



## Original Research Article

# Exploring The Link Between Cognitive Impairment and Fall Risk Among the Elderly in East Chennai: A Survey Study

## Article History:

### Name of Author:

Muthulakshmi K<sup>1</sup>, Rajalaxmi V<sup>2</sup>, Senthil Nathan C V<sup>3</sup> and Kotteswaran K<sup>4</sup>

**Affiliation:** <sup>1</sup>Research Scholar, Faculty of Physiotherapy, Dr.M.G.R Education and Research Institute.

<sup>2</sup>Professor, Faculty of Physiotherapy, Dr.M.G.R Education and Research Institute.

<sup>3</sup>Professor, Faculty of Physiotherapy, Dr.M.G.R Education and Research Institute.

<sup>4</sup>Professor, Faculty of Physiotherapy, Saveetha Institute of Medical and Technical Sciences.

### Corresponding Author:

Muthulakshmi K

**Received:** 04-11-2025

**Revised:** 16-11-2025

**Accepted:** 16-12-2025

**Published:** 31-12-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Abstract: Background:** People aged above 60 years are classified as Geriatric population, among whom there are numerous comorbidities. Falls among the elderly are a significant public health concern due to their high prevalence and severe consequences. A comprehensive assessment of geriatric population that identifies the health impairments and their complex interplays will be helpful in screening those individuals. **Purpose:** This study was focussed on screening the health impairments and calculating the prevalence of variables such as falls, fear of fall, cognitive impairments and Depression encountered by the elderly population in the region of East Chennai and to study the complex interplay of cognitive impairment and falls among elderly. **Materials and Methods:** A total of 320 elderly people from the East Chennai region were included in the study as per the inclusion and exclusion criteria. The population were assessed for the cognitive impairments, depression status, balance impairment and fear of fall using Montreal Cognitive Assessment scale, Geriatric Depression Scale, Timed Up and Go test and Fall Efficacy Scale - International. The Data was analysed using Descriptive statistics. **Conclusion:** Among elderly individuals with a mean age of 74 years, 81% experienced falls, 84% exhibited cognitive impairment, and 63% showed signs of depression. The High prevalence rates and the interrelationship identified in this study highlights the need for a multidimensional approach to geriatric care.

**Keywords:** Fall Prevalence, cognitive Impairment, Geriatric Physiotherapy, Depression, Cognitive behavioural therapy.

## INTRODUCTION

The World Health Organisation (WHO) predicts that by 2050, there will be two billion people worldwide who are 60 years of age or older, contributing about 22% of the world's total population. This change requires a reassessment of methods to attain healthy ageing and puts significant strain on medical services, social security institutions and elder care<sup>(1)</sup>.

The medical treatment of the elderly is referred to as geriatrics. "The study of physical and psychological changes which are incident to old age" is defined as gerontology. According to geriatric classification age divided into three groups: 75–84 years are considered

as Middle-aged; ≥85 years are referred as oldest-aged; and 65–74 year as youngest-aged<sup>(2)</sup>. India is experiencing a demographic shift from a population characterized by high fertility, high birth rates, and high death rates to one marked by low fertility, low birth rates, and low death rates. As this happens, we see a steady increase in the elderly population in India<sup>(3)</sup>.

A significant load on the nation is caused by the geriatric population, which is frequently neglected and brings with it a host of medical, social, psychological, and economic issues. Understanding geriatric issues is essential for their prompt

identification and treatment, which will enhance the elderly's quality of life and lessen the nation's burden<sup>(1)</sup>.

According to the 2011 Census, 56% of the elderly population in India is illiterate. Additionally, 65% are partially or fully economically dependent on others for their daily needs, creating a significant burden on the working-age population with the old age dependence ratio being 14.2%. According to the 2011 census report the elderly population of India were 8.6% and was projected to 10% in the year 2020. The report also stated the geriatric population growth rate to be 1.9%. The 2011 Census also gathered data on eight types of disabilities, revealing that 20.5% of all disabled belonged to those aged >60 years which constitutes to a ratio of 5177/1 lakh people. Movement (25%) and vision disability (25%) are two most common types<sup>(2,4,5)</sup>.

Elderly people are more likely to have both communicable and non-communicable diseases due to age-related physiologic changes and a decline in immunity. The Global Burden of Diseases 2017 estimated a total of 9,909,501 deaths in India, with approximately 59% occurring among the elderly population<sup>(6)</sup>. According to Indian statistics, the leading causes of death among the elderly include cardiovascular illnesses (33%), respiratory disorders (10%), infections, including tuberculosis (10%), malignancies (6%), and accidents, poisoning, and violence (less than 4%)<sup>(7)</sup>.

The WHO reports that 646,000 people die from falls each year and that almost 37.3 million falls among the elderly require medical attention<sup>(1)</sup>. A fall episode is defined as an unintentional change in body position that results in contact with the ground or another lower level, excluding cases caused by intrinsic factors or significant external hazards<sup>(8)</sup>. The Ministry of Health recognizes falls among elderly individuals as a significant public health concern due to their high incidence and potential consequences, including injuries, disabilities, institutionalization, and even death<sup>(6)</sup>. Medication side effects, osteoarthritis, depression, light headedness and abnormalities in balance resulted by damage to the cerebellum and due to the age-related degenerative changes in the middle and inner ear can all contribute to the fall. Falls might also result from muscle weakness brought on by ageing or medicine. Falls are caused by a number of factors like the use of assistive devices, being older than 80, postural hypotension, visual impairments like decreased adaptive power and increased lens opacity<sup>(9,10,11)</sup>.

In addition to medical conditions, older people's health is impacted by functional, psychological, social and cognitive problems. Therefore, evaluating the elderly population with numerous comorbidities

typically requires more than just the standard medical assessment form consisting history of current and past health ailments, review of health systems, physical examination and laboratory investigations. Therefore, a comprehensive assessment of falls/gait disturbances, auditory impairments, visual disorders, urinary incontinence, malnutrition/weight loss, polypharmacy, cognitive impairments, psychological impairments and functional impairments are necessary<sup>(12)</sup>.

However, there is a dearth in the literature to assess all the above screening methods incorporated in a single outcome measure. Hence a comprehensive assessment involving components such as medical history, assistive devices, hearing impairments, visual impairments, musculoskeletal impairments, vestibular impairments, neurological and cardiorespiratory conditions, fall history, cognitive assessment, gait assessment, psychological assessment and fear of fall assessment will be made to screen geriatric population in the area of east Chennai. The data obtained was helpful in identifying the prevalence of the health impairments and their complex coaction encountered by the elderly population at different age groups in east Chennai.

## METHODOLOGY

This cross-sectional study of screening the geriatric population for health impairments was done with a sample of 320 elderly, aged between 60 to 90 years of both genders in east Chennai. The sample size calculation was done using G\* Power 3.1.9.7 software, with Effect Size (ES) = 0.3, alpha error 0.05, power **0.8**. from which the sample size was estimated to be 316. This study was approved by the Institutional Ethical committee of A.C.S. Medical College Hospital A constituent Unit of Dr. M.G.R. Educational And Research Institute (Deemed To Be University) Regd. No: ECR/1857/Inst/TN/2023 Dt: 5th July 2023. The study included mentally stable elderly individuals with a fall history within the past 12 months who willingly provided their consent to participate. Subjects with any history of recent fractures, recent surgeries, neurological illness, uncooperative and uncomprehensible were excluded from the study. After signing the consent forms, the subjects were examined in person through face to face interview and assessment at ACS Medical College and Hospital campus, Sri Lalithambigai Medical College and Hospital campus, Divine Old Age Home and residential areas of Velappanchavadi, Porur, Adayalampattu and Maduravoyal.

The Comprehensive Geriatric Evaluation Sheet was utilized to gather detailed information, including demographic data such as name, age, sex, height, weight, and BMI. The sheet also captured past and present medical history, surgical history, and chief complaints. A thorough assessment was conducted to

identify the presence of neurological conditions, chronic pain, hearing or visual impairments, lower extremity pain or illnesses, dizziness, vestibular issues, cardiorespiratory diseases, mental disorders, and the use of assistive devices. The evaluation also consists of assessment of Fall history, Mobility and fall risk, depression and cognitive impairment using

Timed Up and Go test (TUG), Fall Efficacy Scale - International (FES-I), Short form Geriatric Depression Scale (SFGDS) and Montreal Cognitive Assessment Tool (MoCA). The collected data and response from the subjects were systematically tabulated and analysed using descriptive statistics.

## RESULT

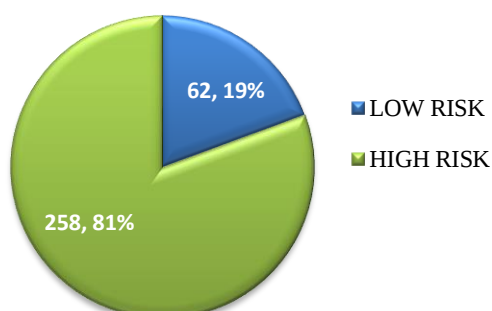
This Study involved a sample of 320 older adults.. Table 1 shows the characteristics of the samples studied in this research. The average age of the sample was 74 years (SD=6.06), with ages ranging from 64 to 85 years. The study sample included 55% females and 45% males, among which 60% were considered to be obese and 33% considered to have normal body built.

**Table 1 – Characteristics of Samples**

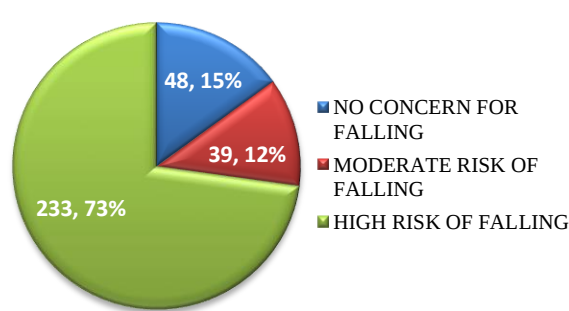
| Variable                                         | Number | Percentage |
|--------------------------------------------------|--------|------------|
| <b>Age range (years)</b>                         |        |            |
| 64 to 69                                         | 119    | 37%        |
| 70 to 79                                         | 126    | 39%        |
| ≥80                                              | 75     | 23%        |
| <b>Gender</b>                                    |        |            |
| Male                                             | 176    | 45%        |
| Female                                           | 144    | 55%        |
| <b>BMI</b>                                       |        |            |
| Lean                                             | 21     | 5%         |
| Normal                                           | 107    | 33%        |
| Obese                                            | 192    | 60%        |
| <b>Comorbidities – Diabetes and Hypertension</b> |        |            |
| No history of both                               | 26     | 8%         |
| History of diabetes only                         | 112    | 35%        |
| History of hypertension only                     | 59     | 18%        |
| History of both                                  | 123    | 38%        |
| <b>History of any other systemic illness</b>     |        |            |
| Yes                                              | 56     | 18%        |
| None                                             | 264    | 82%        |
| <b>Assistive Device usage</b>                    |        |            |
| Yes                                              | 107    | 33%        |
| No                                               | 213    | 67%        |

On evaluating the Fall Risk, the risk of falling assessed through Timed up and go test 62 (19%) of the older adults performed the test in less than 12 seconds, which reveals no risk of falling among them, whereas 258 (80%) completed the TUG test between 13 sec to 41sec indicating high risk of falling (figure 1). In the FES scoring majority of the population (233) were grouped in the category of High risk of falling and 39 individuals were categorised under moderate risk of falling (figure 2).

**Figure 1 - TUG score**



**Figure 2 - FES Scoring**



The Short Form Geriatric Depression Scale (SFGDS) was utilized to assess the prevalence of depression among the elderly. Among the 320 participants, 63.4% were found to be depressed. Among depressed respondents, 36.5% of respondents were having mild depression, 15.3% moderate depression and 11.5% severe depression (Figure 3). The cognitive abilities of elderly individuals were assessed using the Montreal Cognitive Assessment (MoCA) tool. The findings revealed that 7% of the elderly participants exhibited severe cognitive impairment, while the majority, 64.3%, demonstrated mild cognitive impairment. (figure 4).

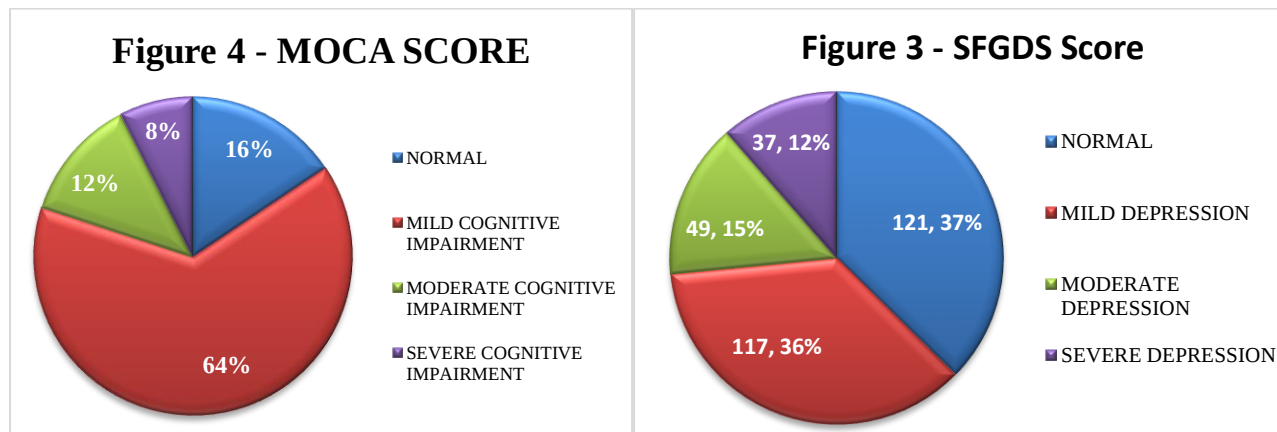


Table 2 summarises the prevalence rate of all the variables (Mobility, fall risk, depression, cognitive impairment) evaluated using TUG test, MOCA, SFGDS, FES through this comprehensive assessment conducted for the elderly in East Chennai.

**Table – 2**

| S.NO | VARIABLE               | TOOL USED                              | PREVALENCE PERENTAGE |
|------|------------------------|----------------------------------------|----------------------|
| 1    | Mobility and Fall Risk | Timed Up and Go test                   | 81%                  |
| 2    | Fall risk              | Falls Efficacy Scale                   | 73%                  |
| 3    | Depression             | Short Form Geriatric Depression Scale  | 63.4%                |
| 4    | Cognitive Impairment   | The Montreal Cognitive Assessment tool | 84%                  |

Overall, the highest prevalence was observed in cognitive impairment, with 84% of individuals showing signs, while depression had the lowest prevalence at 63.4%. These findings emphasize the importance of addressing mobility, fall risk, depression, and cognitive health in the population assessed.

## DISCUSSION

The aim of this study was to screen the health status of elderly and identifying the prevalence of Falls, depression and cognitive impairments among them in East Chennai region. Old age is a period of transition in which individuals must navigate not only the physical aspects of aging but also the challenges that impact their mental and social well-being. Numerous factors like deteriorating physical health and aging process of the brain, escalates the overall prevalence of mental and physical disorders among the elderly<sup>(5)</sup>. The findings of this study reveal that 81% of participants reported a high risk of falls, indicating a substantial prevalence of fall risk within the population studied. Several factors may subscribe to the elevated risk of falls identified in this study. Age-related changes such as diminished muscle strength, impaired balance, and declining cognitive function are well-documented contributors to fall susceptibility, particularly among older adults. Additionally, environmental hazards, such as poorly lit areas,

uneven flooring, or lack of assistive devices, may exacerbate the likelihood of falls. Comorbidities like arthritis, diabetes, and neurological disorders further compound the risk. The high prevalence observed may also reflect limited awareness or access to preventive measures, highlighting the need for widespread educational and intervention efforts.

As to the association with obesity, it is seen that 60% of the sample were categorised as Obese during BMI calculation. This high prevalence aligns with other studies that have reported a significant correlation between obesity and fall risk<sup>(13)</sup>. This association is physiologically plausible, as excess weight, particularly accumulation of fat in the abdominal region, contributes to postural imbalance and altered biomechanics. Obese individuals often exhibit a reduced amplitude of movement and increased torque in the ankle joint to maintain balance, both of which heighten their susceptibility to falls<sup>(13)</sup>. Given these findings, interventions targeting weight maintenance or reduction among elderly individuals are critical, as

obesity physical activity programs focusing on strength and balance training, and behavioural counselling could play a vital role in mitigating fall risk within this population.

The study revealed a strikingly high prevalence of cognitive impairment, with 84% of the elderly participants showing signs of diminished cognitive function. This finding is consistent with existing literature that identifies cognitive decline as a common issue among aging populations<sup>(14,15)</sup>. Cognitive impairment also has a direct impact on fall risk, as it compromises individuals' ability to recognize environmental hazards, react appropriately to balance disturbances, and maintain attention during complex motor tasks. This interplay between cognitive impairment and fall risk underscores the need for integrated approaches to screening and intervention<sup>(14)</sup>. In light of this, cognitive-behavioural approaches specifically designed to address the fear of falling have been developed and implemented in the literature. Through cognitive restructuring and behavioral modifications, these programs aim to alleviate the fear of falling by enhancing self-efficacy and the sense of control over falls. This approach has shown improvement in fear of falling and decreasing the falls episodes, although mixed results have been documented in increasing activity levels<sup>(16,17)</sup>.

Our study identified the prevalence of depression to be 63% of the elderly, a finding notably lower than what is commonly reported in existing literature. The discrepancy between our findings and previous research highlights the heterogeneity of depression prevalence among the elderly. Depression is independently associated with an heightened risk of falls in the elderly<sup>(18)</sup>. Depressed individuals often exhibit decreased physical activity, muscle weakness, and slower reaction times, all of which compromise mobility and balance. Additionally, the use of antidepressant medications, particularly sedatives, can increase the risk of falls due to side effects such as dizziness or hypotension. In geriatric depression, a diminished appetite and subsequent weight loss are frequently reported symptoms, often contributing to a decline in overall health and vitality. These nutritional challenges can exacerbate existing vulnerabilities in older adults. In particular, deficiencies in essential nutrients such as vitamin D and folate are not only common but have also been associated with a heightened risk of falls. This connection underscores the critical role of adequate nutrition in maintaining physical stability and preventing injury in elderly populations<sup>(19,20)</sup>.

The relationships between depression, cognitive impairment, falls, and mobility in the elderly are complex and multifaceted, with each factor influencing and amplifying the others in a cyclical manner. Hence, this study features the need for a

holistic approach to understanding and addressing these issues in aging populations. The complex relationship between the high prevalence of cognitive impairment and falls underscores the necessity for a multimodal treatment approach which includes cognitive behavioural therapy in fall prevention.

## CONCLUSION

In conclusion, We found an occurrence of 81% of falls, 63% depression among elderly individuals with a mean age of 74 years. The highest prevalence was observed in cognitive impairment, with 84% of individuals showing symptoms. The interrelationship between the Cognitive impairment and falls identified in this study between highlights the need for a multidimensional approach to geriatric care integrating fall prevention and cognitive Behavioural Therapy and rehabilitation as prime interventions.

**ACKNOWLEDGEMENT** – I would like to express my sincere gratitude to my mentor Dr Rajalaxmi for providing me with invaluable insights and direction. I am grateful to my parents and friends for their constant encouragement, patience and understanding.

## FUNDING - SELF

## CONFLICT OF INTEREST - NONE

## AUTHORS CONTRIBUTION –

- **K Muthulakshmi** – conceptualization, methodology, project administration, validation, formal analysis, investigation, resources.
- **V Rajalaxmi** – data curation, writing – original draft, writing – review and editing, formal analysis, supervision.
- **C V Senthil Nathan** – methodology, resources, data curation, formal curation, formal analysis, supervision.
- **K Kotteeswaran** - methodology, resources, data curation, formal curation, formal analysis, supervision.

**ETHICAL APPROVAL** - This study was approved by the Institutional Ethical committee of A.C.S. Medical College Hospital A constituent Unit of Dr. M.G.R. Educational And Research Institute (Deemed To Be University) Regd. No: ECR/1857/Inst/TN/2023 Dt: 5th July 2023.

**DATA AVAILABILITY** - No new datasets were generated or analyzed during the current study.

## ABBREVIATION –

- WHO – world health organisation
- TUG – timed up and go
- MOCA - The Montreal Cognitive Assessment tool
- SFGDS – short form geriatric depression scale

- FES – Falls efficacy scale

## REFERENCE:

1. Ageing and health. [cited 2025 Jan 8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
2. Lee SB, Oh JH, Park JH, Choi SP, Wee JH. Differences in youngest-old, middle-old, and oldest-old patients who visit the emergency department. *Clin Exp Emerg Med.* 2018;5(4):249-255.
3. Khan S, Itrat M. Current issues in geriatric health care in India – A review. *J Comm Med Health Care.* 2016;1(1):1003-1006.
4. Paul NsS, Asirvatham M. Geriatric health policy in India: The need for scaling-up implementation. *J Family Med Prim Care.* 2016;5(2):242.
5. Ingle GK, Nath A. Geriatric Health in India: Concerns and Solutions. *Indian J Community Med.* 2008;33(4):214.
6. Malik C, Khanna S, Jain Y, Jain R. Geriatric population in India. *J Family Med Prim Care.* 2021;10(1):72–6.
7. Verma A, Aggarwal S, Garg S, Anand P. Geriatric Health Care in India: A Review. *Journal. Indian Academy of Clinical Medicine.* 2019;20(3–4):212–9.
8. Almeida LM da S, Meucci RD, Dumith SC. Prevalence of falls in elderly people: a population based study. *Rev Assoc Med Bras.* 2019;65(11):1397–403.
9. Barrett-Connor E, Weiss TW, McHorney CA, Miller PD, Siris ES. Predictors of falls among postmenopausal women: results from the National Osteoporosis Risk Assessment (NORA). *Osteoporos Int.* 2009;20(5):715–22.
10. Enrietto JA, Jacobson KM, Baloh RW. Aging effects on auditory and vestibular responses: a longitudinal study. *Am J Otolaryngol.* 1999;20(6):371–8.
11. Rubenstein LZ. Falls in older people: epidemiology, risk factors and strategies for prevention. *Age Ageing.* 2006;35.
12. Rosen SL, Reuben DB. Geriatric assessment tools. *Mt Sinai J Med.* 2011;78(4):489–97.
13. Siqueira FV, Facchini LA, Silveira DS, Piccini RX, Tomasi E, Thumé E, et al. Prevalence of falls in elderly in Brazil: a countrywide analysis. *Cad Saude Publica.* 2011;27(9):1819-26.
14. Barberger-Gateau, P., & Fabrigoule, C. Disability and cognitive impairment in the elderly. *Disability and Rehabilitation.* 1997;19(5), 175–193.
15. Lo Coco, D., Lopez, G., & Corrao, S. (2016). Cognitive impairment and stroke in elderly patients. *Vascular Health and Risk Management.* 12:105–116.
16. Zijlstra GA, van Haastregt JC, Ambergen T. Effects of a multicomponent cognitive behavioural group intervention on fear of falling and activity avoidance in community-dwelling older adults: results of a randomized controlled trial. *J Am Geriatr Soc.* 2009;57:2020–2028.
17. Tennstedt S, Howland J, Lachman M. A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *J Gerontol B Psychol Sci Soc Sci.* 1998;53:P384–P392.
18. Iaboni 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.
19. Shahar D, Levi M, Kurtz I, et al. Nutritional status in relation to balance and falls in the elderly: a preliminary look at serum folate. *Ann Nutr Metab.* 2009;54:59–66.
20. Norman K, Hab U, Pirlich M. Malnutrition in Older Adults-Recent Advances and Remaining Challenges. *Nutrients.* 2021 Aug 12;13(8):2764.