
Low	12 (9.7)
Moderate	31 (25)
High	81 (65.3)

[Table/Fig-7]: Total number of participants with their levels for concern of falls.

Sex	Faller	Non faller	Grand Total	Chi square p-value, Significance
Female	30 (24.2)	31 (25)	61 (49.2)	0.5938, NS
Male	34 (27.4)	29 (23.4)	63 (50.8)	
Grand total	64 (51.6)	60 (48.4)	124 (100)	
Concern falls	**Faller**	**Non faller**	**Grand Total**	**Chi-square p-value, Significance**
Low	7 (5.6)	5 (4)	12 (9.7)	0.8403, NS
Moderate	15 (12.1)	16 (12.9)	31 (25)	
High	42 (33.9)	39 (31.5)	81 (65.3)	
Grand total	64 (51.60)	60 (48.4)	124 (100)	

[Table/Fig-8]: Gender wise distribution and concern of falls among fallers and non fallers.

Descriptive Statistics	CSR1-Rt	CSR1-Lt	BST1-Rt	BST1-Lt	CST1	ACT1-Rt	ACT1-Lt	8FUPGT1	2MST1	GDS1	Number of falls	FES-1
Mean	-4.2	-4.4	-4.0	-3.9	8.1	12.1	12.0	12.7	55.1	17.9	1.0	36.1
Standard deviation	1.4	1.3	1.2	1.3	1.8	3.0	3.0	2.9	9.2	3.5	1.1	12.8
Median	-4	-4	-4	-4	8	12	12	13	55	18	1	34
Mode	-5	-3	-3	-4	7	15	15	15	52	18	0	25
Minimum	-7	-7	-7	-8.7	2	2	5	6.2	35	9	0	17
Maximum	-2	-1	-2	-2	12	18	18	19.3	90	27	4	62
K-S test p-value	0.00122	0.00241	0.00057	0.01075	0.09131	0.03513	0.06124	0.12597	0.61695	0.02018	< 0.00001	0.01293
Passed Normality test	No	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No

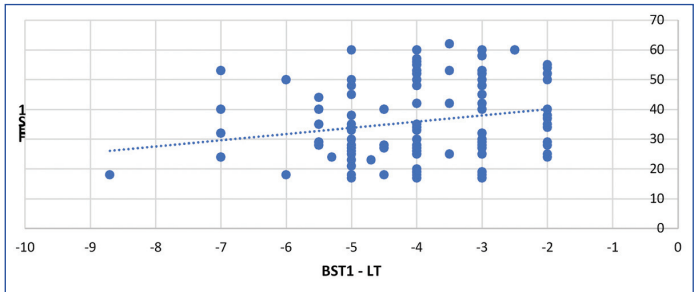
[Table/Fig-9]: Descriptive statistics of components of SFT, depression score on GDS and Fear Of Falls (FoF) on FES.
In senior fitness testing, upper limb flexibility and lower limb flexibility is assessed by back scratch test and chair sit and reach test -this is measured in distance (cm). In case if patient has reduce flexibility, that shortened range is measured in minus. So, the minus points indicate that subject has tightness means has low flexibility of that joint.

Var 1	Var 2	Correlation coefficient	p-value	Significance
CSR1-Rt	FES-1	0.087	0.33815	NS
CSR1-Lt	FES-1	0.042	0.63955	NS
BST1-Rt	FES-1	0.106	0.24217	NS
BST1-Lt	FES-1	0.217	0.0156	S
CST1	FES-1	0.004	0.96486	NS
ACT1-Rt	FES-1	-0.106	0.24273	NS
ACT1-Lt	FES-1	-0.089	0.32598	NS
8FUPGT1	FES-1	0.085	0.34583	NS
2MST1	FES-1	-0.022	0.809	NS
GDS1	FES-1	0.049	0.5879	NS

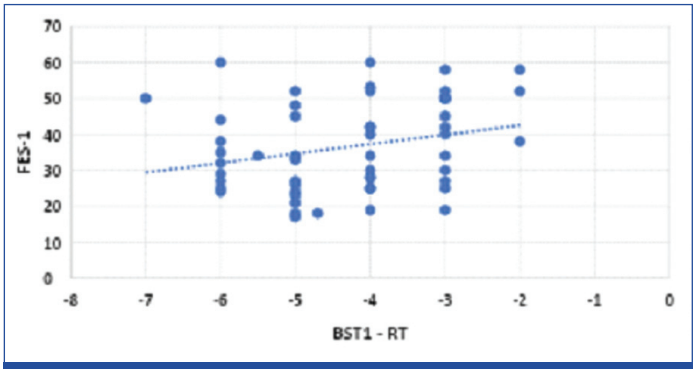
[Table/Fig-10]: Co-relation of SFT with FES in overall population.

participants. There was a significant positive correlation between the Back Scratch Test (left) and FoF on FES, although the strength of the correlation is weak.

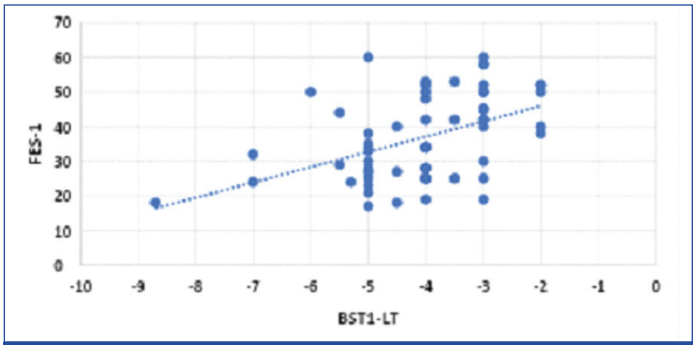
[Table/Fig-11] denotes a scatter plot showing a weak correlation between BST1 (LT) and FES1 in the overall population, r-value=0.217, p-value=0.016. [Table/Fig-12] shows the correlation between SFT components and GDS with FES among fallers and non fallers; no significant correlations were observed. [Table/Fig-13] shows a scatter plot showing a weak correlation between BST1-Right and FES, r-value=0.272, p-value=0.036. [Table/Fig-14] shows a scatter plot showing a still weaker correlation between BST1-Left and FES, r-value=0.471, p-value <0.001. [Table/Fig-15] shows a scatter plot showing a weak relationship between ACT1 right and FES among fallers, p-value=0.032, r-value=-0.268. [Table/Fig-16] indicates a scatter plot showing a weak correlation between ACT-LT and FES-1 among fallers, r-value=-0.289, p-value=0.021.



[Table/Fig-11]: Scatter plot of BST1 left vs FES1 among overall population.



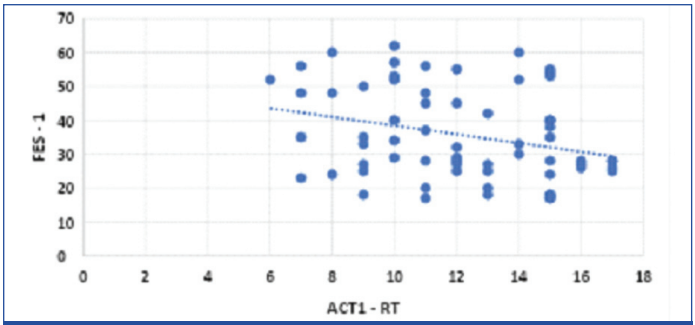
[Table/Fig-13]: Scatter plot of BST1 right vs FES1 among non fallers.



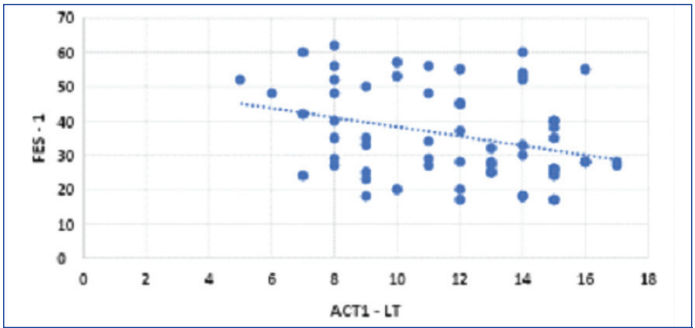
[Table/Fig-14]: Scatter plot of BST1 left vs FES1 among non fallers.

Correlation with FES-1	Non fallers			Fallers		
	Correlation coefficient	p-value	Significance	Correlation coefficient	p-value	Significance
CSR1-Rt	-0.047	0.722	NS	0.192	0.128	NS
CSR1-Lt	-0.026	0.843	NS	0.086	0.500	NS
BST1-Rt	0.272	0.036	S	-0.019	0.879	NS
BST1-Lt	0.471	0.0001	HS	0.027	0.831	NS
CST1	-0.191	0.143	NS	0.148	0.243	NS
ACT1-Rt	0.072	0.584	NS	-0.268	0.032	S
ACT1-Lt	0.126	0.338	NS	-0.289	0.021	S
8FUPGT1	0.169	0.198	NS	0.034	0.79	NS
2MST1	-0.019	0.884	NS	-0.023	0.859	NS
GDS1	0.124	0.344	NS	-0.013	0.917	NS

[Table/Fig-12]: Corelation of components of SFT and GDS with FES among fallers and non fallers.



[Table/Fig-15]: Scatter plot of ACT1 right vs FES1 among fallers.



[Table/Fig-16]: Scatter plot of ACT1 left vs FES1 among fallers.

DISCUSSION

This correlation study was conducted in five old-age homes in the Dombivli area, Thane district, Mumbai, Maharashtra, India. A total of 124 elderly participants (mean age 71.4±5.8 years) were recruited according to the inclusion criteria. A similar retrospective study was conducted by Lin WS et al., to study the correlation between physical fitness and its impact on fallers, but in community-dwelling elderly [37]. As most of the literature suggests that institutionalised elderly populations have low levels of physical activity and an increased incidence of falls, this study aimed to assess the correlation between physical fitness, history of falls and depression with FoFs among institutionalised elderly.

Stratification of fallers and non fallers: In this study, the participants were asked whether they had any history of falls in the past 12 months (Yes/No). Those with a history of one fall or more were considered fallers and those with no history were described as non fallers. A Sri Lankan study by Ihalage WISM et al., had also categorised fallers and non fallers by the number of falls [38]. Out of 124 participants, 64 reported at least one fall and were considered fallers.

Correlation of physical fitness with FoFs in the study population: The Senior Physical Fitness Test was used to assess the physical fitness parameters of upper- and lower-limb flexibility, upper- and lower-limb strength, cardiorespiratory endurance and agility. The FES-I Marathi version was used to study FoFs among the participants. The chair sit-and-reach test and the back-scratch test were used to assess flexibility of the lower and upper limbs, respectively. There was no correlation between lower-limb flexibility and FoF (CSR-right, p-value=0.33815; CSR-left, p-value=0.63955). However, a positive correlation was found between upper-limb flexibility and FoFs (Back Scratch Test, left; p-value=0.0156). A study done in China by Wu S et al., found that older women with high FoFs had worse sit-and-reach test performance [39].

The 30-second arm curl test and the 30-second chair stand test were used to assess upper- and lower-limb muscle strength. There is a significant negative correlation between the arm curl test (right) and FES, with a weak strength of correlation for faller geriatric patients. There was also a significant negative correlation between the arm curl test (left) and FES, with a moderate strength of correlation for faller geriatric patients. The 30-second chair stand test showed no association with FoFs. A study by Alosaimi RM et al., showed that the time to complete five times sit-to-stand was associated with FoFs, but the study was conducted in adults aged 50 years and above [40]. Muscle strength is an important indicator of physical fitness in the elderly; many studies have explored the relationship between muscle strength and FoF since muscle strength is an important component of physical fitness, but the results are inconsistent due to the use of different muscle-test tools [41-45].

Eight-Foot Up-and-Go Test was used to assess the agility and balance of the study participants. There was no association between the agility scores on the Eight-Foot Up-and-Go Test and FoF (FES-1), p=0.34583. Cardiorespiratory endurance, as measured by the 2-Minute Step Test (2MST), was also not associated with FoF (FES-1), p=0.8089.

Thus, there was no significant correlation between the various fitness parameters and FoF in present study, except for upper-limb flexibility and upper-limb strength. These findings are not consistent with most studies showing that lower physical fitness components such as weakness of the lower limbs and reduced balance are associated with FoF. A Sri Lankan study by Ihalage WISM et al., assessed the correlation between physical fitness and FoF in institutionalised elderly and showed that reduced physical fitness components increase FoF [38]. The inconsistency in present study results could be because all participants reported relatively sedentary or low levels of physical activity. A study by Wu S et al., explored the mediating role of physical fitness in the relationship between physical activity and FoF among community-dwelling elderly women in China and reported that those with low levels of physical activity showed no significant association with FoF [39].

Correlation of history of falls with FoF: In this study, history of falls had no correlation with FoF among the elderly participants. A one-year cohort study by Asai T et al., also indicated that a single fall history does not affect the association of FoF occurrence; FoF may affect non fallers and single fallers equally in terms of fall occurrence [46].

Correlation between depression and FoF: There was no significant difference between GDS scores and FoF on the FES in this study. This could be because both depression and FoF scores were self-reported by participants and there were no clinically diagnosed cases of depression. A systematic review by Queiros AM et al., states that depression and depressive symptoms should be addressed and evaluated separately [7]. While both depression and FoF can impact gait and balance, evidence suggests that depression's influence on falling may be more indirect than a direct cause of FoF. FoF is more strongly linked to activity restriction in individuals with depression. Additionally, anxiety symptoms may have a stronger and more independent predictive impact on FoF and activity restrictions compared with depressive symptoms [47].

Limitation(s)

There may be recall bias, as falls were determined by interview-based questions. Physical activity levels were self-reported by participants. This was a cross-sectional study, so causal relationships between variables cannot be inferred.

CONCLUSION(S)

There was no correlation between overall physical fitness and FoF in the elderly population, except for upper-limb flexibility and upper-limb strength. Although participants with a history of falls showed greater concern about falls than non fallers, this difference was not statistically significant. Depression in the elderly was not correlated with FoF. Future longitudinal studies should be conducted to understand the complex relationship among physical fitness, history of falls and depression with FoF in institutionalised elderly.

Acknowledgement

Authors would like to thank the study participants for volunteering and the authorities of the old-age homes for permission to conduct this study.

REFERENCES

[1] United Nations Department of Economic and Social Affairs, Population Division. World Population Prospects 2019, Volume II: Demographic Profiles. New York: UN; 2019. (ST/ESA/SER.A/427).
[2] Kandapan B, Pradhan J, Pradhan I. Living arrangement of Indian elderly: A predominant predictor of their level of life satisfaction. BMC Geriatr. 2023;23:88.
[3] Agrawal S. Effect of living arrangement on the health status of elderly in India: Findings from a national cross-sectional survey. Asian Popul Stud. 2012;8(1):87-101.
[4] Rajan SI, Kumar S. Living arrangements among Indian elderly: New evidence from National Family Health Survey. Econ Polit Wkly. 2003;38(1):75-80.
[5] Bongaarts J, Zimmer Z. Living arrangements of older adults in the developing world: An analysis of demographic and health survey household surveys. J Gerontol B Psychol Sci Soc Sci. 2002;57(3):S145-S157.
[6] Adams BN. Themes and threads of family theories: A brief history. J Comp Fam Stud. 2010;41(4):499-501.
[7] Queiros AM, von Gunten A, Amoussou JR, Martins MM, Verloo H. Relationship between depression and falls among nursing home residents: Protocol for an integrative review. JMIR Res Protoc. 2023;12:e46995.
[8] Giovannini S, Brau F, Galluzzo V, Santagada DA, Loreti C, Biscotti L. Falls among older adults: Screening, identification, rehabilitation and management. Appl Sci. 2022;12(15):7934.
[9] Mehta J, Knowles K, Wilson E. Prevalence of falls in patients presenting to an ophthalmic outpatients department—A surveillance study. Br Ir Orthopt J. 2021;17:134-41.
[10] Mane AB, Sanjana T, Prabhakar R, Patil T, Srinivas J. Prevalence and correlates of fear of falling among elderly population in urban area of Karnataka, India. Midlife Health. 2014; 5(3):150-55.
[11] Skelton DA, Becker C, Lamb SE, Close JCT, Zijlstra W, Yardley L, et al. Prevention of Falls Network Europe: A thematic network aimed at introducing good practice in effective falls prevention across Europe. Eur J Ageing. 2004;1:89-94.
[12] Murphy J, Isaacs B. The post-fall syndrome: A study of 36 elderly patients. Gerontology. 1982;28:265-70.
[13] Sawa R, Doi T, Misu S, Tsutsumimoto K, Nakakubo S, Asai T, et al. The association between fear of falling and gait variability in both leg and trunk movements. Gait Posture. 2014;40:23-27.
[14] Asai T, Misu S, Sawa R, Doi T, Yamada M. The association between fear of falling and smoothness of lower trunk oscillation in gait varies according to gait speed in community-dwelling older adults. J Neuroeng Rehabil. 2017;14:5.
[15] Hausdorff JM. Gait variability: Methods, modeling and meaning. J Neuroeng Rehabil. 2005;2:19.
[16] Kwan MM-S, Close JCT, Wong AKW, Lord SR. Falls incidence, risk factors, and consequences in Chinese older people: A systematic review. J Am Geriatr Soc. 2011;59:536-43.
[17] Scheffer AC, Schuurmans MJ, van Dijk N, van der Hooft T, de Rooij SE. Fear of falling: Measurement strategy, prevalence, risk factors and consequences among older persons. Age Ageing. 2008;37:19-24.
[18] Dite W, Temple VA. A clinical test of stepping and change of direction to identify multiple falling older adults. Arch Phys Med Rehabil. 2002;83:1566-71.
[19] Dite W, Temple VA. Development of a clinical measure of turning for older adults. Am J Phys Med Rehabil. 2002;81:857-66.
[20] Lord SR, Dayhew J. Visual risk factors for falls in older people. J Am Geriatr Soc. 2001;49:508-15.
[21] Michel JP, Sadana R. "Healthy aging" concepts and measures. J Am Med Dir Assoc. 2017;18(6):460-64.
[22] Saavedra JM, Torres S, Caro B, Escalante Y, De la Cruz E, Duran MJ, et al. Relationship between health-related fitness and educational and income levels in Spanish women. Public Health. 2008;122(8):794-800.
[23] Perez-Cruzado D, Cuesta-Vargas AI, Vera-Garcia E, Mayoral-Cleries F. Physical fitness and levels of physical activity in people with severe mental illness: A cross-sectional study. BMC Sports Sci Med Rehabil. 2017;9:17.
[24] Duray M, Genc A. The relationship between physical fitness and falling risk and fear of falling in community-dwelling elderly people with different physical activity levels. Turk J Med Sci. 2017;47(2):455-62.
[25] Klenk J, Kerse N, Rapp K, Nikolaus T, Becker C, Rothenbacher D, et al. Physical activity and different concepts of falls risk estimation in older people- results of the ActiFE-Ulm study. PLoS One. 2015;10(6):e0129098.
[26] Petrica J, Serrano J, Paulo R, Ramalho A, Lucas D. The sedentary time and physical activity levels on physical fitness in the elderly: A comparative cross-sectional study. Int J Environ Res Public Health. 2019;16:19.
[27] Corcoran MP, Chui KK, White DK, Reid KF, Kirn D, Nelson ME, et al. Accelerometer assessment of physical activity and its association with physical function in older adults residing at assisted care facilities. J Nutr Health Aging. 2016;20:752-58.
[28] Laboni A, Flint AJ. The complex interplay of depression and falls in older adults: A clinical review. Am J Geriatr Psychiatry. 2013;21(5):484-92.
[29] Demircioglu-Karagoz A, Sahin UK, Dag O, Sari IF. Fear of falling is a top issue for older adults with a history of falling: Multidimensional perspective. Psychogeriatrics. 2025;25(3):e70029. Doi: 10.1111/psyg.70029.
[30] Jensen MP, Chen C, Brigger AM. Interpretation of visual analog scale ratings and change score: A reanalysis of two clinical trials of postoperative pain. J Pain. 2003;4(7):P407-414.
[31] Jones J, Rikli RE. Measuring functional fitness of older adults. J Active Aging. 2002 Mar-Apr.
[32] Falls Efficacy Scale–International (FES-I) [Internet]. Manchester: University of Manchester; [cited 2025 May 3]. Available from: https://sites.manchester.ac.uk/fes-i.
[33] Geriatric Depression Scale (GDS) [Internet]. Stanford University; [cited 2025 May 3]. Available from: https://web.stanford.edu/yesavage/GDS.html.
[34] Kurlowicz L, Wallace M. The Mini Mental State Examination (MMSE). Best Pract Nurs Care Older Adults. 1999;(3).
[35] Berg RL, Cassells JS. Falls in older persons: Risk factos and prevention. The Second Fifty Years: Promoting Health and Preventing Disability. Institute of Medicine (US) Division of Health Promotion and Disease Prevention: Berg RL, Cassells JS. Washington(DC):National Academies Press (US):1992.
[36] Shumway-Cook A, Baldwin M, Polissar NL, Gruber W. Predicting the probability for falls in community dwelling older adults. Phys Ther. 1992;77(8):812-19. (Retrived 10-5-2014 from Rehab Measures Database).
[37] Lin WS, Hsu NW, Lee MJ, Lin YY, Tsai CC, Pan PJ. Correlation analysis of physical fitness and its impact on falls in 2130 community-dwelling older adults: A retrospective cross-sectional study. BMC Geriatr. 2022;22:447.
[38] Ihalage WISM, Wijebandara VRCS, Wickramakumari DGWS, Wickramasingha WMBD, Sampath K, Manchanayake MMJP, et al. Prevalence of falls and comparison of health-related physical fitness factors between different faller categories among institutionalized older adults in Kandy District of Sri Lanka. PLOS ONE. 2024;19(2):e0297946-6.
[39] Wu S, Li G, Shi B, Ge H, He Q. The association between physical activity and fear of falling among community-dwelling older women in China: The mediating role of physical fitness. Frontiers in Public Health [Internet]. 2023;11. [cited 2023 Dec 1]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10461811/.
[40] Alosaimi RM, Almegbas NR, Almutairi GR, Alqahtani MA, Batook SG, Alfageh IA, et al. The five times sit-to-stand test is associated with both history of falls and fear of falling among community adults aged 50 years and older. Ir J Med Sci. 2023;5:01-07.
[41] Callisaya ML, Blizzard L, Martin K, Srikanth VK. Gait initiation time is associated with the risk of multiple falls: A population-based study. Gait Posture. 2016;49:19-24.
[42] Oh E, Hong GS, Lee S, Han S. Fear of falling and its predictors among community-living older adults in Korea. Aging Ment Health. 2017;21:369-78.
[43] Yardimci B, Akdeniz M, Demir T. The correlation between fear of falling and upper extremity muscle strength. Saudi Med J. 2021;42:411-18.
[44] Vongsirinavarat M, Mathiyakom W, Kraiwong R, Hiengkaew V. Fear of falling, lower extremity strength, and physical and balance performance in older adults with diabetes mellitus. J Diabetes Res. 2020;2020:8573817.
[45] Park S, Cho OH. Fear of falling and related factors during everyday activities in patients with chronic stroke. Appl Nurs Res. 2021;62:151492.
[46] Asai T, Oshima K, Fukumoto Y, Yonezawa Y, Matsuo A, Misu S. The association between fear of falling and occurrence of falls: A one-year cohort study. BMC Geriatr. 2022;22(1):393.
[47] Gambaro E, Gramaglia C, Azzolina D, Campani D, Molin AD, Zeppegno P. The complex associations between late life depression, fear of falling and risk of falls. A systematic review and meta-analysis. Ageing Res Rev. 2022;73:101532.

PARTICULARS OF CONTRIBUTORS:
1. PhD Scholar, Faculty of Physiotherapy, Parul University, Waghodia, Vadodara, Gujarat, India.
2. Professor, Department of Ortho Physiotherapy, Parul Institute of Physiotherapy and Research, Faculty of Physiotherapy, Parul University, Waghodia, Vadodara, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Ms. Sheetal Khanderao Aurangabadkar,
803, Mangeshi Srushti, Phase 2, Opposite Vasant Park, Vasant Valley Road, Kalyan West, Mumbai-421301, Maharashtra, India.
E-mail: coolchimi@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Feb 24, 2025
- Manual Googling: Jul 24, 2025
- iThenticate Software: Jul 26, 2025 (16%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Feb 18, 2025**
Date of Peer Review: **Apr 13, 2025**
Date of Acceptance: **Jul 28, 2025**
Date of Publishing: **Sep 01, 2025**