Falls in Indian older adults: a barrier to active ageing

SA Dsouza¹, PhD, B Rajashekar², PhD, HS Dsouza³, PhD, KB Kumar⁴, PhD

ABSTRACT

Objectives. Rapid population ageing is predicted in India. Falls are one of the causes of injuries and non-communicable diseases associated with old age. Studies on falls in Indian older adults were reviewed to determine the prevalence, consequences, risk factors, and interventional strategies for falls.

Data sources. MEDLINE, PubMed, Google, and IndMED.

Study selection. Studies related to falls in Indian older adults published after 2000 were found using the key words: falls, Indian older adults or older adults, prevalence, circumstances and consequence, injuries, risk factors, health, balance, and mobility.

Data extraction. The search resulted in 16 publications and 3 unpublished research studies.

Data synthesis. The prevalence of falls in Indian older adults ranges from 14% to 53%. Falls result in considerable morbidity and mortality. Indian elderly people are facing challenges secondary to the changing socio-economic scenario, economic dependency, and decreasing family support. Fall-related injuries impose a substantial financial burden on older adults and their families, in addition to dependency for daily activities and activity restriction.

Conclusion. Falls are an emerging public health problem and a barrier to active ageing in India. There is an urgent need for coordinated and collaborative efforts of health professionals, researchers, policy makers, and health care delivery systems to prevent falls and promote active ageing.

Key words: Accidental falls; Aged; Prevalence; Primary prevention; Risk factors

INTRODUCTION

By 2050, the worldwide population of older adults may grow to almost 2 billion, with 80% living in developing countries.¹ This is alarming as over half of the world’s older adults live in Asia.² In India, a ‘senior citizen’ or ‘older adult’ is defined as a person aged 60 years and older.³ This is the fastest growing population in India, increasing from 6.7% in 1991 to 10% in 2021. Between 2001 and 2051, the number of old-old (age 70 years and older) is projected to increase 5-fold, and that of the oldest-old (age 80 years and older) is expected to increase 4-fold; these increases are faster than for any other age-groups.⁴ The average remaining length of life is around 18 years (16.7 years for men, 18.9 years for women) at age 60 years and <12 years (10.9 years for men and 12.4 years for women) at age 70 years.⁵ The old-age dependency ratio has increased over the past 2 decades, which increases the burden on the working population.⁶ In most developed countries, population ageing is a gradual process associated with steady socio-economic growth. In India, the process is compressed into 2 to 3 decades.¹

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Traditionally, older adults are taken care of by their families. A caregiving crisis is predicted owing to changing gender roles, employment of women, erosion of traditional family values, and an increasing trend for nuclear families. The number of older adults living alone is increasing.6 With decreased family support and informal caregivers, more older adults in India care for themselves.1,7

The World Health Organization proposes ‘active ageing’, which aims to extend healthy life expectancy and quality of life for all people as they age, including those who are frail, disabled, and in need of care.2 It emphasises on promoting an active lifestyle, which saves substantial health care–related expenditure.8 Considering the magnitude of the ageing population and socio-economic changes in India, measures to keep older people healthy and active are of utmost importance.2 Preventing non-communicable chronic diseases (such as fall) is one such measure.2,6 Fall is a major cause of injuries associated with old age.9

The present paper reviewed the literature on falls in Indian older adults using Medline, PubMed, Google, and IndMED. Studies related to falls in Indian older adults published after 2000 were found using the key words: falls, Indian older adults or older adults, prevalence, circumstances and consequence, injuries, risk factors, health, balance, and mobility. The search resulted in 16 publications and 3 unpublished research data.

### EPIDEMIOLOGY OF FALLS

Falls are defined as inadvertently coming to rest on the ground, floor, or other lower level, excluding intentional change in position to rest.9 In the US, 30% of individuals aged 65 years and older fall at least once a year.10 In Japan, the prevalence of falls was 13.7%,11 and in China it was 26.4%.12 In India, the prevalence of falls among older adults aged 60 years and older was 14% to 53% (Table 1).13-16 These studies vary in terms of sample size, geographical region, fall history criteria, and methods. Falls are highly under-reported, and the actual prevalence is likely to be higher. In India, fall prevalence increases with age and is the highest in women and institutionalised older adults.13,14,17

### CONSEQUENCES OF FALLS

Falls are a leading cause of death in older adults.38 Falls lead to 20% to 30% of mild-to-severe injuries, and are the underlying cause of 10% to 15% of all emergency department visits.19 The major clinical conditions for fall-related hospital admissions are hip fractures, traumatic brain injuries, and upper limb injuries. The duration of hospital stay after fall injuries ranges from 4 to 15 days9 and may be longer when associated with hip fractures,20 advancing age, and frailty. 30% to 50% of older adults fear a fall, and one-third report restricting their activities.21

<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Design</th>
<th>Fall history criteria</th>
<th>No. of participants</th>
<th>No. of men/women</th>
<th>Prevalence of falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dsouza et al,13 2008</td>
<td>Manipal and Udupi, Karnataka</td>
<td>Cross-sectional survey</td>
<td>Falls in the previous 2 years</td>
<td>190 (169 community dwelling, 21 old-age home residents)</td>
<td>109/81</td>
<td>38/5 31/47</td>
</tr>
<tr>
<td>Johnson,14 2006</td>
<td>Trivandrum, Kerala</td>
<td>Cross-sectional survey</td>
<td>Falls in the previous year</td>
<td>145 women (82 community dwelling, 63 long-term care home residents)</td>
<td>0/145</td>
<td>0/53</td>
</tr>
<tr>
<td>Joshi et al,15 2003</td>
<td>Chandigarh city and rural population of Haryana state</td>
<td>Cross-sectional survey using cluster sampling techniques</td>
<td>All falls</td>
<td>200 (100 urban, 100 rural)</td>
<td>98/102</td>
<td>51.5/2</td>
</tr>
<tr>
<td>Krishnaswamy and Gnanasambandam16</td>
<td>10 Indian states</td>
<td>Multi-centric community study</td>
<td>Single fall in the previous 6 months</td>
<td>10 200 equally distributed in urban and rural areas</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Falls in Indian older adults

In India, falls are associated with considerable mortality and morbidity (Table 2). Soft-tissue injuries were most common, followed by fractures, especially hip fractures. In an unpublished study of 312 older adults admitted for fall-related injuries, 12% died and 68% required surgical management. Hip, femoral, and pelvic injuries were most common. The mean duration of hospital stay was 12 to 15 days. Documentation of the fall event, cause, and consequences was inadequate. There are psychosocial consequences of fall such as fear of fall, decreased balance confidence, and activity restriction that may affect quality of life. Mortality after falls was high (53-86%). Based on mortality surveillance methods, including verbal autopsy and accessing medical records of people reported to have died from unintentional falls (based on the International Classification of Diseases, 10th Revision), the actual prevalence of fall-related consequences may be higher due to under-reporting of fall events and inadequate documentation of fall-related injuries.

**ECONOMIC COSTS OF FALLS**

Direct costs of falls include health care costs, and indirect costs include societal productivity of individuals or caregivers (such as income loss). The mean costs of falls are US$3476 per faller, US$10 749 per injurious fall, and US$26 483 per fall requiring hospital admission. The total economic burden of falls may be significantly higher if direct non-medical, intangible, and indirect costs of falls are also included.

The costs related to medical management, hospital stay, and rehabilitation of fall-related injuries are considerable. The consequent morbidity and dependency for daily activities may require assistance of family members (informal caregivers) or nursing aides (formal caregivers). Both types of assistance are associated with considerable direct and indirect costs. In an unpublished study, the mean cost per hospitalisation for fall-related injuries to a tertiary hospital was 44 266 Indian rupees (US$835).

In India, one-third of older adults aged 60 years and older live below poverty line. Up to 65% of older adults are economically dependent, especially widowed women. In India, private sector employees may not necessarily receive pension and retirement benefits. Inadequate income is a major problem for...
older adults. Non-affordability is a cause of not seeking medical treatment among older adults. In India, only 25% of people have health insurance coverage, and medical expenses are predominantly borne out-of-pocket. Fall-related injuries may affect a person’s savings, increase the economic burden of caregivers, and contribute to neglect of older adults.

**RISK FACTORS OF FALLS**

According to the World Health Organization global report on fall prevention in older age, risk factors for falls involve biological, environmental, behavioural, and socio-economic factors. Biological (intrinsic) risk factors include sex, race, age-related declines in strength, balance, vision, cognition, and chronic diseases. The most common predictors of falls are abnormalities of gait or balance and a history of fall in the past year. Behavioural risk factors include risky behaviours such as hurrying, sedentary lifestyle, and multiple medications. Socio-economic risk factors include low income, low education, inadequate housing, and limited access to health care services. Environmental (extrinsic) risk factors include physical environmental features in the home or community that may pose hazards, such as slippery or uneven surfaces, steps, and poor building design. Extrinsic factors are more likely to be the cause of falls for the age-group of 60 to 74 years, whereas intrinsic factors are more likely to be the cause for those aged 75 years and older.

In Indian adults older than 70 years, intrinsic causes for falls and recurrent falls are the most likely factors. Gait disorders and poor physical mobility are associated with difficulty in activities of daily living. Age-related decline in lower extremity strength and balance has been reported in Indian community-dwelling older adults. Difficulty in getting up from a chair (indicative of lower limb weakness) and decreased physical activity increase the risk for hip fractures. Compared with older adults without a history of falls, older adults with a history of fall have decreased lower limb strength, impaired balance and functional mobility, decreased balance confidence, and more comorbidities. Medical conditions that are risk factors for falls include musculoskeletal problems, visual impairment, and neurological disorders. Sedatives are risk factors; long-term medications are a risk factor for hip fractures.

Compared with western countries, more younger patients had hip fractures, which is attributed to low bone mineral density caused by vitamin D deficiency, especially in post-menopausal women. Poor sunlight exposure, skin pigmentation, and a diet deficient in vitamin D are the common causes. Among Indians aged 50 years and older, the prevalence of vitamin D deficiency was 91.2%, that of osteoporosis was 31.2%, and that of osteopenia was 50.2%.

The other intrinsic risk factors for fall include depression (21.9%), dementia (0.6-4.8%), urinary incontinence (20%), and chronic diseases such as diabetes (5.5-11.75%) and hypertension (39.8-51.2%). Of great concern is the early onset and high prevalence of cardiovascular disease and diabetes in young and middle-aged adults in India. Falls are associated with the geriatric syndromes of depression, cognitive impairment, urinary incontinence, and chronic diseases, especially cardiovascular disease. Older adults commonly have more than one chronic disease, and the risk of fall increases with the number of chronic diseases.

Indian older adults have high prevalences of anaemia (41.8-66.5%) and respiratory disorders, especially asthma (6.0-16.5%) and chronic obstructive pulmonary disease (42%) and hence are susceptible to falls. It is hypothesised that the symptoms of weakness, fatigue, dyspnoea, syncope, and postural hypotension contribute to decrease in activity levels and subsequent physical deterioration that increase risk for fall.

Indian older adults are predominantly of the young-old age-group and thus more active. Falls occurred most commonly at home and in the bathroom. Outdoors, most falls occurred on the roads. The circumstance (location, activity being performed, time) of falls has implications for developing fall prevention programmes. Falls commonly occur during walking or bathing and are caused by slips and trips and often in the morning. Indians prefer completing self-care and household chores in the morning, resulting in hurrying or rushing. The use of mobility aids was also associated with falls.

Inadequate income, poor housing, limited access to health care, and low literacy are some of the salient socio-economic issues in India that affect the health
of elderly people. These issues could contribute to injurious falls and poor treatment outcomes. These socio-economic factors in India may also contribute to environmental or extrinsic risk factors in the home and community such as inadequate power supply resulting in poor lighting, poor building structures, transport facilities, and roads. The risk of falls and injuries increases with the number of risk factors.

**FALL PREVENTION**

Fall prevention programmes commonly involve education, exercises, medication review and

<table>
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<tr>
<th>Study</th>
<th>Type of Intervention</th>
<th>Participants</th>
<th>Study design</th>
<th>Outcome measures</th>
<th>Conclusion</th>
</tr>
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<tbody>
<tr>
<td>Parnami et al., 2005</td>
<td>Nutritional</td>
<td>Elderly women aged ≥60 years</td>
<td>No iron folic acid (IFA) [n=30] vs. IFA supplementation for 6 weeks (n=30)</td>
<td>Pre- and post-test assessment of haemoglobin levels, physical performance (standing balance, walking speed and lower limb strength), cognitive functions (attention, concentration, and memory)</td>
<td>Haemoglobin levels, standing balance, and cognitive functions improved significantly with IFA supplementation</td>
</tr>
<tr>
<td>Rege and Joshi, 2005</td>
<td>Visual perception, depth perception and balance training</td>
<td>Elderly aged ≥60 years</td>
<td>Activities for visual perception and depth perception, functional balance training for 6 weeks (n=20)</td>
<td>Pre- and post-test assessment of Test of Visual Perception Skills, Depth Perception Instrument, Timed Up and Go Test, subjective report</td>
<td>Intervention improved visual perception, sense of well being, and confidence for outdoor activities</td>
</tr>
<tr>
<td>Bhat and Walia, 2010</td>
<td>Balance and mobility training</td>
<td>Elderly aged ≥65 years</td>
<td>Task-oriented training with (n=24) vs. without (n=24) altered sensory input</td>
<td>Pre- and post-test assessment of Berg Balance Scale (BBS), Modified Clinical Test of Sensory interaction for Balance, 10 meter walk test</td>
<td>Interventions improved balance and mobility</td>
</tr>
<tr>
<td>Jahagirdgar and Kenkre, 2010</td>
<td>Balance and mobility training</td>
<td>Elderly aged ≥60 years</td>
<td>Electromyography biofeedback, Swisball/ peanut ball and conventional functional balance exercises (n=16)</td>
<td>Pre- and post-test assessment of Performance Oriented Mobility Assessment (POMA), Manual Muscle strength, Dartmouth-Northern New England Primary Care Cooperative Information Project functional assessment charts</td>
<td>Interventions improved balance and mobility</td>
</tr>
<tr>
<td>Choudhary and Mohammad, 2011</td>
<td>Ankle exercises</td>
<td>Elderly in old-age home aged 60-80 years</td>
<td>No intervention (n=27) vs. ankle mobilisation, stretching, and strengthening for 6 weeks (n=24)</td>
<td>Pre- and post-test assessment of Functional Reach Test, POMA, and ankle range of motion</td>
<td>Interventions improved balance</td>
</tr>
<tr>
<td>Dsouza et al.</td>
<td>Balance training under dual task conditions with graded sensory context</td>
<td>Elderly at risk for fall aged ≥60 years</td>
<td>Postural control training under single task conditions (n=23) vs. postural control training with manual-cognitive dual tasks (n=24) vs. postural control training with manual-cognitive task conditions (n=23) vs. postural control training with manual-cognitive dual tasks under graded sensory context (n=23)</td>
<td>Pre- and post-test, and 12-week follow-up assessment of Functional Reach Test, Lateral Reach Test, BBS, Dynamic Gait Index, Timed Up and Go Test under single and dual task conditions (manual, cognitive, and manual-cognitive tasks), falls and near-falls, fear of fall, Geriatric Depression Scale-15, Survey of Activities, and Fear of Fall</td>
<td>Training under single and dual task conditions equally effective in decreasing falls. Dual-task training had additional benefits on automaticity of functional mobility, balance and fear of fall. Intervention effects of dual-task training are influenced by type of task. Manual-cognitive tasks are suitable for functionally independent elderly. Training in graded sensory context does not enhance the effectiveness of dual-task training</td>
</tr>
<tr>
<td>Anuradha et al. 2012</td>
<td>Balance and mobility training</td>
<td>Frail institutionalised elderly aged ≥60 years</td>
<td>General balance exercises (n=25) vs. specific balance strategy training with functional strength, flexibility, balance strategy training, sensory integration, and additional attentional demands (n=25)</td>
<td>Pre- and post-test assessment of BBS and Timed Up and Go Test</td>
<td>Both interventions improved balance and mobility. Specific balance training improved BBS</td>
</tr>
<tr>
<td>Krishnamurthy and Telles, 2007</td>
<td>Yoga and Ayurveda</td>
<td>Elderly aged 60-95 years</td>
<td>No intervention (n=23) vs. yoga (n=23) vs. Ayurveda (n=23) for 6 months, 6 days a week</td>
<td>Pre- and post-test assessment with Tinetti balance and gait evaluation and Timed Up and Go Test</td>
<td>Yoga improved balance, gait, and mobility</td>
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</table>

**Table 3 Interventions for older adults towards fall prevention**
modifications, home safety interventions by occupational therapists, correction of refractive errors, and prescription of appropriate assistive devices. A comprehensive programme of strengthening, balance, and/or endurance training effectively reduces falls and fall risks in older adults. Exercises alone are effective in reducing fall rates in older adults in community and sub-acute settings, whereas multifactorial interventions are more effective in long-term care settings.

Fall prevention studies in Indian older adults are summarised in Table 3. Limitations of these studies include the lack of blinding and/or controls, and inadequate description of sample size estimation, randomisation, and/or sampling methods. Nevertheless, these studies suggest that balance and mobility improves with training. Only one study reported a decrease in falls and fall risks (physical and psychological) after intervention.

In Indian older adults, falls are emerging as a prevalent public health problem. Falls are potentially predictable and preventable. The World Health Organization designed a comprehensive fall prevention model based on 3 highly interrelated and mutually dependent pillars: awareness, assessment, and intervention.

Awareness is critical for the success of fall prevention programmes. Culturally relevant educational programmes are required to improve awareness of older adults, their families, the community at large, health agencies, and the government. Initial fall events without serious injuries are considered ‘coincidental’ or ‘accidental’ and are often ignored. Educational programmes should emphasise the importance of reporting fall events, even if they are not associated with serious injury. Older adults commonly do not acknowledge falls, owing to negative stereotyping and embarrassment at loss of control. Educational programmes should emphasise the positive outcomes (health and functional independence) of interventions, positive self-image, and social participation. Considering India’s collective culture and traditional roots of family, active ageing and fall prevention should be encouraged as means to continue to contribute to the family, rather than living alone independently. Media are powerful tools to increase awareness, as many older adults watch television for leisure.

Assessment of fall risk factors is important to develop effective fall prevention programmes. It is cost-effective and easier to prevent rather than treat falls. Fall-specific comprehensive assessments should be available at primary health centres for older adults. Screening for intrinsic risk factors can help identify at-risk older adults. Assessment of the home and bathroom for hazards is important, especially for older adults with a history of fall. Assessment of intrinsic factors is important for the old-old and oldest-old, whereas assessment of extrinsic risk factors is important for the young-old. Accessibility and safety of roads, public places, and transport services also need to be assessed.

Detailed documentation of the fall event, consequent injuries, and management is important, as is culture-specific assessment. In India, bathrooms are different to those in the West, and bathing involves an ‘oil bath’, which may predispose older adults to falls. Similarly, most balance assessments do not assess the ability to sit and rise from the floor, which is a common activity in various religious rituals, traditional practices, and daily routine tasks. This activity may pose a risk of fall that can be identified with suitable assessments.

It is also important to design and implement culturally appropriate interventions to decrease falls. More research is needed on multifactorial and multidisciplinary fall prevention programmes in the Indian context, especially in rural areas. Problems specific to Indian older adults such as osteoporosis, anaemia, poor nutrition, and non-communicable chronic diseases need to be addressed. Effective fall prevention programmes should include assessment with targeted interventions, for example, surgery for cataracts, vitamin D supplementation for vitamin D deficiency, and iron supplements for anaemia.

Yoga can improve balance and gait. Yoga involves ‘asanas’ which require stretching, maintaining positions, and various stances that improve flexibility, strength (trunk and lower limbs), and balance. Older adults can practise independently at home after supervised training. Older adults are encouraged to participate in daily activities such as household chores and gardening to improve physical activity. An active and healthy lifestyle should be emphasised to young and middle-aged adults, the future older adults.
Home and bathroom modifications (installation of grab bars, use of non-skid mats or flooring with matt-finished tiles, bidirectional doors, permanent bathing seats, improved ventilation, and hand showers) are important, especially for the oldest-old, as they spend most of their time at home and most falls occur at home and in the bathroom.61 Outdoors, safe road-crossing, accessible public transport services, barrier-free pavements, low curbs, and universal architectural designs are some recommendations, as is management of fall-related injuries and strategies to promote quality of life after a fall. In view of the increasing ageing population in India (particularly in rural areas) and diverse sociocultural and geographical influences, novel solutions may be required to design and implement comprehensive fall prevention programmes that are easily available and accessible to elderly people.

Public health policies and strong legislation effectively decrease falls in older adults.8 Nonetheless, the actual translation of these policies is a problem, especially in health promotion.62 Fall prevention must be emphasised in public health policies and health programmes for elderly people. Falls are an emerging public health problem and a barrier to active ageing in India. There is an urgent need for coordinated and collaborative efforts of health professionals, researchers, policy makers, and health care delivery systems to prevent falls and promote active ageing.

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