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Incidence of hip fracture in Rohtak district, North India

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Abstract

Purpose—To study hip fracture incidence in Rohtak district of North India.

Methods—The study was conducted in Rohtak district, Haryana state; India located 80 km north of New Delhi. All patients having hip fracture admitted in Pt BD Sharma PGI or one of the four orthopaedic centres located in Rohtak in year 2009 were included. Total population of Rohtak for the year 2009 was used to calculate age specific hip fracture incidence.

Results—A total of 541 patients with hip fracture were hospitalized in Rohtak district in year 2009. Out of these 304 were from Rohtak district. Hip fracture crude incidence above the age of 50 years was 129 per 100,000. The corresponding figures were 105 and 159 per 100,000 among men and women respectively. Hip fracture incidence was similar in both sexes till age of 55 years. From age of 55 onwards the rates were significantly higher in women.

Conclusions—This is the first hip fracture incidence study from India. Hip fracture incidence rates in Rohtak district of India are intermediate between those in the industrialised world and Africa and similar to some of Asian countries such as China, Iran and South Korea. This study will help in formulating strategies for prevention of hip fracture in India.

Keywords

Hip fracture incidence; hip fracture rates; epidemiology; India; osteoporosis

Background

Osteoporosis and fall are major health problems in elderly populations and are associated with fragility fractures at the hip, spine and wrist. Hip fracture contributes to both morbidity and mortality in the elderly [1]. The demographics of world populations are set to change with more elderly living in developing countries and it has been estimated that by 2050 half of hip fractures will occur in Asia [2]. There is a worldwide geographic variation in hip fracture incidence [3-4]. The highest hip fracture rates are seen in North Europe and the USA and lowest in Latin America and Africa. Asian countries such as Kuwait, Iran, China and Hong Kong show intermediate hip fracture rates [5-7]. This could be because of difference in latitude, genetic or ethnic differences and environmental factors [8].

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Despite being the second largest emerging economy and second largest populated country in the world there are few studies in osteoporosis and none that describe hip fracture rates from India. According to rough estimates there were approximately 25 million people with osteoporosis in India in 2001 [9]. Vitamin D deficiency, a risk factor for osteoporosis, is also widely prevalent in the general Indian population and 80% of Indian patients with hip fracture are vitamin D deficient [10]. In the background of widespread vitamin D deficiency and a rapidly increasing elderly population which is predisposed to fall it is likely that hip fracture would be an important public health problem in India in the coming years. The aim of the present study was to determine the incidence of hip fracture in the Rohtak district, Haryana state of North India.

Methods

The study was conducted in Rohtak district of India located at Latitude (North). 28°-38'-54" and 29°-03'-36" and Longitude (East). 76°-09'-12" and 76°-52'-30". (figure 1). Rohtak is one of 21 districts in Haryana State and has a total area of 1668 km². Rohtak district was chosen for important reasons. Being a regional orthopaedic centre it can be presumed that subjects who have hip fracture visit either Pandit B.D. Sharma Postgraduate Institute (PGI), a tertiary care hospital or one of the other four orthopaedic centres in Rohtak. These are Civil Hospital, Dr. Ishwar Singh, Dr. Moda and Dr. Mudgil Hospitals located in district of Rohtak. Pandit B.D. Sharma PGI is a university teaching hospital and treatment is provided free of cost. In addition, there are no large orthopaedic centres near Rohtak which deal with serious orthopaedic problems. Therefore patients residing in other districts of Haryana state with hip fracture and other orthopaedic problems also visit this institution for treatment. Pandit B.D. Sharma PGI at Rohtak has a computerised medical record department (MRD) and case sheets of last 15 years are filed systematically and can be accessed with permission from head of departments. Other hospitals also maintain computerised records. The possibility that a small proportion of elderly were not brought to these hospitals for medical attention following hip fracture cannot be excluded. We do not at present have a mechanism to determine the exact proportion of such patients.

This was a retrospective study. The medical records including surgical notes and radiography of the four hospitals from January 1, 2009 to December 31, 2009 were reviewed to identify patients with hip fracture in all age groups during second half of 2010. Hip fracture was defined as clinical and radiological evidence of fracture of the proximal femur (ICD-10: S72.0-72.2). The case sheets of hip fracture patients were identified by ICD coded computerised hospital record from PGI and using admission registers and computerised records from other three hospitals. The diagnosis of hip fracture was validated with a diagnosis from orthopaedic surgeon, radiographic report and operation notes as described in the case files. Hip fractures due to high energy trauma, metastatic disease and secondary to cyst were excluded from analysis. The information was collected in a pre designed proforma by a health professional. Important information included age, sex, type of fracture and place of residence. Subjects from other districts of state were excluded from the study. Projected population of 2009 based on 2001 census was used as denominator to calculate the hip fracture incidence. This district population data was available from District Deputy Commissioner's office. Ethical approval was obtained from Pt. B.D. Sharma PGI, Rohtak. The data was recorded in Microsoft access data sheet. Stata 10 system was used to calculate age specific hip fracture rates per 100,000 population at Lifecourse Epidemiology Unit, MRC, Southampton, UK. Chi-squared tests or Fisher's exact tests were used to find the difference in incidence rates between men and women.

Results

A total number of 543 patients with hip fracture were identified during calendar year 2009 from Rohtak district of North India (fig 1). Majority of these patients (n=435) were from PGI, Rohtak and rest from other four hospitals. Among these 315 (58%) were women. The mean age was 58.2 ± 19.3 years. The number of trochanteric fractures was 375 (61%), and those of neck femur were 158 (30%). Rest of the fractures were due to pathological causes. Out of total 543 patients with hip fractures, 304 were from Rohtak district and rest from other districts and therefore, excluded from the study. The lack of any significant orthopaedic facilities in the neighbouring areas makes it unlikely that patients from Rohtak would go elsewhere for medical attention. The projected population in 2009 based on 2001 census was about 1.15 million.

Table 1 and figure 2 show the age specific hip fracture incidence rates in the study population. There was an increasing trend of hip fracture incidence with increasing age in both men and women and highest rates seen were 962 in women in age group 90-94 and 638 in men in age group 85-90. The crude hip fracture rates were 159 and 105 per 100,000 respectively in women and men above the age of 50 years. The hip fracture rates in women seems to be higher compared to those in men however, there was no statistical difference between two sexes across all age groups.

Discussion

This is the first study to find out the hip fracture incidence from Indian subcontinent. The major findings of our study are that age specific hip fracture incidence rates in Rohtak, a North Indian district are 159 and 105 per 100,000 in women and men respectively above the age of 50 years. Further the study shows that with increasing age hip fracture rates increase exponentially reaching 962 per 100,000 in women in 90-94 age group and 638 per 100,000 in men in 85-90 age group.

There is no data on hip fracture incidence from India; however, hip fracture incidence in Indians has been reported from Indians living in Singapore [11]. The first attempt to study hip fracture from India was in year 1963 from Kanpur, an industrial city in North India [12]. This study described 92 hip fracture subjects from a large hospital. The authors concluded that the average age of occurrence of hip fracture among Indian population is 10 years lower to that of Western population and maximum incidence was found in the 6th and 7th decade of life. It was further observed that number of these subjects had osteoporosis based upon radiological and histological methods. The mean age from this study in Rohtak district is 58.2 years which is comparatively lower compared to that in Western population. More recently hip fracture rates were studied in Indians living in Singapore as part of large population above 50 years from 1991 to 1998 [11]. Based on the national population census 1990 and yearly population estimates, the hip fracture age adjusted rates for 1991-1998 were 152 in men and 402 per 100,000 in women. Among the three major racial groups, in men, the Chinese had significantly higher age-adjusted hip fracture rates: 168 compared with 128 for Indians and 71 for Malays. A similar pattern was observed among women: 410 for Chinese compared with 361 for Indians and 264 for Malays.

Geographic variations and trends in hip fracture incidence across world population have been reported earlier [3, 4]. The crude hip fracture incidence rates above 50 years in India as found in the present study are similar to age standardised hip fracture rates from population-based studies in South Korea, South East Asia (Thailand and Malaysia), Iran [6, 13-14]. The incidence rates in the present study are also close to those crude rates reported from Mexico above the age of 50 years and China (Tangshan) above the age of 70 years [15, 16].

However, these are lower than the age standardised rates from other advanced Asian countries such as Japan, Hong Kong, and Singapore and Western countries [17-20]. Our results show higher incidence rates compared to age standardised rates reported in China (Shenyang) and crude rates reported from Venezuela and African countries [21-23]. In the present study, the age specific incidence of hip fractures in women seems to be higher compared to men. However, this difference is not statistically significant. The studies from Hong Kong and Singapore have shown a sex difference in the hip fracture rate however a study from China did not report any difference [6, 21]. Secular trends are available from many countries especially from industrialized world. A recent review on secular trends in hip fracture has shown that there is decline in hip fracture rates in some industrialised countries [24]. Similar decline in hip fracture has been reported from Finland in recent years [25, 26]. However, hip fractures in India are likely to increase in coming decades because of increase in elderly population which would be predisposed to osteoporosis and fall, the two of the major risk factors for hip fracture.

Haryana state is a prosperous state and ranks at the top in India after Goa for per capita income. State's per capita income has been pegged at Rs 56, 280 (US 1200 dollars) at current price. Additionally it is also major milk and milk product producer and consumer. Currently the per capita availability of milk is 680 gm as compared to national average of 258 gm. This study may not necessarily represent hip fracture incidence across India. However, if one were to apply this data to estimate hip fracture rates to the population across India the annual number of hip fractures in India would be 81, 724 in women and 61, 083 in men above the age of 50 years. The current life expectancy in Indian population is 67.4 and 72.6 years in men and women respectively and this is set to increase in coming decades. This will put a huge burden on India's health resources which is still to come out of the burden of infectious diseases.

The study has several limitations. Indian population is diverse in genetic background, geographical location and socioeconomic status. Therefore the results of this study may not be applicable to whole of Indian population and more studies need to be carried out from different parts of India. The sample size is small and is from one district in North India. In India, census is held every 10 years and last census before the study period was in 2001. Therefore projected population of 2009 as per Census of India was used for analysing results in this study. The study is based upon presumption that patients with hip fracture in Rohtak district visit one of the orthopaedic centres in Rohtak. Although unlikely, it is possible that a small number of these cases might have gone to other centres. The present study shows a decline in hip fracture in women in the age group 80-89 years which is due to smaller fracture numbers and a possibility that that few of very elderly women with hip fracture are managed at home.

To conclude, this epidemiological study is first attempt to evaluate hip fracture incidence anywhere in India. The hip fracture rates in this study are intermediate between industrialised world and Africa and similar to some of Asian countries such as China, Iran and South Korea. The hip fracture incidence among men is somewhat similar to as reported from Indians men living in Singapore. Considering its increasing rate in the elderly population, hip fracture is likely to become a huge socioeconomic burden in India. Thus, this study underscores the importance of hip fracture as a public health problem in India and calls for urgent steps to prevent osteoporosis and fragility fractures across India.

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References

1. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporos Int.* 2006; 17:1726–33. [PubMed: 16983459]
2. Cooper C, Campion G, Melton LJ III. Hip fractures in the elderly: a world-wide projection. *Osteoporos Int.* 1992; 2:285–289. [PubMed: 1421796]
3. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: World wide geographic variations. *Indian J Orthop.* 2011; 45:15–22. [PubMed: 21221218]
4. Dhanwal DK, Cooper C, Dennison EM. Geographic variation in osteoporotic hip fracture incidence: the growing importance of Asian influences in coming decades. *J Osteoporos.* 2010; 2:757102. [PubMed: 20981334]
5. Cheng SY, Levy AR, Lefaivre KA, et al. Geographic trends in incidence of hip fractures: a comprehensive literature review. *Osteoporos Int.* 2011; 22:2575–2586. [PubMed: 21484361]
6. Lau EM, Lee JK, Suriwongpaisal P, et al. The incidence of hip fracture in four Asian countries: the Asian Osteoporosis Study (AOS). *Osteoporos Int.* 2001; 12:239–243. [PubMed: 11315243]
7. Hagino H, Katagiri H, Okano T, et al. Increasing incidence of hip fracture in Tottori Prefecture, Japan: Trend from 1986 to 2001. *Osteoporos Int.* 2005; 16:1963–1968. [PubMed: 16133645]
8. Johnell O, Borgstrom F, Jonsson B, et al. Latitude, socioeconomic prosperity, mobile phones and hip fracture risk. *Osteoporosis International.* 2007; 18:333–337. [PubMed: 17077942]
9. Malhotra N, Mithal A. Osteoporosis in Indians. *Ind J Med Res.* 12(7):263–268. (20008).
10. Dhanwal DK, Sahoo S, Gautam VK, Saha R. Hip fracture patients in India have vitamin D deficiency and secondary hyperparathyroidism. *Osteoporos Int.* 2013; 24(2):553–557. [PubMed: 22543576]
11. Koh LK, Saw SM, Lee JJ, Leong KH, Lee J, National Working Committee on Osteoporosis. Hip fracture incidence rates in Singapore 1991-1998. *Osteoporos Int.* 1998; 12:311–318. [PubMed: 11420781]
12. Gupta AK, Samuel KC, Kurian PM, Rallan RC. Preliminary study of the incidence and aetiology of femoral neck fracture in Indians. *Indian J Med Res.* 1967; 55:1341–1348. [PubMed: 5595582]
13. Kim SR, Ha YC, Kim JR, Kim R, Kim SY, Koo KH. Incidence of Hip Fractures in Jeju Island, South Korea: A Prospective Study (2002-2006). *Clin Orthop Surg.* 2010; 2:64–68. [PubMed: 20514262]
14. Moayeri A, Soltani A, Larijani B, Naghavi M, Alaeddini F, Abolhassani F. Epidemiology of hip fracture in Iran: results from the Iranian Multicenter Study on Accidental Injuries. *Osteoporos Int.* 2006; 17:1252–1257. [PubMed: 16680499]
15. Clark P, Lavielle P, Franco-Marina F, et al. Incidence rates and life-time risk of hip fractures in Mexicans over 50 years of age: a population-based study. *Osteoporos Int.* 2005; 16:2025–2030. [PubMed: 16133641]
16. Zhang L, Cheng A, Bai Z, Lu Y, Endo N, Dohmae Y, Takahashi HE. Epidemiology of cervical and trochanteric fractures of the proximal femur in 1994 in Tangshan, China. *J Bone Miner Metab.* 2000; 18:84–88. [PubMed: 10701163]
17. Hagino H, Katagiri H, Okano T, Yamamoto K, Teshima R. Increasing incidence of hip fracture in Tottori Prefecture, Japan: trend from 1986 to 2001. *Osteoporos Int.* 2001; 16:1963–1968. [PubMed: 16133645]
18. Støen RO, Nordstletten L, Meyer HE, Frihagen JF, Falch JA, Lofthus CM. Hip fracture incidence is decreasing in the high incidence area of Oslo, Norway. *Osteoporos Int.* 2012; 23:2527–2534. doi: 10.1007/s00198-011-1888-3. Epub 2012 Jan 14. [PubMed: 22246602]
19. Ho SC, Bacon WE, Harris T, Looker A, Maggi S. Hip fracture rates in Hong Kong and the United States, 1988 through 1989. *Am J Public Health.* 1993; 83:694–697. [PubMed: 8484451]
20. Boufous S, Finch CF, Lord SR. Incidence of hip fracture in New South Wales: are our efforts having an effect? *Med J Aust.* 2004; 180:623–626. [PubMed: 15200359]
21. Yan L, Zhou B, Prentice A, Wang X, Golden MH. Epidemiological study of hip fracture in Shenyang, People's Republic of China. *Bone.* 1999; 24:151–155. [PubMed: 9951786]
22. Reira-Espinoza G. Epidemiology of osteoporosis in Latin America 2008. *Salud publica Mex.* 2009; 51(Suppl 1):S525–5. 51.

23. El Maghraoui A, Koumba BA, Jroundi I, Achemlal L, Bezza A, Tazi MA. Epidemiology of hip fracture in 2002 in Rabat, Morocco. *Osteoporos Int.* 2005; 16:597–602. [PubMed: 15452688]
24. Cooper C, Cole ZA, Holroyd CR, et al. Secular trends in the incidence of hip and other osteoporotic fractures. *Osteoporos Int.* 2011; 22:1277–1288. [PubMed: 21461721]
25. Kannus P, Niemi S, Parkkari J, Palvanen M, Vuori I, Järvinen M. Nationwide decline in incidence of hip fracture. *J Bone Miner Res.* 2006; 21:1836–1838. [PubMed: 17002578]
26. Korhonen N, Niemi S, Parkkari J, Sievänen H, Palvanen M, Kannus P. Continuous decline in incidence of hip fracture: nationwide statistics from Finland between 1970 and 2010. *Osteoporos Int.* Oct 30.2012 [Epub ahead of print].



Figure 1.
Showing geographic location of Rohtak district in North India

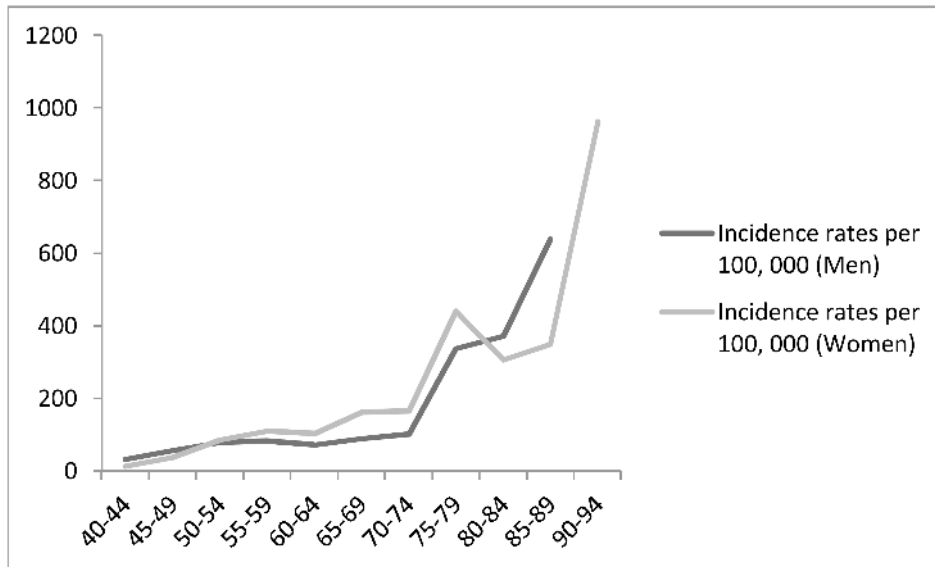
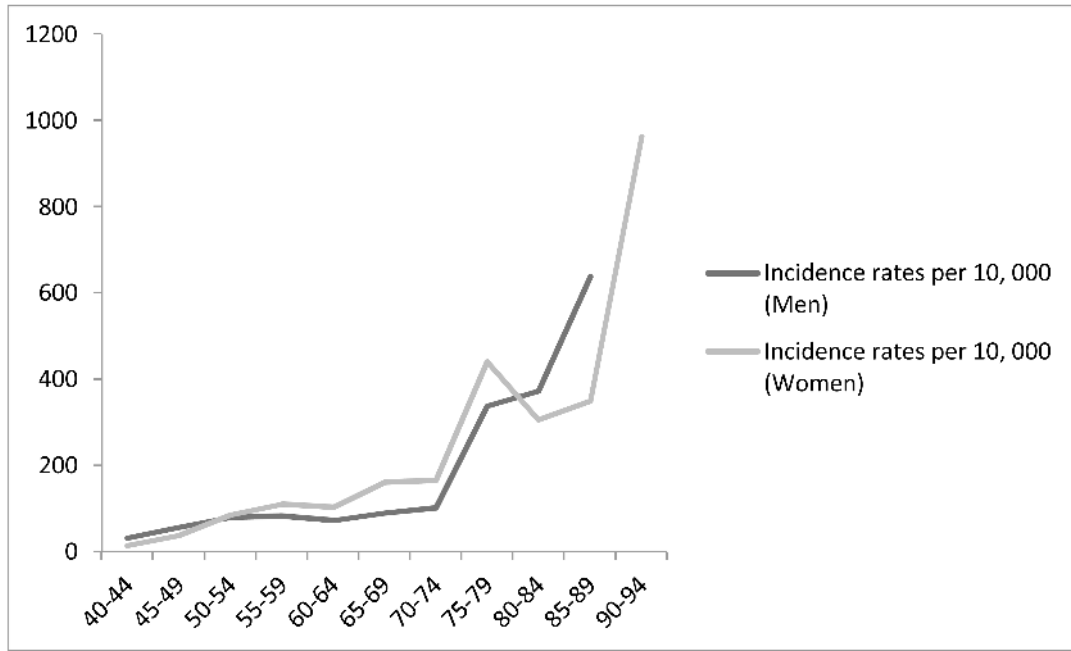


Figure 2. The age and sex specific hip fracture incidence in Rohtak district, North India in during 2009

Table 1

The age- and sex-specific incidence rate of hip fracture per 100,000 during 2009 in Rohtak district, North India

Age group (Years)	Men		Women	
	Incidence	95% CI	Incidence	95% CI
40-44	32	16-57	14	4-35
45-49	57	33-93	38	17-73
50-54	79	46-127	85	46-142
55-59	83	41-148	110	60-185
60-64	72	34-132	103	60-165
65-69	90	46-157	161	102-242
70-74	101	50-180	165	92-272
75-79	338	197-542	441	261-697
80-84	372	170-707	306	140-581
85-89	638	234-1388	349	94-895
90-94	-	-	962	198-2812