

FUNCTIONAL STATUS AND FALL RISK PROFILE OF THE ELDERLY IN INSTITUTIONAL SETTINGS

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Abstract

Background

The elderly segment of the population is increasing worldwide, and there is wide variation in functional status and fall risk factors among the elderly. The functional status of the elderly living in institutional settings cannot be compared with that of the elderly living in community settings owing to the difference in lifestyle. Studies exploring the functional status and fall risk of the elderly in institutional settings in developing countries are limited.

Methods

A cross-sectional study of the census approach among institutionalized elderly in a district in southern India was conducted. A validated, structured interviewer-administered questionnaire was used in the study. The level of difficulty for each of the functional tasks was separately analyzed. Descriptive statistics were used to describe the sociodemographic characteristics and fall risk profiles of the respondents.

Results

Out of 142 elderlies in eight institutional settings, 103 (73.57%) participated in the cross-sectional descriptive study. Males were 64 (62.1%), and females were 39 (37.9%). The mean age was 69.7, with a standard deviation 7.9. Nearly 27.2% of the elderly had difficulty walking indoors, and 35.9% had difficulty walking outdoors. Around 63.1% of the elderly shared difficulty climbing stairs and 14.6% used assistive aids for ambulation. Institutionalized elderly experienced Vision impairment by 85 (82.5%), and 48.5% of them were using spectacles. Thirty-five (34% of them) had hearing impairments, and only 1% were using hearing aids. Around 47 (45.6%) experienced balance issues, and 42 (40.8%) felt balance issues while making turns while walking. Around 44 (42.7%) of the participants experienced dizziness. A history of falling in the past year was reported by 31.1% of the elderly, and 2% had much

concern about falling over, 5.8 % were quite afraid of falling over, and a little concern about falling was shared by another 25.2 % of the elderly.

Conclusion

Functional status and fall-risk profile evaluations should be regularly performed among institutionalized elderly. Prospective follow-up studies need to be conducted among the elderly in institutional settings to understand the progressive changes in the fall risk profile and incidence of falls. The functional status of most of the subjects in the current study was good, and they had better functional independence. Many risk factors were present among the elderly in institutional settings. Visual impairment was the most important one reported. Other risk factors reported were hearing impairment, history of falls, fear of falling, and use of assistive devices.

INTRODUCTION

The demographic transition in recent decades has resulted in a significant increase in the elderly segment of the population, especially in developing countries. Most developing countries adhere to the definition of the elderly as followed by the United Nations Assembly and consider people 60 years and older as elderly owing to the low life expectancy in these countries [1]. The functional status of the elderly will differ based on various age- and lifestyle-related comorbidities. Functional decline occurs as age progresses among the elderly. The health of the elderly is evaluated on the basis of their functional status level. Functional status is defined as the individual's ability to perform normal daily activities required to meet basic needs, fulfill usual roles, and maintain health and well-being [2]. Basic Activities of Daily Living (BADL) include the normal self-care activities in everyday life such as eating, dressing, toileting, bathing, and transferring.

Functional status shows a decline as age progresses among the elderly. There is a reduction in gait speed, alterations in gait because of balance and stability impairment, loss of strength in the muscles of the lower limbs, and fear of falling. Associations of low gait speed with a history of multiple falls, a lower educational level, and a higher number of medications were reported in a study among community-dwelling elderly [3]. A meta-analysis reported a significant association between gait speed and an increased risk of cognitive decline and dementia [4]. The loss of muscle quality and power has been found to lead to gait, sit-to-stand, and balance impairments [5].

The functional status of the elderly living in institutional settings cannot be compared with that of the elderly living in community settings owing to the difference in lifestyle. It was found that the elderly living in the community are more mobile and have better functional status [6]. Many risk factors lead to falls among the elderly. Older age, female gender, balance impairment, low vision, poor gait speed, fear of falling, moderate depression, and poor cognition are the main risk factors reported [7]. Some fall risk factors are modifiable. Studies exploring the functional status and fall risk of the elderly in institutional settings in developing countries are limited. Hence, a cross-sectional study of the census approach among institutionalized elderly people in a district in southern India was conducted.

METHODS

A cross-sectional survey with a quantitative approach was conducted among the elderly residing in various institutional settings in Kozhikode. A validated, structured interviewer-

administered questionnaire was used in the study. The level of difficulty for each of the functional tasks was separately analyzed. Descriptive statistics were used to describe the sociodemographic characteristics and fall risk profiles of the respondents. The data was collected between September 2022 and December 2022. Jamovi (Version 2.3) and R software (Version 4.1) were used for statistical analysis.

Ethical clearance for the study was obtained from the Institutional Ethical Committee of IQRAA International Hospital and Research Centre, Kozhikode (IEC/2021/04/03). The cross-sectional study was conducted according to ethical guidelines. Informed consent was obtained from participants, and they were assured of confidentiality. The questionnaires were serially coded, and the data were entered on a computer. The data were protected, and access was limited to the research team and statisticians.

RESULTS

A demographic profile of 103 institutionalized elderly residing in eight settings in Kozhikode district was collected. Males were 64 (62.1 %) and females were 39 (37.9 %). The mean age was 69.7, with a standard deviation 7.9.

Educational Level	Counts	% of the Total	Cumulative %
Not Attended School	12	11.7 %	11.7 %
Primary	34	33.0 %	44.7 %
Upper Primary	22	21.4 %	66.0 %
High School	28	27.2 %	93.2 %
Pre-Degree	4	3.9 %	97.1 %
Graduation	3	2.9 %	100.0 %

Table 1: Educational Level of the Institutionalized Elderly

Years living in the institution	Counts	% of the Total	Cumulative %
Less than 1 year	36	35.0 %	35.0 %
1	17	16.5 %	51.5 %
2	27	26.2 %	77.7 %
3	4	3.9 %	81.6 %
4	5	4.9 %	86.4 %
5	2	1.9 %	88.3 %
6	2	1.9 %	90.3 %
7	3	2.9 %	93.2 %
8	2	1.9 %	95.1 %
10	3	2.9 %	98.1 %
11	1	1.0 %	99.0 %
More than 25 years	1	1.0 %	100.0 %

Table 2: Years living in the Institution

Nearly 27.2 % of the elderly had difficulty walking indoors, and 35.9 % had difficulty walking outdoors. Around 63.1% had difficulty climbing stairs, and 14.6% of the elderly used assistive aids for ambulation. Table.3 depicts the types of assistive aids for ambulation and their frequencies.

Regarding vision, impairment was experienced by 85 (82.5 %), and 48.5 % of them are using spectacles. Nearly; 18.4% had undergone cataract surgery. Among them, 57.9 % had undergone cataract surgery in both eyes. Another 15.8 % had undergone cataract surgery in their left eyes and 26.3 % in their right eyes. Thirty-five (34 % of them) had hearing impairments, and only 1% were using hearing aids. Balance issues were faced by 47 (45.6 %) of the elderly, and 42 (40.8 %) felt balance issues while making turns while walking. Among the participants, 44 (42.7%) experienced dizziness. Around 31.1% felt dizziness while coming to sit from lying in bed, and 30.1% felt dizziness while coming to stand from sitting.

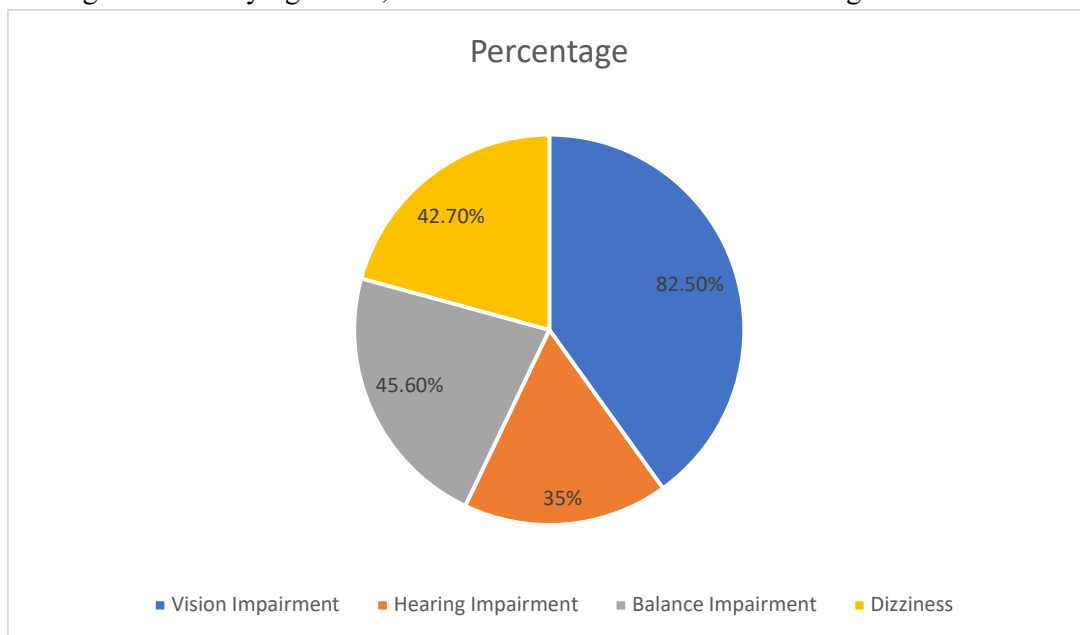


Figure 1: Percent of Sensory Impairment in the Elderly

The elderly reported a history of falling by 31.1 %. Out of them, 15.5 % had a single fall episode, while another 8.7 % had two episodes of fall, and 7.8 % had more than two episodes of fall. Two percent of the elderly were concerned about falling over, and, 5.8 % were quite afraid about falling over. A little concern about falling was shared by another 25.2 % of the elderly.

The Type of Assistive Aids for Ambulation	Counts	% of the Total	Cumulative %
Cane	4	28.6 %	28.6 %
Tripod	1	7.1 %	35.7 %
Walking Frame	7	50.0 %	85.7 %
Wheel Chair	2	14.3 %	100.0 %

Table 3: Types and frequency of assistive aids of ambulation used by the elderly

Frequencies of support needed for Activities of Daily Living among the elderly are as depicted in Table 4.

Support Needed for Activities of Daily Living	Not at all	Quite a little	Little	Very much
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Sitting up from Lying in Bed	82.5 %	11.7 %	3.9 %	1.9 %
Sitting to Standing	75.7 %	15.5 %	6.8 %	1.9 %
Standing to Sitting	78.6 %	12.6 %	6.8 %	1.9 %
Changing Dress	92.2 %	2.9 %	3.9 %	1.0 %
Sitting in Commode	84.5 %	7.8 %	5.8 %	1.9 %
Standing up from Commode	81.6 %	9.7 %	6.8 %	1.9 %
Cleaning yourself after toileting	91.3 %	2.9 %	4.9 %	1.0 %
Taking Bath	89.3 %	2.9 %	6.8 %	1.0 %
Having Food	94.2 %	2.9 %	1.9 %	1.0 %
Wearing Footwear	91.3 %	5.8 %	1.9 %	1.0 %

Table 4: Frequencies of support needed for Activities of Daily Living among the elderly

DISCUSSION

A systematic review found that age, male gender, functional status at baseline, length of stay in an institutional setting, presence of urinary incontinence, depression, being married, and stroke history were predictive factors for functional decline in institutional elderly [8]. In the current study, most participants were functionally independent and did not have much impairment. Similar findings have been reported in a study among the elderly residing in residential settings and visiting general practitioner clinics [9]. It has been reported that most of the elderly below the age of 80 are functionally independent even in the presence of chronic disorders. Major health changes, transition toward progressive decline, occur between the ages of 80 and 85 years [10].

Nearly 27.2 % of the elderly had difficulty walking indoors, and 35.9 % had difficulty walking outdoors. Around 63.1 % of the elderly had difficulty climbing stairs. Gait speed was found to be slower in institutionalized elderly compared with their community-dwelling counterparts [11]. Significant reductions in knee extensor muscle size occur as age progresses among the elderly, causing difficulty in activities requiring good knee extensor strength such as fast walking, stair ascending, stair descending, sit-to-stand transition, and squatting [12].

Optimal physical balance performance is considered an indicator of good health and functional status in the elderly. Deterioration in balance performance with aging has been reported [13]. Balance issues were faced by 47 (45.6 %) of the elderly, and 42 (40.8 %) felt balance issues while making turns while walking in the current study. It was found that balance ability determines sustained walking distance and speed among the elderly in institutional settings [14].

Dizziness is a common problem among the elderly and is considered a risk factor for falling. In this study, 44 people (42.7%) experienced dizziness. A similar cross-sectional study among institutionalized elderly people reported that 48.9% of the elderly subjects had dizziness [15]. Around 31.1% felt dizziness while coming to sit from lying in bed, and 30.1% felt dizziness while coming to stand from sitting. A significant association between dizziness and the

presence of diseases of the musculoskeletal system, sub-connective tissue, and genitourinary system, as well as medication use for the musculoskeletal system has been reported [15].

The elderly will need assistive devices to counter the deterioration of their physical health and to maintain their functional status. Walking aid use reduces the chances of falling. Around 14.6 % of the elderly use assistive aids for ambulation. The walker is the most commonly used assistive devices. Social image plays a key role in the attitude of the elderly toward using assistive aids. The use of a standard-size walker and the transfer of body weight to the frame are recommended to enhance stability [16].

Educational status was associated with functional status. Higher educational levels lead to enhanced health literacy and the adoption of health-promoting behaviors [17]. However, such a relationship could not be found in the current study, as 66% of the elderly had education less than high school grade and the functional status of the majority was good.

Visual impairment affects the functional status of older people. The most common causes of visual impairment among the elderly were cataracts, presbyopia, glaucoma, diabetic retinopathy, and age-related macular degeneration [18]. In the current study, 85 (82.5 %) of the institutionalized elderly experienced visual impairment, and 48.5 % of them were using spectacles. It was reported in previous studies that the prevalence of visual impairment is higher in the elderly in institutional settings compared to their community-dwelling counterparts [19, 20]. Visual impairment is considered a risk factor for falls. Studies in Southern India found that the presence of visual impairment, chronic diseases, balance impairment, fear of falling, and a history of a previous fall are the risk factors for falls in the elderly in residential settings [21,22]. A longitudinal study in India found that around 34% of the elderly experience visual impairment, and the incidence of falls was 16% higher among them [23]. Nearly 18.4 % had undergone cataract surgery. Among them, 57.9 % had undergone cataract surgery in both eyes. Another 15.8 % had undergone cataract surgery in their left eyes and 26.3 % in their right eyes. It has been reported that corrected refractive error can be corrected with spectacles, and such a measure leads to a reduction in the fall rate [7]. Cataract surgery was also believed to lead to a reduction in falls. However, such an association between cataract surgery and fall reduction could not be established in reported studies [7].

Mild to moderate hearing impairment was associated with falls in a study among institutionalized elderly people in southern India [7]. In the current study, 35 percent of the elderly reported hearing impairment, but only 1% used hearing aids.

The strongest predictor of fall is a previous history of fall. The elderly with a history of multiple falls are in the higher-risk zone. Nearly 31.1% had a history of falling in the past year. It is comparable to a previous study among institutionalized elderly, which reported a 29.1% fall in the past year [7]. A large study among the elderly in the United States reported a 23% fall among older adults [24]. In the current study, 15.5 % had a single fall episode, while another 8.7 % had two episodes of fall, and 7.8 % had more than two episodes of fall. The history of falls in the previous year is considered as good predictor of the fear of falling [25]. In the current study, 2% of the elderly were very concerned about falling over, and 5.8 % were quite afraid of falling over. A little concern about falling was shared by another 25.2 % of the elderly.

Conclusions

The functional status of most of the subjects in the current study was good, and they had better functional independence. Many risk factors were present among the elderly in institutional

settings. Visual impairment was the most important one reported. Other risk factors reported were hearing impairment, history of falls, fear of falling, and use of assistive devices.

It is recommended that visual and auditory screening be regularly performed among institutionalized elderly. Remedial measures such as corrective lenses, cataract surgery, and hearing aid support should be provided. Balance evaluation and interventions to improve balance should be given priority. Prospective follow-up studies need to be conducted among the elderly in institutional settings to understand the progressive changes in the fall risk profile and incidence of falls.

REFERENCES

1. Ajayi SA, Adebuseye LA, Ogunbode AM, Akinyemi JO, Adebayo AM: Profile and correlates of functional status in elderly patients presenting at a primary care clinic in Nigeria. *African J Prim Heal care Fam Med*. 2015, 7: 10.4102/phcfm.v7i1.810
2. Elsayy B, Higgins KE: The geriatric assessment. *Am Fam Physician*. 2011, 83:48–56.
3. Kyrdalen IL, Thingstad P, Sandvik L, Ormstad H: Associations between gait speed and well-known fall risk factors among community-dwelling older adults. *Physiother Res Int*. 2019, 24:e1743. 10.1002/pri.1743
4. Quan M, Xun P, Chen C, et al.: Walking Pace and the Risk of Cognitive Decline and Dementia in Elderly Populations: A Meta-analysis of Prospective Cohort Studies. *Journals Gerontol Ser A Biol Sci Med Sci*. 2017, 72:266–70. 10.1093/gerona/glw121
5. Millor N, Cadore EL, Gómez M, et al.: High density muscle size and muscle power are associated with both gait and sit-to-stand kinematic parameters in frail nonagenarians. *J Biomech*. 2020, 105:109766. 10.1016/j.jbiomech.2020.109766
6. Johnson SJ: Frequency and Nature of Falls among Older Women in India. *Asia Pacific J Public Heal*. 2006, 18:56–61. 10.1177/10105395060180010901
7. Marmamula S, Barrenkala NR, Challa R, et al.: Falls and visual impairment among elderly residents in ‘homes for the aged’ in India. *Sci Rep*. 2020, 10:13389. 10.1038/s41598-020-70066-2
8. Moreno-Martin P, Jerez-Roig J, Rierola-Fochs S, et al.: Incidence and Predictive Factors of Functional Decline in Older People Living in Nursing Homes: A Systematic Review. *J Am Med Dir Assoc*. 2022, 23:1815-1825.e9. 10.1016/j.jamda.2022.05.001
9. Talarska D, Strugała M, Szewczyzak M, Tobis S, Michalak M, Wróblewska I, Wieczorowska-Tobis K: Is independence of older adults safe considering the risk of falls? *BMC Geriatr*. 2017, 17:66. 10.1186/s12877-017-0461-0
10. Santoni G, Angleman S, Welmer A-K, Mangialasche F, Marengoni A, Fratiglioni L: Age-Related Variation in Health Status after Age 60. *PLoS One*. 2015, 10:e0120077. 10.1371/journal.pone.0120077
11. Marques NR, dos Santos APDML, Camilo GF, et al.: Effect of different residential settings on gait kinematic parameters in older adults with cognitive impairment. *Hum Mov Sci*. 2021, 75:102747. 10.1016/j.humov.2020.102747
12. Ozaki H, Nakagata T, Yoshihara T, et al.: Effects of Progressive Walking and Stair-Climbing Training Program on Muscle Size and Strength of the Lower Body in Untrained Older Adults. *J Sports Sci Med*. 2019, 18:722–8.
13. Wu H, Wei Y, Miao X, et al.: Characteristics of balance performance in the Chinese

- elderly by age and gender. *BMC Geriatr.* 2021, 21:596. 10.1186/s12877-021-02560-9
14. Bowen ME, Crenshaw J, Stanhope SJ: Balance ability and cognitive impairment influence sustained walking in an assisted living facility. *Arch Gerontol Geriatr.* 2018, 77:133–41. 10.1016/j.archger.2018.05.004
 15. Rosa TSM, de Moraes AB, dos Santos Filha VAV: The institutionalized elderly: sociodemographic and clinical-functional profiles related to dizziness. *Braz J Otorhinolaryngol.* 2016, 82:159–69. 10.1016/j.bjorl.2014.12.014
 16. Thies SB, Russell R, Al-Ani A, et al.: An investigation of the effects of walking frame height and width on walking stability. *Gait Posture.* 2020, 82:248–53. 10.1016/j.gaitpost.2020.09.017
 17. Bennett JS, Boyle PA, James BD, Bennett DA: Correlates of health and financial literacy in older adults without dementia. *BMC Geriatr.* 2012, 12:30. 10.1186/1471-2318-12-30
 18. Miller KE, Zylstra RG, Standridge JB: The geriatric patient: A systematic approach to maintaining health. *Am Fam Physician.* 2000, 61:1089–94.
 19. Dev MK, Shrestha GS, Paudel N, Joshi ND, Thapa M, Shah DN: Visual status and ocular morbidity in older adults living in residential care. *Graefes Arch Clin Exp Ophthalmol.* 2012, 250:1387–93. 10.1007/s00417-012-2056-y
 20. Marmamula S, Ravuri CSL V, Boon MY, Khanna RC: A cross-sectional study of visual impairment in elderly population in residential care in the South Indian state of Andhra Pradesh: a cross-sectional study. *BMJ Open.* 2013, 3:e002576. 10.1136/bmjopen-2013-002576
 21. Dhargave P, Sendhilkumar R: Prevalence of risk factors for falls among elderly people living in long-term care homes. *J Clin Gerontol Geriatr.* 2016, 7:99–103. 10.1016/j.jcgg.2016.03.004
 22. Berg WP, Alessio HM, Mills EM, Tong C: Circumstances and consequences of falls in independent community-dwelling older adults. *Age Aging.* 1997, 26:261–8. 10.1093/aging/26.4.261
 23. Singh RR, Maurya P: Visual impairment and falls among older adults and elderly: evidence from longitudinal study of aging in India. *BMC Public Health.* 2022, 22:2324. 10.1186/s12889-022-14697-2
 24. Jia H, Lubetkin EI, DeMichele K, Stark DS, Zack MM, Thompson WW: Prevalence, risk factors, and burden of disease for falls and balance or walking problems among older adults in the U.S. *Prev Med (Baltim).* 2019, 126:105737. 10.1016/j.ypmed.2019.05.025
 25. Lavedán A, Viladrosa M, Jürschik P, Botigué T, Nuín C, Masot O, Lavedán R: Fear of falling in community-dwelling older adults: A cause of falls, a consequence, or both? *PLoS One.* 2018, 13:e0194967. 10.1371/journal.pone.0194967