# Fall Risk Assessment in Mild Cognitively Impaired Institutionalised Elderly

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**ABSTRACT**

Occurrence of falls with advancing age is the most common phenomenon observed in the elder population. Degenerative changes in the somatosensory system as well with decline in cognition are the most common contributing factors. Gradual deterioration in the processing of higher mental functions has the potential to increase the episodes of falls. Incidence of fall in geriatrics residing in an institutionalised old age home are the most common cause of concern as it increases their level of dependence on the caregivers. Present study aims to evaluate risk of fall in institutionalised elderly with mild cognitive impairment by administering a reliable and   valid Tinneti POMA assessment tool.

*Keywords:* Falls, cognitive impairment, geriatrics, Balance, Gait.

## INTRODUCTION

Elderly people all over the world struggle with falls as a major health issue.[1] In the community, 15% of seniors, 65 years and older fall twice a year or more, while 50% of elderly residents of residential care homes fall at least once a year.[1] Falls happen for a variety of reasons. Age related degenerative changes of the neuro muscular system is one of the major contributing factor for falls in geriatrics. Decline in the processing of higher mental functions along with planning, programming and execution of the task have contributed to falls. This accounts for a negative impact and dependence on the family and caregivers, which in turn affects the individuals quality of life to carry out activities of daily living. This is particularly more common in those who are residents of nursing homes.[2]The number of senior living facilities and the population residing there have significantly expanded recently.[3]According to the Orphanage Control Board of the social justice, the overall population of old-age homes in India increased from 18,057 to 26,728 in 2017–18.

Determining fall risk factors, and altering the environment and behavior in response, can becrucial in preventing falls in people of these ages. [3]

One of the major contributing factors for falls in geriatrics is impaired cognition. The cognitive domains like executive function deficits, attention difficulties, visuospatial disfunction, learning and remembering information.[4]Review from the literature demonstrates Mild Cognitive impairment (MCI),in geriatrics. It is characterized as a decline of the higher mental function.[5] Nearly 60% of elderly persons with cognitive impairment experience falls each year.[6]

In older adults, there is a strong association between cognition and balance, owing to an increase risk of fall. [7]Degenerative changes

observed in the central and peripheral nervous system results in gait and balance disorders. Characteristics of abnormal gait like Forward bent posture and decrease in the vigorous development of force during the phase of push off leads to fall. Maintenance of postural control requires a complex integration of all the physiological systems. Sensory input, central processing, motor coordination and a response from the musculoskeletal system to perturbations in order to control the body is vital. As the age progresses these system fails to process in harmony. Slow activation of postural reflexes and decline in postural control and muscle response lead to balance disturbances.[8]

Assessment of balance and gait can done by observational outcomes as well with subjective measures. In the present study, balance and gait will be assessed by Tinetti Performance Oriented Mobility Assessment (POMA).POMA was developed by Tinetti, to demonstrate the risk of fall in institutionalized elders and holds good reliability and validity for the same (r=0.75-0.97).[2] Cognition was assessed by MoCA, for the identification of MCI . Literature review suggests that MoCA is considered as a valid and reliable measure to assess cognition than MMSE.[9] The reliability of MoCA in adults above age of 60 is (r=0.823–0.868).

Present study aims to evaluate fall risk in elders with mild cognitive impairment living ininstitutionalized elderly homes as to our knowledge, there is dearth in the literature to demonstrate fall risk and its association with MCI in institutionalized elderly homes.

## MATERIALS & METHODS

Present study had a sample size of 160 subjects which were taken from the institutionalized old age homes of Thane. Inclusion criteria necessitated of individuals with Age (> 65 years), participants willing to participate and individuals with Montreal Cognitive Assessment (MoCA) score between 25-18 points (mild cognitive impairment). Exclusion criteria comprised of individuals with MoCA score (<18 points), presence of neurological or auditory deficits (i.e., a history of stroke with visible functional deficits of the locomotor system, sciatica, cerebral injuries), presence of any fractures. Participants with mild cognitive impairment who were willing to participate were included in the study after getting an ethical clearance from Institutional Ethics Committee. A written informed consent was taken from all the subjects prior to the study. All the study subjects were screened as per the inclusion and the exclusion criteria. The subjects were explained about the procedure and the purpose of this study. Assessment scales and outcome measure were taken. Cognition was assessed using MoCA and risk of fall was assessed by administering using Tinetti POMA.

## STATISTICAL ANALYSIS

Descriptive statistics (mean ± SD) were used to determine the population characteristics. Prior to statistical analysis, data was assessed for normality by using Shapiro Wilk Test. Spearman's Rank Correlation coefficient test was administered to find the correlation between the variables.

## RESULT

The demographic data and study results are documented in (table 1).Out Of the total population (160), 64 participants were male and 96 were female (figure 1). The participants included were aged above 65 years. As per the inclusion criteria participants with mild cognitive impairment on the score of MoCA scale of cognition was included in the present study.

**Table 1: Demonstrates demographic data and results of tests**

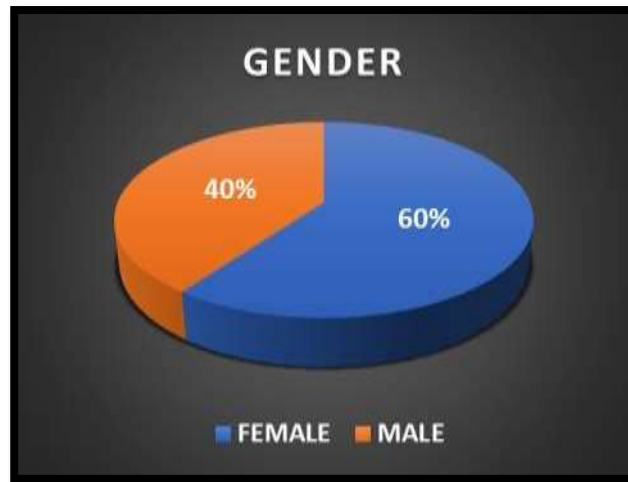| Demographic Data | Mean ± SD |
|---|---|
| AGE | 72.59 ± 6.62 |
| GENDER | |
| Male | 64 |
| Female | 96 |
| MoCA | 21.03 ± 1.87 |
| POMA | 20.58 ± 2.40 |

**Figure -1: Demonstrates gender distribution.**

**Table 2: Demonstrates results of MoCA scale for cognition**

| MOCA Scale | | |
|---|---|---|
| Mild Cognitive Impairement | 18-25 | 160 |
| Moderate Cognitive Impairement | 10 to 17 | 0 |
| Severe Cognitive Impairement | <10 | 0 |

**Table 3: Demonstrates results of POMA**

| POMA | | |
|---|---|---|
| Interpretation Of Scores | | No. Of Patients |
| Low Fall Risk | 25-28 | 19 |
| Medium Fall Risk | 19-24 | 108 |
| High Fall Risk | <19 | 33 |

Score of 18-25 on MoCA scale of cognition suggests mild cognitive impairment. In the present study, mean score for MoCA scale of cognition is 21.03, suggestive of mild cognitiveimpairment. (Table 2)

Further, the participants were assessed for the risk of fall by administering Tinetti Performance Oriented Mobility Assessment scale (POMA). The mean score documented was 20.58, suggestive of moderate risk of fall.(Table 3)
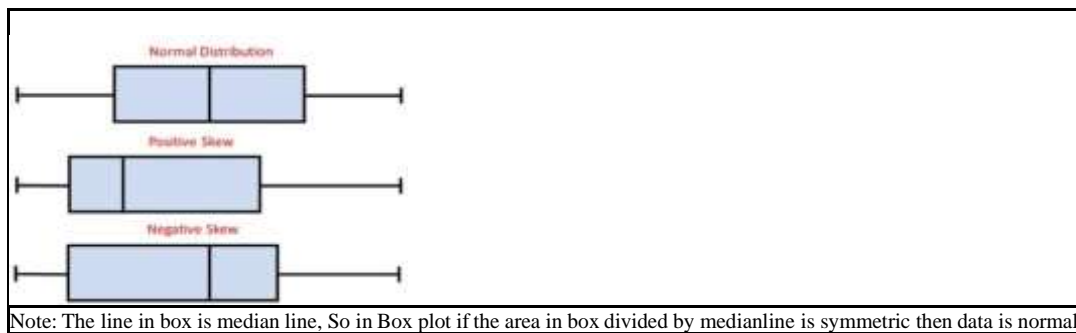


Note: The line in box is median line, So in Box plot if the area in box divided by medianline is symmetric then data is normal.

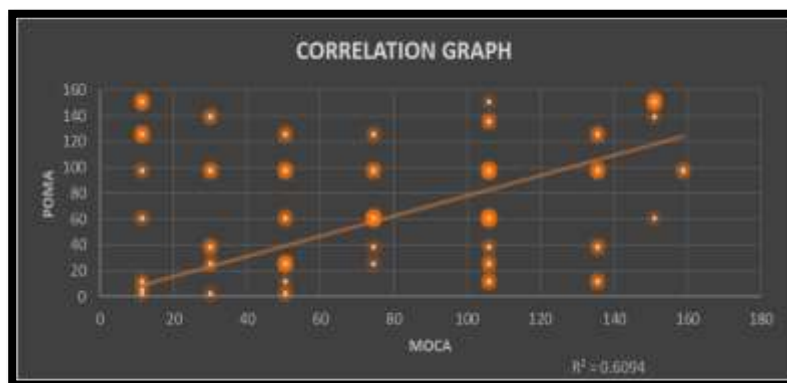**Figure 2: Demonstrates results of normality distribution.**



**Figure 3 : Demonstrates correlation graph between MoCA and POMA**

Spearman rank correlation was administered, the results of which is suggestive of weak positive correlation between the ranks of MoCA and POMA as correlation coefficient is small. Moreover, in Correlation graph $R^2$=0.6094 demonstrates that it is a good fit.

We conclude that, there is a weak positive correlation between the scores of MoCA and POMA, which suggests that mild cognitive impairment in institutionalized elderly population can have a moderate risk of fall.

## DISCUSSION

Physical and cognitive functions of the human body are thought to decline with age.[10] Among the primary physical functions are somatosensory systems.[11] Ageing is associated with a progressive loss of motor neurons and, as a consequence, muscle fibres become denervated.[11] The level of physical activity steadily declines with age and disuse contributes to the decline in muscle mass and function.[11] There is evidence from numerous research between falls and changes in old age.[11] Falling is a significant source of morbidity and mortality in older persons.[12] Reduction in muscle strength and coordination of the lower extremities accompanied by lowered gait confidence and balance control are the result of a physical deterioration in an older body.[13] Aging causes the precentral gyrus and cerebellum to lose cortex neurons which is connected to the information-carrying regions that cause balance loss in elderly people. The balance system, which regulates body sway, deteriorates with age to a greater or lesser extent depending on the presence of other disorders or a sedentary lifestyle, which increases the risk of falls.[14] These changes contribute to risk of falls. Vision loss is another facet of physical decline with ageing.[15] Slowing visual processing speed makes it harder for older adults to spot dangers in their surroundings and raises their chance of falling.[15] Age-related hearing loss (ARHL) has been receiving more attention as a result of its connection to cognition.[16] Human research have also revealed that hearing impairment accelerates the atrophy of the brain, and that age-related hearing loss (ARHL) is linked to a lower brain volume.[16] Verbal communication difficulties can significantly restrict social integration in people with hearing loss which follows social isolation.[16] The association between hearing loss and cognitive impairment may be mediated by depression and social isolation.[16] One study found a statistically significant link between the findings of the Tinnetti test (TT) and the Geriatric Depression Scale (GDS).[17] The unmet need for meaningful relationships among residents of old age homes has a significant impact on feelings of loneliness[18]. According to reports, elderly persons who have spent a lengthy period in an institution are more likely to fall.[3] Age-related cognitive decline is increasingly acknowledged as a clinical problem. Inflammation, autophagy, mitochondrial failure, and cellular senescence are the aging-related traits that have been discovered as mechanisms; these mechanisms are all linked to cognitive decline in old age, as shown by Mitzi M. Gonzales et al.[19]

According to studies, certain other factors also influence the likelihood of falls in old age. It was found that patients who had fallen previously were far more likely to do so again than those who were able to prevent such accidents.[17] The person reporting an increasing number of comorbid conditions was significantly correlated with other factors that were shown to have influenced falls.[4] Acute illness or its symptoms were determined to be the cause of all falls, either separately or in conjunction with delirium and infection, most frequently a urinary tract infection.[20] Most of the drug-precipitated events of falls involved benzodiazepines or neuroleptics. External elements, such as flaws in the materials and other factors that affected both the person and the environment, including misinterpretation (such as overestimating capacity or forgetfulness), misuse of a roller

walker, or errors made by the staff influence falls.[20]

Despite the fact that cognitive impairment and falls in the elderly have been studied individually, there is a dearth in the literature to demonstrate the relation between preeminent falling risks and cognitive impairment. Older adults with cognitive impairment experience up to 60% more falls each year than older adults who live in their communities as a whole.[6] Despite the fact that many research have advanced, literature review demonstrates cognition as a whole is associated with risk of falls in older population, but there is paucity to demonstrate association of mild cognitive decline and its co relation with risk of fall.[6] According to a prevalence survey by Fuzhong Li et al., 82.3% of older persons with cognitive impairment reported having one or more falls in the prior year.[21] Participants who had cognitive impairment were 2.57 times more likely to fall once than cognitively healthy participants, and they were 2.33 times more likely to fall more than once.[21]

Present study sought to determine whether there was a correlation between cognition and falls among elderly residents of institutions who had mild cognitive impairment by administering a valid and reliable outcome measure. In the present study, the participants demonstrated mild cognitive impairment on MoCA scores, while risk of fall was assessed by Tinetti POMA. Results of which are suggestive of moderate risk of fall in participants who were diagnosed with MCI. Moreover, to study the correlation between MCI and fall risk, present study demonstrated a weak positive correlation. Our findings are similar to the results observed in a study by Thanthrige RS et.al which demonstrated cognitive impairment along with lower extremity strength and its association with fall.[1] The findings of our own investigation are supported by the findings of the Fuzhong Li et al. study, which found that older people with cognitive impairment are more prone to fall and perform worse on physical and dual-tasking tasks.[21] Similar findings were observed by Carey E. Gleason et al. which demonstrated minor declines in MMSE scores and its association with rise in the rate of falls and concluded that that mild cognitive deficits can be one of the contributing factor for falls in older individuals.[4]

## CONCLUSION
To conclude, there is a positive correlation between the mild cognitive impairment and fall risk in institutionalized older population. Moreover, with the results of this present study there is an insight provided towards the current literature to inculcate cognitive rehabilitation as one of the management strategies to prevent falls in the early stages of ageing in geriatric population residing at the institutionalized old age homes.

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