



Original article

Risk factors and epidemiological profile of hip fractures in Indian population: A case-control study

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ABSTRACT

Objectives: This analytic retrospective case-control study was designed to analyze risk factors and the epidemiological profile of hip fractures among the Indian population with special importance to the mechanism of injuries.

Methods: Patients of hip fractures ($n = 41$) and age- and sex-matched healthy volunteers ($n = 41$) were interviewed by a questionnaire regarding the occurrence of the fracture, past history of diseases and long-term medication usage, past and physical activity, supplements, smoking, and alcohol intake. The data were tabulated using descriptive statistics and logistic regression was used to determine significant risk factors.

Results: Age group 60–69 was found to be most affected by hip fractures, though an early onset of fractures was noted in males. Falls due to slipping indoors from standing position was found very commonly. However, an increasing trend of falls was noted from lying down position in the older age groups which was more common during the morning and night hours. Logistic regression analysis for the detection of risk factors was applied to the various variables in the questionnaire. Active status in the past was inversely related (odds ratio [OR], 0.33; $P < 0.05$) to fracture risk while alternative medication usage in the past 1 year (OR, 4.086; $P < 0.05$) and significant alcohol consumption were directly associated with fracture risk (OR, 5.484; $P < 0.05$). A potential inverse relation of use of calcium supplements in the past 3 months and fracture risk (OR, 0.872) was seen, although this was not significant. A potential positive relation of smoking with hip fractures was also seen, but not found significant (OR, 2.204).

Conclusions: Hip fractures in the elderly population are on a rising trend especially in the Indian sub-continent due to a number of factors both hereditary and acquired. Simple measures like routine usage of bedside railing, wall-side railings at an appropriate height, high friction tiles inside rooms and wash-rooms, and adequate lighting indoors can play a significant role in reducing falls and hip fractures among the elderly.

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1. Introduction

Osteoporotic hip fractures have become a major cause of morbidity and mortality in the adult and elderly population around the world. Hip fractures are becoming a matter of concern in Asia

particularly because of a 2–3 times increase in their incidence in almost every country in the continent [1,2]. The incidence of hip fracture is estimated to rise from 1.66 million in 1990 to 6.26 million in 2050 [3]. Apart from an increasing urbanization throughout Asia, there has also been an increase in the proportion of the elderly population due to an increase in average life span [1,4]. With changing world population dynamics, it has been estimated that more than half of these fractures will be concentrated in Asia by the year 2050 and although the exact reason for this geographic distribution is poorly understood, proposed contributing factors include genetic factors, less bone mineral content,

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physical activity, aging population, and environmental factors such as diet and vitamin D levels. Risk factors for hip fracture include widespread Vitamin D and calcium deficiency, negligence towards osteoporosis, alcohol consumption, smoking, reduced physical activity levels, obesity, and migration status.

The purpose of this study was to identify and analyze the preceding events and subsequent mechanism of trauma and other risk factors responsible for hip fractures in Indian population and to compare these factors with healthy control population to study their contributory significance. To the best of our knowledge, the influence of these factors on hip fractures (intracapsular or extracapsular) and their significance in Indian population has not been studied extensively till to date. The understanding of these risk factors and their significance will help policy makers and health care providers to develop strategies and prioritize them to reduce the rising trend of hip fractures in India [5].

2. Methods

This analytic retrospective case-control study (level III evidence) was conducted in at a tertiary care center in New Delhi during the months of January 2014 to December 2014. Twenty-one men and 20 women patients ($n = 41$) aged 40 years and above admitted with radiologically detected intracapsular and extracapsular fractures of femur were included as cases. Sample size calculation was done using a prevalence rate of 152–400 fractures per 100,000 population [6] at a confidence interval of 95% and keeping α -error at 0.05 and both controls and cases were selected accordingly. Exclusion criteria held that patients having femur shaft fractures, pathological fractures (due to neoplasia, Paget disease, osteogenesis imperfecta, etc.), and road traffic accident cases with multiple fractures were going to be excluded from the study. An equal number of age and sex matched healthy controls were recruited from amongst the patient relatives attending various clinics of our hospital. Age matching was done within ± 2 years of the age of the cases. The study was started only after obtaining clearances from the Institutional Review Board of Maulana Azad Medical College (F-1/IEC/MAMC/30/2/2012/141). All the subjects of the study gave their full, free and voluntary consent and the study adhered to the tenets of the Declaration of Helsinki. Subjects were interviewed using a structured pre-determined questionnaire ([Supplementary material](#)) about the following study variables.

2.1. Physiological data

Height, weight, and body mass index (BMI; kg/m^2) of cases and controls were measured.

2.2. Place and time of fracture

They were asked about the place of the occurrence of the trivial trauma which led to the fracture, whether it was indoors or outdoors. If indoors, they were asked if it had happened in the room or bathroom; if outdoors, whether in the market, road or the stairs. They were also asked to specify the timing of the trauma if it had happened during morning, day, evening or night hours.

2.3. Mode and cause of fracture

They were enquired about the mode of fall; from standing, sitting, lying down position or from a height, and also regarding the cause of fall; if it was due to a blackout, loss of balance or slipping.

2.4. History of weight loss

History of loss of weight, significant enough to loosen their clothes, in the last one year period before the trauma, was asked for.

2.5. Past and present physical activity

Participants were asked about the nature of physical activity they undertook during their 20 when they were of 20–30 years age and 30–40 years age and also in present times. The activities were walking, sitting, standing, squatting, and running/jogging. The response to each activity was scored according to time imparted daily towards that activity. Daily walking was graded as none = 0, 1–4 hours = 1, 5–8 hours = 2, 9–12 hours = 3, and >12 hours = 4, whereas sitting was graded as >12 hours = 0, 9–12 hours = 1, 5–8 hours = 2, 1–4 hours = 3, and none = 4 (considering increased hours of sitting as an indicator of inactivity, unlike in walking). Daily standing, squatting, and running/jogging were each graded as none = 0, 1–30 minutes = 1, 30–60 minutes = 2, and >60 minutes = 3. Scores for each activity were added. The total scores for the ages 20–30 and 30–40 were added and named 'total past physical activity score' (TPaPAS). Likewise, scores for each activity in the present were added and this total was doubled to match TPaPAS, the final value being named 'total present physical activity score' (TPrPAS). Tertiles of respectively the TPaPAS and the TPrPAS of the controls were determined and according to the tertile values both cases and controls were grouped into 6 categories, past inactive, past active, past very active, present inactive, present active, and present very active.

2.6. History of chronic disease and long-term medication usage

The questionnaire included a history of chronic illnesses like arthritis, diabetes mellitus, stroke, hypertension, epilepsy, thyroid illness, and asthma and also more than 6 months intake of drugs for diseases namely hypertension, heart disease, diabetes mellitus, asthma and epilepsy over the last 3 years. They were also asked about more than 6 months intake of thyroid hormone, steroids, sleeping tablets, hormone replacement therapy (HRT) (in women) and alternative medication usage over the last 3 years.

2.7. Smoking and alcohol intake

Participants were enquired about their smoking and alcohol intake history in the last 1 year.

2.8. Statistical analysis

Data analysis was done using IBM SPSS Statistics ver. 21.0 (IBM Co., Armonk, NY, USA). Descriptive statistics using bar charts and pie charts were used to describe the demographic profile of the study population and the details of the occurrences of the fractures. Univariate logistic regression analysis was done to determine the odds of having hip fracture with the variables cited above. Multiple logistic regression analysis was applied to the variables found significant in the univariate analysis, after applying Hosmer-Lemeshow goodness of fit to find the odds of hip fracture occurrence with these selected variables.

3. Results

3.1. Fracture characteristics

There were 42 men and 40 women in this study with 41 cases and 41 controls. The distributions of age, height, weight, and BMI in

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