Prevalence of Falls and Risk Assessment for Falls Among Elderly in A Rural Area of Karnataka
Ratnaprabha GK¹, Shanbhag D², Aswini B³, Steffi C², Edwin B², Goud BR²

Abstract:
Background: Falls are extremely common among elderly population, accounting for substantial morbidity and mortality, and are often potentially preventable. Approximately 28-35% of people aged 65 yrs & above fall every year, increasing to 32-42% for those over 70 yrs (WHO). This study was designed for identification of risk factors among elderly, so that the future falls can be prevented. Objective: 1. To assess the prevalence of falls in elderly aged ≥60 yrs residing in a rural area in Bangalore. 2. To assess the risk for falls and 3. To study the factors associated with the falls risk among these elderly. Materials and Methods: A cross sectional study was conducted in a village in Bangalore Urban District, Bangalore of Karnataka, among people aged ≥60 yrs during the period of July to August 2011. Demographic details, history of fall in the last one year were collected and falls risk was assessed. Data was analysed using SPSS16. Results: A total of 124 people aged ≥60 yrs participated in the study, 51(41%) were males and 73(59%) females. Prevalence of falls: 39(31.45%) people had history of at least one fall in the last one year averaging 1.25 falls per person per year. 32(82%) of them had one fall and 7(17.95%) experienced recurrent falls. Slip was the most common cause (51.3%) of the last fall. Risk for falls: 78(63%) elderly were having low risk, 12(9.6%) were in medium risk and 34(27.4%) were having high risk for falls. Risk was highest in 70-79 yrs age group and in females (P=0.003). On multivariate logistic regression analysis, people with hearing impairment (OR=10.09, CI=1.24-81.94), psychological impairment (OR=3.0, CI=1.19-7.55) and with history of falls in the last one year (OR=5.17, CI=1.98-13.49) had higher risk for falls and hypertensives (OR=0.25, CI=0.09-0.64) had lower risk. Conclusion: The study showed that there is a high prevalence of falls in elderly and more than 1/4th of the study population was at high risk. Psychological impairment, hearing impairment and history of previous falls significantly increased the risk of falling. Therefore, it is necessary to identify and address these problems and educate them on falls prevention.

Introduction
A fall is defined as “inadvertently coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other objects” (ICD 10). Falls are extremely common among elderly population, account for substantial morbidity & mortality & are often potentially preventable. Approximately one third of the population aged 65 yrs & above living at home and over two third of persons living in nursing homes will fall at least once in one year (WHO 2007). Several studies conducted across the countries among elderly have shown that the burden of falls range from 10 to 60 percent.(1-5) Fall risk has been related to a number of factors such as history of falls, muscle weakness, gait deficit, balance deficit, use of assistive device, visual impairment, mobility impairment, fear of falling, cognitive impairment, depression, sedentary behavior, age, number of medications, psychotropic/ cardiovascular medications, nutritional deficits, urinary incontinence, arthritis, home hazards and footwear.(6,7) Since falls constitute major part of morbidity & mortality among elderly, especially injuries and fractures and reduced quality of life(6,8,9) and increased cost of medical care(10), there is a need to identify the population who are at high risk and prevent these falls by appropriate balance and strength training and ensuring safer environment.(8,9) 

Objectives
1. To assess the prevalence of falls in elderly aged ≥60 yrs residing in a village in Bangalore Urban District
2. To assess the risk for falls among these elderly, and
3. To study the factors associated with the falls risk among these elderly
Materials & Methods

A cross-sectional study was conducted in a village in Bangalore Urban District, which comes under the rural field practice area of St. John’s Medical College, Bangalore, Karnataka, among people aged ≥60 yrs during the period of July to August 2011. Approval from the Institutional Ethical Board was obtained. All the elderly residing in the village for more than one year were included in the study by a house to house survey. After the initial identification of elderly, data pertaining to demography, falls in the last one year and falls risk was collected using a pre-tested structured and validated interview schedule. Fall risk component was assessed using Falls Risk Assessment Tool (FRAT). This was developed by Peninsula Health Falls Prevention Service for a DHS funded project in 1999. A study evaluating the reliability and validity of the FRAT has been presented at a number of conferences, and is being prepared for publication. The FRAT has been distributed to approximately 400 agencies worldwide. FRAT has three sections, part first deals with falls risk status, part second has risk factor checklist and part three has action plan. First two sections were considered for the present study data. Falls risk status uses four components, history of recent falls, medications which increase risk for falls like (sedatives, anti-depressants, anti-parkinson’s, diuretics, anti-hypertensives, hypnotics), psychological factors like depression and anxiety assessed using geriatric depression scale and generalised anxiety disorder questionnaire-7 respectively and cognitive status using modified Hudkinson Abbreviated Mental Test Score. The scores were interpreted as follows, low risk = 5–11, medium = 12–15 and high risk = 16-20. Elderly were also interviewed for history of other co-morbidities like hypertension, diabetes, osteoarthritis, stroke, incontinence, vertigo and activities of daily living using Barthel’s criteria. Person was examined for BMI, vision using finger count method, hearing using whisper test, mobility using ‘timed get up and go test’ and blood pressure using mercury sphygmomanometer. Weight was recorded to the nearest 0.1kg by a digital weighing scale without shoes and standing height was recorded to the nearest 0.5cm by a non elastic measuring tape without shoes.

Data was entered in Microsoft Excel Sheet and analyzed using SPSS 16 for frequencies, chi square, fisher’s exact, independent t-test and ANOVA tests.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gender</td>
<td>51 (41) Males 73 (59) Females</td>
</tr>
<tr>
<td>2.</td>
<td>Age (yrs)</td>
<td>60 – 69 60 (48.4), 70 – 79 36 (29), ≥ 80 28 (22.6)</td>
</tr>
<tr>
<td>3.</td>
<td>Marital status</td>
<td>Currently married 26 (21), Widow / Widower 98 (79)</td>
</tr>
<tr>
<td>4.</td>
<td>Occupation</td>
<td>Gainfully Employed 29 (23.4), Unemployed 95 (76.6)</td>
</tr>
<tr>
<td>5.</td>
<td>Socioeconomic status</td>
<td>Low 5 (4), Medium 38 (30.6), High 81 (65.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Variable</th>
<th>Mean FRAT score</th>
<th>Tests of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gender</td>
<td>Males 7.59 ± 2.38, Females 9.08 ± 2.86</td>
<td>F= 1.31, p = 0.003*</td>
<td></td>
</tr>
<tr>
<td>2. Age (yrs)</td>
<td>60 – 69 8.25 ± 2.3, 70 – 79 8.92 ± 3.1, ≥ 80 8.36 ± 3.1</td>
<td>F= 0.678, p = 0.510*</td>
<td></td>
</tr>
<tr>
<td>3. Marital status</td>
<td>Currently married 8.88 ± 3.61, Widow / Widower 8.36 ± 2.50</td>
<td>T = -0.86, p = 0.39</td>
<td></td>
</tr>
<tr>
<td>4. Occupation</td>
<td>Gainfully Employed 8.17 ± 2.52, Unemployed 8.56 ± 2.84</td>
<td>T = 0.65, p = 0.51</td>
<td></td>
</tr>
<tr>
<td>5. Socioeconomic status</td>
<td>Low 9.0 ± 2.91, Medium 9.08 ± 3.29, High 8.15 ± 2.46</td>
<td>F= 1.57, p = 0.21</td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA test †Independent t-test
Results

Totally 124 elderly participated in the study and their mean age was 70.96 ± 9.19 yrs and it ranged from 60 – 95 yrs. Table 1 explains the demographic details of the participants.

Prevalence of falls

Thirty nine (31.45%) people had history of at least one fall in the last one year averaging 1.25 falls per person per year. 32 (82%) of them had one fall and 7 (17.95%) experienced recurrent falls. 12 (23.3%) women and 27 (36.98%) men had history of at least one fall in the previous year, of whom 2 (3.92%) women and 5 (6.84%) men had experienced recurrent falls. Prevalence was highest (38.88%) among 70 – 79 yrs age group, while it was lowest (21.42%) in ≥80 yrs age group and 31.66% of 60 – 69 yrs people fell in the previous year. Slip was the most common cause (51.3%) of the last fall, followed by trip (28.2%), collapse (7.7%), lost balance (7.7%) and dizziness (5.1%).

Risk for falls

Using the scoring pattern, the mean score was found to be 8.47 ± 2.76 and ranged from 5 – 19. Majority of the participants (63%) had low risk for falls, while 12 (9.6%) and 34 (27.4%) people had medium and high risk respectively. The fall risk was significantly high among females compared to males. Association with other demographic variables is shown in table 2.

The association of falls risk with other co-morbidities was assessed and found that the risk was significantly higher among osteoarthritis patients (Chi Sq = 6.78, P = 0.009), those having vertigo (Fisher’s Exact P = 0.049), impaired mobility (Chi Sq = 8.84, P = 0.003), not oriented to surrounding environment (Chi Sq = 6.68, P = 0.010), psychological impairment (Chi Sq = 15.72, P = <0.001), cognitive impairment (Chi Sq = 5.32, P = 0.021) and who had history of fall in last one year (Chi Sq = 25.17, P = <0.001). Though the risk was slightly high among people who had impaired hearing (Fisher’s Exact P = 0.1), unable to perform ADL (Fisher’s exact P = 0.467), incontinence (Chi Sq = 2.7, P = 0.099), hypertension (Chi Sq = 2.5, P = 0.113) and those who were currently on chronic medications (Chi Sq = 1.15, P = 0.283) and less in people having impaired vision (Chi Sq = 1.0, P = 0.317), diabetes (Fisher’s Exact P = 0.284) and obese people (Chi Sq = 0.02, P = 0.969), it was not statistically significant. Further stepwise multiple logistic regression analysis was done for variables having p value < 0.2 in univariate analysis, the best set of independent correlates with fall risk (Negelkerke’s r² = 0.425) are shown in table 3.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Variable</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>P</th>
<th>OR (CI)</th>
</tr>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(significant &lt;0.05)</td>
</tr>
<tr>
<td>1</td>
<td>Psychological impairment</td>
<td>0.470</td>
<td>5.477</td>
<td>1</td>
<td>0.019</td>
<td>3.0 (1.19-7.55)</td>
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<tr>
<td>2</td>
<td>Hearing impairment</td>
<td>1.068</td>
<td>4.683</td>
<td>1</td>
<td>0.03</td>
<td>10.09 (1.24-81.94)</td>
</tr>
<tr>
<td>3</td>
<td>Immobility</td>
<td>0.485</td>
<td>1.276</td>
<td>1</td>
<td>0.259</td>
<td>1.72 (0.66 – 4.47)</td>
</tr>
<tr>
<td>4</td>
<td>Hypertension</td>
<td>0.475</td>
<td>8.422</td>
<td>1</td>
<td>0.004</td>
<td>0.25 (0.09-0.64)</td>
</tr>
<tr>
<td>5</td>
<td>H/o fall in last one year</td>
<td>0.489</td>
<td>13.781</td>
<td>1</td>
<td>&lt;0.001</td>
<td>6.13 (2.35-16.0)</td>
</tr>
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</table>

Discussion

The present study found that 39 (31.45%) people had history of at least one fall in the last one year averaging 1.25 falls per person per year and 7 (5.64%) of them experienced recurrent falls. Similarly another study conducted among 225 elderly reported 33.5% falls when followed over a period of one year. Another study conducted in community dwelling elderly in Washington in the year 1993 showed 12.35% people had at least one fall in a period of one year. A telephonic survey among 1709 elderly aged >65 yrs in USA in the year 2003 showed that 9.6% reported falling at least once in the past 3 months. A study done exclusively among >90 yrs age group in Cambridge city during the year 2002 - 04 reported 60% prevalence rate of falls in the last one year and when they were followed up for one year 45% were repeat fallers and the incidence rate was 2.8 falls per person years of observation. Incidence of falls was high among females, increased with age, higher education level, significantly high among non-manual social class and those who had a history of fall in the past one year. A metaanalysis of fourteen studies on incidence of falls among elderly revealed that approximately 30% of subjects aged >65 yrs fall atleast once a year and 15% fall recurrently.

Many studies have shown that falls increased with increasing age. This may be explained by decline in lean muscle mass and strength with increasing age as proved in a study conducted by
Kim Delbaere in Ghent University. However the present study showed decline in prevalence of falls among oldest old, which may be because of the limited mobility itself among the oldest old either due to decreased locomotor function or fear of fall. This may also be just due to unequal number of participants in each age group in the study.

Unlike many studies, the prevalence of falls was low among females in the present study. In the literature, the difference in falls rate between sexes has been attributed to reduced muscle strength, and more frequent use of psychotropic medication. The observation in the present study might be just because men will be more exposed to external environment and more likely to move around. However, the risk for fall was significantly higher among females in the present study.

A metaanalysis of fourteen studies has shown that the main risk factors for falls among the elderly belong to the intrinsic (patient-related) factors: cognitive impairment, balance and gait disorders, use of sedatives and hypnotics, a history of stroke, arthritis of the knee and a high level of dependence, most of the factors similar to the present study findings. However, extrinsic (environment-related) risk factors did not play a significant role in any of the studies unlike the present study where, ‘not oriented to the surrounding environment’ was significantly associated with fall risk. A study conducted among elderly in Cambridge city showed higher incidence of falls among people with higher education level, significantly high among non-manual social class. Other important risk factors identified for falls in the previous literature are altered mental status, dizziness, history of previous falls, polypharmacy, visual defects, unable to perform activities of daily living, decreased activity level and fear of falling. The present study showed that the risk for falls was significantly associated with osteoarthritis, vertigo, hearing impairment, psychological impairment, cognitive impairment, impaired mobility, not oriented to the surrounding environment and history of falls in the past. Studies have shown that the risk for falls was higher among hypertensives and also among those who had low systolic blood pressure while in the present study, fall risk was low among those who were diagnosed as hypertensives, which probably could be explained by low risk taking behavior among them. However, the present study did not show significant association with visual impairment, unable to perform daily activities and those who were on chronic medications. Studies have shown that due to fear of falling, avoidance of activity occurs at the mobility level, then they restrict themselves to home, and when they start falling at home, they also become fearful of activities at home. Therefore one can say that impaired mobility assessed using ‘get up and go test’ would be an early indicator of increased risk for falls much earlier than impaired ADL.

Very few studies have tried to quantify the risk for falls in elderly. Meta-analysis of two population based studies showed that hip weakness, poor balance and number of medications prescribed were most strongly associated factors with falls among elderly and increased the risk of falls to 100% if all three were present. Stalenhoef et al. developed a desk model with three risk categories (low, moderate, high) evaluating physical, cognitive and environmental risks. Some other studies have developed falls risk screening tests, containing several measures. However the present study is one of its kinds in India, which quantifies the risk for falls in elderly. This can be applied easily and utilized in resource poor settings to efficiently manage the people who have high risk and subsequently for everyone.

Limitation of the present study was that it included small sample size, and the study sample was chosen from one village, which may not be representative of the whole population of elderly. The exact magnitude of the falls in the community would have been better determined using a prospective study, but due to time, money and manpower constraint it could not be possible in the present study. A study conducted among oldest old of Cambridge city, showed that the proportion of people who fell according to remembered fall history was strikingly similar to that observed during intensive follow up, but the recalled falls may underestimate the extent of repeat falling. Recall was almost same in both males and females.

**Conclusion**

The prevalence of falls was found to be high among elderly in selected village of Bangalore in Karnataka. On recall, the prevalence was found to be high among 70 – 79 yrs age group and among men. However, the fall risk using FRAT showed risk was high among females, those who had history of previous fall, psychological impaired, hearing impaired, osteoarthritis patients, those having vertigo, impaired mobility and those
who were not oriented to surrounding environment. Therefore these medical conditions will have to be addressed to reduce the falls and also mobility in old people will have to be trained by medical personnel in such a way as to avoid falls, for example using a cane while walking, using rails while walking and getting up from sitting posture. Environmental modifications like railing, grab bars, slip resistant surfaces in the bathroom, provision of lighting and hand rails will have to be promoted for houses of elderly. This needs integrative approach from all the specialties of medical field including medical social workers and health workers.

References: