# Risk Profiles for fall among Elderly People in South India

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## ABSTRACT

**Background:** Globally, the population of elderly people aged ≥65 years is increasing and is projected to reach 1.5 billion by 2050. In India, the elderly people constitute 8.1% of the total population. Falls are a major health problem in an elderly people and are the second leading cause of accidental or unintentional injury deaths worldwide.

**Methods**: A cross-sectional study was carried out amongst 195 elderly people from March to July 2018 in Khammam District of Telangana State. Data collected includes socio-demographic characteristics, fall events, medication use, co-morbidity, visual and hearing impairment, walking aid use, smoking and alcohol consumption. For an assessment of functional status, the activities of daily living (ADL) and instrumental activities of daily living (IADL) scale were used.

**Result**s: A total of 195 elderly people with a mean age of fallers were 68.4±10 years and that of non-fallers were 66.7±5.5 years. The prevalence of falls in the past one year was reported to be 13.8%. Age, gender, comorbidity, visual impairment, living alone and poor sleep quality were associated with falls.

**Conclusion**: The overall prevalence of fall among elderly was found to be 13.8% with majority of falls in indoor settings. More efforts needed to reduce falls related to home environment with a special focus on elderly people and females.

**Key words**: Elderly, Epidemiology, Falls, Risk factors

## INTRODUCTION

The population of worldwide elderly people aged ≥65 years is projected to reach 1.5 billion by 2050, a dramatic three fold increase from 524 million in 2010, with the highest increase in developing countries.[1] India's elderly population is also growing rapidly and accounted for 8.1% of the total population in 2011.[2] According to the World Health Organization (WHO), each year an estimated 6,46,000 individuals die from falls globally, over 80% live in low and middle income countries. Falls are a major public health problem in older adults and are the second leading cause of accidental or unintentional injury deaths worldwide.[3] Previous investigations have identified falls in older people in India as a major public health issue.[4] A recent survey of adults over 60 years of age in urban, rural and slum areas of Chandigarh in India found that 31% of the 300 survey participants had fallen in the last year and that injuries occurred in 67% among fallers.[5]

Although falls among elderly people is not necessarily an indicator of an underlying poor health condition, consequences of falls may predispose them to adverse outcomes. Falls results in disability, loss of mobility, decline in the functional capacity, poor quality of life, decrease of autonomy, reduction insocial activity and psychological distress. They are also associated with high economic and social costs when there is impairment of the independence of elderly people and the need for specialized care at home or in long-term institutions.[6] Furthermore, falls can have a detrimentaleffect on an individuals' confidence i.e. following a fall,

older peoplecan develop a fear of falling decreasing their levels of activity in an attempt to prevent further falls. Falls among elderly people are caused by the interaction of multiple risk factors including intrinsic and extrinsic factors. A previous meta-analysis revealed that a history of falls, instrumental disability, walking aid use, cognitive impairment, history of stroke, urinary incontinence, rheumatic disease, dizziness and vertigo, diabetes, pain, fear of falling, Parkinson's disease, a number of medications, use of sedatives, use of antiepileptics and gait problems were associated with the risk of falls among elderly people.[7] The identification and removal of these risk factors associated with falls is very important for the prevention and control of falls among elderly people.

Studies conducted in different parts of India have reported prevalence of fall among elderly people between 13% and 53% among elderly people and various factors were found to be associated with fall including older age, females, poor body balance, a number of medications, musculoskeletal causes and visual defect, neurological illness, syncope, vestibular causes, hypertension, postural hypotension, dementia, cognitive and physical impairment.[8-12] However, there is no data available on the prevalence of fall and its associated factors in Khammam district of Telangana state in South India. Keeping this in mind, this study was aimed to estimate the prevalence of fall among community dwelling elderly people in Khammam, and to describe the socio-demographic and health related factors associated with fall.

## MATERIALS AND METHODS

Study Design and Study Population - A cross-sectional study was carried out amongst 195 elderly people (≥65 years) from March to July 2018 in Khammam District of Telangana State. The urban health center of Mamata Medical College and Hospital has six areas from which three areas were randomly selected. The total number of households in these three areas was 1175. In 937 houses, there were no elderly people, non response was obtained in 63 houses and in 17 houses elderly people were bed ridden, confined to a wheel chair or suffering from a terminal disease. Hence, we surveyed 158 households and total 195 elderly people were interviewed. A pilot tested and validated structured questionnaire was used to collect the data from elderly people.

Study Definitions - Fall was defined as an unexpected event in which the individual comes to rest on the ground, floor or lower level.[13] Those resulting from outside events, such as a motor vehicle accident or violence were excluded.

Data Collection Techniques and Tools - The information obtained from the study participants included socio-demographic characteristics (age, gender, marital status, education level, occupation, living arrangements) and questions regarding use of oral medications, comorbidity (hypertension, dyslipidemia, diabetes, cancer, chronic lung diseases,liver disease,heart disease, stroke, kidney disease, stomach or other digestive disease, emotional, nervous or psychiatric problems, memory related disease, arthritis or rheumatism and breathlessness), fall events, use of a walking aid, physical activity participation, smoking and alcohol consumption. Participants were asked if in thelast 12 months they had suffered a fall, how many times they had fallen, how many of thefalls resulted in aninjury, how many of the falls resulted in going to hospital and howmany of the fallsresulted in being admitted to hospital. The interviews were conducted in the community. Before starting the interview, each participant was explained in brief about the need and purpose of the study. The importance for their cooperation for the success of the study and possible benefits to the community through the findings of the study were emphasized. The study protocol and questionnaire was approved by the Institutional Ethical Committee at Mamata Medical College and Hospital. The informed consent was obtained from each interviewee before enrolment in the study and confidentiality of the information was maintained throughout the study.

For an assessment of anthropometry, weight was measured to the nearest 0.1 kg using a portable standardized weighing machine with a maximum capacity of 100 kg. All subjects were weighed barefoot while wearing light clothing. The zero mark on the scale was checked after every reading for accuracy. Height was measured to the nearest 0.1cm using a portable stadiometer while the subject stood barefoot with their head, buttocks and heels touching the instrument and their head in the Frankfurt plane. Identification of individuals who were overweight or obese was conducted using body mass index (BMI). It was determined using the formula BMI = weight in kg/height in m$^2$. Patients with a BMI less than 18.5 kg/m$^2$ were considered underweight, those with a BMI of 18.5-22.9 kg/m$^2$ were normal weight, and those with a BMI 23.0-24.9 kg /m2 were overweight and those with a BMI 25.0 kg/m$^2$ or above were obese, according to the WHO Asian adult body weight standard.[14]

For an assessment of functional status, the activities of daily living (ADL) scale containing 6 items (bathing, dressing, carrying out personal toileting, moving from bed to chair, bowel or urine continence and eating) and the instrumental activities of daily living (IADL) scale containing 8 items (telephone usage, shopping, cooking, housekeeping,

laundry, transportation, ability to take medications and financial management) were used. Balance was assessed using tandem walk test, finger nose test and 360 degree turn test.[11-13]

Statistical Analysis - All statistical analyses were performed using SPSS, version 18.0 (SPSS Inc., Chicago, IL). For continuous variables means and standard deviations (SD) were used to present the data, while categorical variables were presented as frequency and percentages. Fallers were compared with non-fallers. Appropriate tests of significance (Chi-square, Student's t and F-tests) were applied wherever necessary at the 5% level of significance. A p<0.05 was considered as statistically significant at 95% confidence level.

## RESULTS

As observed from Table 1 that the majority of the participants (77.8%) fell in indoor settings and 22.2% fell outdoor settings. In the house, most of the fall incidents occurred in living room (23.8%) followed by the bathroom & kitchen (19%), and bedroom & on the stairs (9.6%).

### Table 1: Location of falls in the house

| Location | Frequency (%) |
|---|---|
| *Indoor* | 21 (77.78) |
| Living room | 05 (23.8) |
| Kitchen | 04 (19.0) |
| Bathroom | 04 (19.0) |
| Bedroom | 02 (9.6) |
| On the stairs | 02 (9.6) |
| Outside compound | 04 (19.0) |
| *Outdoor* | 06 (22.22) |

It was seen from Table 2 that the falls were more frequent in women (p=0.036), in individuals older than 65 years (p=0.039), in those who are living alone (p=0.043), in those who reported morbidity (p=0.008), in those with vision impairment (p=0.020) and in those with poor sleep duration (p=0.033). Approximately 37% of participants were female and had a mean body mass index of 23.96±4kg/m². The mean age of fallers was 68.4±10 years and that of non-fallers was 66.7±5.5 years. The prevalence of falls in the last year was 13.8%. The prevalence of falls was 44.4% in males and 55.6% in females. Regarding the number of falls, 58.7% of the older adults suffered a single fall, 28.1% fell twice and 13.2% fell three or more times in the last year. It was found that 42.1% of the sample mentioned the need to use at least one drug continually. There was no association between education, marital status, income, occupation, and smoking, hearing impairment, living arrangement, use of medication or physical activity and experi-

encing of all. Majority of the participants under study were considered as independent to carry out activities (88.2%) and instrumental activities (72.8%) of daily living.

### Table 2: Comparison of socio-demographic characteristics with fall experience

| Characteristics | Fallers (n=27)(%) | Non-fallers (n=168) (%) | OR (95%CI) | P value |
|---|---|---|---|---|
| **Age (in yrs)** | | | | |
| <=65 | 14 (51.9) | 53 (31.5) | 0.43 | 0.039 |
| >65 | 13 (48.1) | 115 (68.5) | (0.19-0.97) | |
| **Gender** | | | | |
| Female | 15 (55.6) | 58 (34.5) | 0.42 | 0.036 |
| Male | 12 (44.4) | 110 (65.5) | (0.18-0.96) | |
| **Completed secondary school** | | | | |
| No | 18 (66.7) | 129 (76.8) | 1.65 | 0.257 |
| Yes | 09 (33.3) | 39 (23.2) | (0.69–3.97) | |
| **Marital status** | | | | |
| Single | 07 (25.9) | 49 (29.2) | 0.85 | 0.730 |
| Married | 20 (74.1) | 119 (70.8) | (0.34–2.14) | |
| **Occupation** | | | | |
| Nonworking | 20 (74.1) | 114 (67.9) | 1.35 | 0.518 |
| Working | 07 (25.9) | 54 (32.1) | (0.54–3.39) | |
| **Co-morbidity** | | | | |
| Yes | 16 (59.3) | 55 (32.7) | 0.34 | 0.008 |
| No | 11 (40.7) | 113 (67.3) | (0.15-0.77) | |
| **Per-capita income (INR)** | | | | |
| <7000 | 14 (51.9) | 84 (50.0) | 0.93 | 0.858 |
| >=7000 | 13 (48.1) | 84 (50.0) | (0.41–2.09) | |
| **Smoking** | | | | |
| Yes | 04 (14.8) | 33 (19.6) | 0.71 | 0.553 |
| No | 23 (85.2) | 135 (80.4) | (0.23–2.19) | |
| **Alcoholism** | | | | |
| Yes | 04 (14.8) | 24 (14.3) | 1.04 | 0.942 |
| No | 23 (85.2) | 144 (85.7) | (0.33–3.28) | |
| **Vision Impairment** | | | | |
| Yes | 03 (11.1) | 56 (33.3) | 0.25 | 0.020 |
| No | 24 (88.9) | 112 (66.7) | (0.07–0.87) | |
| **Hearing impairment** | | | | |
| Yes | 19 (70.4) | 103 (61.3) | 1.49 | 0.367 |
| No | 08 (29.6) | 65 (38.7) | (0.62–3.62) | |
| **Oral medication** | | | | |
| Yes | 13 (48.1) | 69 (41.1) | 1.33 | 0.489 |
| No | 14 (51.9) | 99 (58.9) | (0.59–3.01) | |
| **Living alone** | | | | |
| Yes | 01 (3.7) | 33 (19.6) | 0.19 | 0.043 |
| No | 26 (96.3) | 135 (80.4) | (0.02–0.88) | |
| **Sleep duration** | | | | |
| Poor | 03 (11.1) | 52 (31.0) | 0.28 | 0.033 |
| Good | 24 (88.9) | 116 (69.0) | (0.08–0.97) | |
| **Functional characteristics** | | | | |
| **ADL independent** | | | | |
| Yes | 23 (85.2) | 149 (88.7) | 0.73 | 0.533 |
| No | 04 (14.8) | 19 (11.3) | (0.23–2.35) | |
| **IADL independent** | | | | |
| Yes | 20 (74.1) | 122 (72.6) | 1.08 | 0.875 |
| No | 07 (25.9) | 46 (27.4) | (0.43–2.72) | |

## DISCUSSION

The present study showed a prevalence of fall among elderly in south India of 13.8%. This is similar to a study conducted by Sharma et al that showed 13% of south Indian elderly had a history of falls.[12] Studies conducted in other parts of India reported prevalence of fall between 31% and 53%.[8-11] while in other countries reported prevalence of fall between 4% and 46%.[15-18] This difference in prevalence rates of fall between countries could be due to different ethnicity and culture associated factors that could play a role in falling among elderly people. In this study, age, gender, presence of comorbidity, visual impairment, living alone and poor sleep quality were found to be significant risk factors of falls. Our findings are consistent with previous study done by Prato et al, found that the age, female gender, poor sleep quality associated with falls.[19] Another study by Wu and Ouyang, also found that older age, female gender and quantity of chronic diseases associated with a greater risk of falls.[16]

The present study observed that females were more likely to fall than males similar to earlier studies where females tend to experience falls more than men among the elderly aged 65 years and older.[19] This may be explained by the fact that females tend to have lower amount of lean body mass, less muscular force and osteoporosis compared to males of the same age. In this study, advanced age was associated with higher number of falls as mentioned in other studies also.[20] As age increases, structural and functional alterations may impair the performance of motor skills of elderly and their adaptation to the environment which in turn predispose elderly to fall.

In the present study, indoor settings were the most common location of falling (77.8%). Similar findings were observed to the study of Almegbel FY et al.[21] These indoor falls could be due to inadequate lighting, slippery floor, presence of rugs and using stairs without support. We observed significant association between comorbidity and the risk of falls. This finding is consistent with previous studies that showed that the presence of chronic diseases is related to the risk of falls.[22] As a result of chronic diseases, physical activities of elderly are limited due to which they tend to reduce daily activities increasing the risk and fear of falling. In comparison with a study undertaken by Valderrama-Hinds et al.[17] regarding the effect of visual impairment on increased risk of falling, both studies showed the increased risk among visually impaired elderly.

Living alone is a major factor associated with falls in this study which is in agreement with observation reported by other studies.[23,24] The elderly living alone tend to have greater fear of falling compared to those who live with others. A high level of social support provided by family and friends is associated with a low incidence of falls.[25] In this study, poor sleep quality has been identified as a risk factor for falls. This result is similar to findings presented by a study in Brazil.[19] Education, marital status and family income were not found to be associated with falls among elderly people in this study. Characteristics recognized as risk factors for falls such as hearing impairment, presence of ADL or IADL disability and use of drugs[18,26], have shown no association with the risk of fall in this study. In some studies it was mentioned that the prevalence of falls was higher in unemployed older adults[20] which we failed to observe in this study. It is likely that employed older adults will have a better financial situation, are healthier and fit for work and therefore less likely to fall.

## LIMITATIONS

In the present study, we observed three limitations. Firstly, the cross-sectional nature of the data does not allow examination of causal relationships. Secondly, the fall was self-reported, a condition subject to the recall bias of the interviewer. Finally, the selection of only three areas for the purpose of the study limits the generalization of the results to the whole population. Despite these limitations, this study also has unique strengths. This is the first epidemiologic study on fall in elderly people in Khammam district of Telangana State.

## CONCLUSION

The overall prevalence of fall among elderly people was found to be 13.8%, with majority of falls in indoor settings. More efforts should be made to reduce the fall prevalence particularly those related to home environment with a special focus on elderly people aged over 65 years and females.

## ACKNOWLEDGMENT

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