

# Risk Factors for Falls in Elderly

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## Abstract

**Background:** Falls are an important cause of morbidity and mortality in elderly. Most often the cause of fall is multifactorial. Falls and their sequelae are potentially preventable and hence it is of importance to know the risk factors for falls in the elderly.

**Methodology:** This prospective study evaluated 100 patients above 60 years with falls. Comprehensive geriatric assessment including detailed history of fall, ADL using Barthel index, underlying medical disorders, and medication history was elicited. Examination included assessment of BMI, MMSE, cardiovascular, neurological and musculoskeletal system. Patients with injuries underwent relevant plain x-rays to diagnose fractures.

**Results:** Of the 100 patients, 68% were females. Among the causes for falls, intrinsic causes for falls were more prevalent in people >70 years. Among the medical conditions causing falls, musculoskeletal problems (72%) and visual defects (54%) were common. 46% had 3 or more risk factors for falls. The mean BMI was low in patients who sustained fractures. Fractures occurred in 48% of sedentary group as against 12% of exercising group. Drug induced falls accounted for 42% of which 20% were due to sedatives.

**Conclusion:** Falls and fractures are more common in females. Falls due to intrinsic causes and recurrent falls were common in people >70 years. The sedentary group fell more frequently than exercising group due to lack of stability. Of the medical conditions predisposing to falls, musculoskeletal problems and visual defects were common. Multiple risk factors were common. Drug induced falls were commonly associated with sedatives.

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## Introduction

Fall is an event caused by age associated diseases like Parkinson's disease, cognitive decline and musculoskeletal problems in association with physiological changes like impairment of sensory system, impairment of righting reflex and decrease in lean body mass. The incidence of falls increases with advancing age.<sup>1</sup> It is one of the leading cause of death in elderly. The morbidity due to falls includes serious injuries and fractures, restricted mobility and loss of independence leading to functional decline, psychological fear of falling (post fall syndrome) and permanent disability.

One major impact of fall is hip fracture.<sup>2</sup> More than 90% of hip fractures are associated with falls in persons above 70 years of age and are associated with greater mortality.<sup>3</sup> Falls are potentially preventable. Much interest is being shown in the evaluation of falls

and identification of the risk factors, which would help in falls prevention programs. There are many studies on evaluation of falls in various populations. These studies suggest recurrent falls are more common with multiple, often interacting risk factors.<sup>4,5</sup> Some studies reveal that risk of falls appears to rise as the number of risk factors increases.<sup>4,6</sup> The associated risk factors include older age, history of past falls, cognitive impairment, impairments of activities of daily living, lower extremity weakness or other disability, impaired balance and gait, dizziness, arthritis, history of stroke, poor visual acuity, low body mass index, increased number of medications and use of psychotropic medications.<sup>5,6,7</sup> This study was done to identify the risk factors for falls in elderly population of our region.

## Material and Methods

This was a prospective study done between October 2003 and September 2004. During this period, 1950 patients attended Geriatric Out Patient Department of Government General Hospital, Chennai. A sample of 100 patients above the age of 60 years with history of falls was chosen for evaluation. Patients with history of assault / road traffic accident (RTA) were excluded.

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Table 1: ADL INDEX AND FALL

ADL	60-69 YRS	70-79 YRS	>80 YRS
16 - 20	40	10	2
11 -15	-	28	6
<10	-	6	8

Based on the age, these patients were classified into three groups: 60-69 years; 70-79years; and >80 years. Detailed history regarding nature of fall, location of fall, ADL (Activities of Daily Living) score using Barthel index, underlying medical disorders and medication history were recorded. Clinical examination including height, weight, BMI, pulse, blood pressure in supine and standing postures, MMSE, neurological, cardiovascular and musculoskeletal system examination was performed. Biochemical investigations like blood sugar, blood urea, serum creatinine, serum proteins, serum calcium, serum alkaline phosphatase, ECG, and relevant plain X-rays of hip, forearm and spine were done as indicated.

The nature of fall was classified as extrinsic causes e.g. slippery toilets, uneven floor, poor lighting, improper walking aids, low toilet seats and intrinsic causes e.g. musculoskeletal problems like arthritis, foot deformities; medical conditions like stroke, Parkinson’s disease, epilepsy, dementia, peripheral neuropathy, autonomic dysfunction, postural hypotension, cardiovascular syncope, drug intake, and impaired vision. The patients were classified into sedentary and exercising group. ADL was assessed using Barthel Index as below:

Total score: 20.

- Group I: 16-20 – Independent
- Group II: 11-15 – Need assistance
- Group III: <10 – Dependent

**Results**

In this study, the age groups of selected individual range from 60 years to 90 years with mean age of 69.8 years. Falls were common in females (68%) than males (32%) (Fig. 1). Extrinsic causes accounted for 56% and intrinsic causes 44% in the entire study group. In people >70 years the intrinsic causes were more common and recurrent falls occurred more in this age group (Fig. 2).

Mean BMI was compared in both fracture group (19.02) and non-fracture group (25.22); it was lower in those who sustained fractures (Fig. 3). The incidence

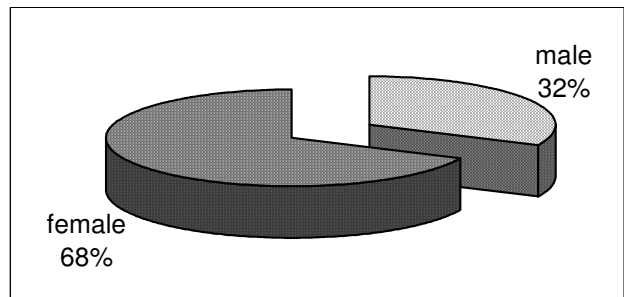


Fig. 1: Sex Ratio

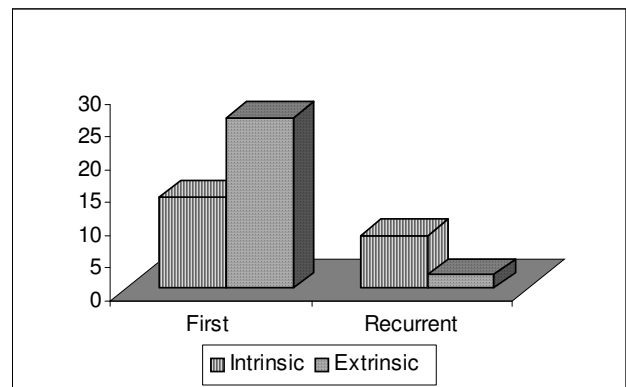


Fig. 2: Causes of falls

of fracture was less in people who were exercising (12%) than the sedentary group (48%). The ADL index (Barthel index) was >15 in people less than 70 years and the score was low (<15) in majority of people aged 70 years and above (Table.1). Among the medical disorders causing falls, musculoskeletal problems (72%) were the most common. This included osteoarthritis of knee joints (56%), rheumatoid arthritis with joint deformity (4%), myopathy secondary to hypothyroid state (2%), cervical and lumbar spondylosis (10%). Visual causes (54%) were mainly related to cataract. A few had visual loss secondary to trauma and failure of cataract surgery. Causes of neurological illness (28%) were peripheral neuropathy of sensory type (16%), post stroke residual weakness (4%), Parkinson’s disease (3%), cervical myelopathy (3%), cerebellar disease (1%), and postvaccinial demyelination (1%). Other causes responsible for falls were vestibular (18%), syncope (18%), systolic hypertension (14%), postural hypotension (10%). Cognitive decline was observed in 8% of patients. Forty two percent patients had history of drug intake of which sedatives were the commonest drugs that caused falls. The usage of sedatives was 20%, antihypertensives 12%, diuretics 4%, antiparkinson drugs 4% and tricyclic antidepressants 2%. (Fig. 4)

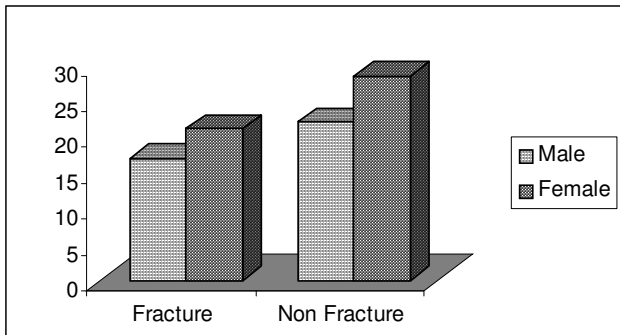


Fig 3: Body Mass Index & Fracture

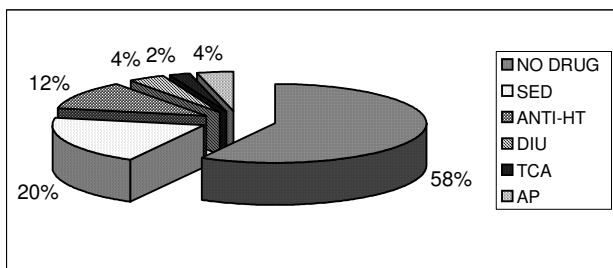


Fig. 4: Drugs and falls

## Discussion

Falls more common in older females than in older males, the ratio being 2:1. Women develop greater postural sway and imbalance than men and hence greater tendency to fall. In another study of falls among community dwelling elderly in Japan, the prevalence of fall was greater among women than men; this finding correlates well with our study.<sup>7</sup>

Extrinsic causes for falls were common in 60-69 years age group than people >70 years due to more activity and mobility. In people >70 years, intrinsic causes were more common indicating that disturbance of stability and balance increases as age advances.<sup>5,8</sup> Recurrent falling episodes were more frequent with intrinsic causes (36.4%) than extrinsic causes (7%). Hence complete evaluation of risk factors should be done in patients with recurrent falls.

The mean body mass index of fracture cases was lower (19.02) than BMI of non-fracture case (25.22). Normal body mass protects against fractures by dissipating the forces generated during a fall.<sup>9</sup> This also helps to preserve the bone mass in postmenopausal women by increasing the conversion of androstenedione to oestrone in fatty tissues. The incidence of falls was less in exercising group than sedentary group. Among the exercising group who had

falls, 60% did not sustain hip fracture, indicating that muscle strength and endurance improves with regular exercise which prevents falls by better neuromuscular control and fracture by better dissipation of force.<sup>10</sup>

In our study, musculoskeletal problems like osteoarthritis, rheumatoid arthritis, myopathy secondary to hypothyroidism, cervical and lumbar spondylosis were the cause for falls in elderly. According to Davis et al, musculoskeletal disease, physical disability or limited activity increased the risk of fall by two to four times.<sup>11</sup>

Neurological illnesses, which cause deterioration of sensorimotor function of muscle, contribute to falls. According to a study on risk factors for major injurious falls, peripheral neuropathy, gait disturbance and poor distant visual acuity had significant correlation.<sup>12</sup> This corroborates with our study where major neurological cause was peripheral neuropathy. Also multiple factors are responsible for falls in our study group. Cognition decline was found in 8 patients who were above 70 years of age. Six of them had recurrent falls and all of them sustained repeated fractures. This correlates with the fact that falls and fracture risk in patients with Alzheimer's disease is greater than in normal healthy adults.<sup>13</sup>

In the study of medication related falls and fractures, it was found that psychotropic drugs have two fold increased risk of falls due to their central depressant effect.<sup>14</sup> The strongest evidence was for antidepressants. A statistically significant increase in risk of falls with use of psychotropic medication, sedatives and antidepressants has been inferred from many studies.<sup>15, 16</sup> Diuretic therapy by causing electrolyte imbalance can precipitate falls and increase risk of fracture.<sup>17</sup> In our study drug induced falls accounted for 42% and sedatives were the commonest offender. The low percentage of tricyclic antidepressants (TCA) attributed falls in our study was probably due to less number of patients being treated with these antidepressants. Postural hypotension is due to autonomic dysfunction or secondary to drug intake. Antihypertensives, antiparkinson drugs and tricyclic antidepressants produce postural hypotension that results in increased risk of falls and fractures. In our study only 10 patients had objective evidence of postural hypotension and among them 6 patients were consuming antiparkinson drugs and tricyclic antidepressants. This indicates identification of drug induced postural drop in blood pressure is important for prevention of falls.

## Conclusion

Falls are common in older women. Recurrent falls due to intrinsic causes were common in people more than 70 years of age indicating presence of multiple medical problems in them. Falls are common in the sedentary group of people than the regularly exercising group. Musculoskeletal diseases and visual defects were common medical problems responsible for falls. Multiple risk factors for falls are common. Among the various drugs, sedatives more commonly precipitated falls. Hence complete evaluation of the underlying medical conditions and measures to prevent falls in the high risk group are necessary.

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