

Epidemiology of knee osteoarthritis in India and related factors

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ABSTRACT

Background: Among the chronic rheumatic diseases, hip and knee osteoarthritis (OA) is the most prevalent and is a leading cause of pain and disability in most countries worldwide. Its prevalence increases with age and generally affects women more frequently than men. OA is strongly associated with aging and heavy physical occupational activity, a required livelihood for many people living in rural communities in developing countries. Determining region-specific OA prevalence and risk factor profiles will provide important information for planning future cost effective preventive strategies and health care services.

Materials and Methods: The study was a community based cross sectional study to find out the prevalence of primary knee OA in India which has a population of 1.252 billion. The study was done across five sites in India. Each site was further divided into big city, small city, town, and village. The total sample size was 5000 subjects. Tools consisted of a structured questionnaire and plain skiagrams for confirmation of OA. Diagnosis was done using Kellgren and Lawrence scale for osteoarthritis.

Results: Overall prevalence of knee OA was found to be 28.7%. The associated factors were found to be female gender (prevalence of 31.6%) ($P = 0.007$), obesity ($P = 0.04$), age ($P = 0.001$) and sedentary work ($P = 0.001$).

Conclusions: There is scarcity of studies done in India which has varied socio geographical background and communities. We conducted this study for analyzing the current prevalence of OA in different locations. This study has evidenced a large percentage of population as borderline OA; therefore, it depends mainly on the prevention of modifiable risk factors to preserve at ease movement in elderly population through awareness programs.

Key words: Knee osteoarthritis, prevalence, related factors

MeSH terms: Osteoarthritis, knee, knee joint, risk factors, epidemiology

INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis, and range of biochemical and morphological alterations of the synovial membrane and joint capsule.¹

Pathological changes in the late stage of OA include softening, ulceration, and focal disintegration of the articular cartilage. Synovial inflammation also may occur.^{2,3} Typical clinical symptoms are pain, particularly after prolonged activity and weight-bearing; whereas stiffness is experienced after inactivity.² It is probably not a single disease but represents the final end result of various disorders leading to joint failure.^{1,2} It is also known as degenerative arthritis, which commonly affects the hands, feet, spine, and large weight-bearing joints, such as the hips and knees.^{1,2}

Most cases of OA have no known cause and are referred to as primary OA.³ Primary osteoarthritis is mostly related

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Access this article online	
Quick Response Code:	Website: www.ijoonline.com
	DOI: 10.4103/0019-5413.189608

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How to cite this article: Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij A. Epidemiology of knee osteoarthritis in India and related factors. Indian J Orthop 2016;50:518-22.

to aging.^{1,2} It can present as localized, generalized, or as erosive OA.^{3,4} Secondary osteoarthritis is caused by another disease or condition.⁴

Osteoarthritis is the second most common rheumatologic problem and it is the most frequent joint disease with a prevalence of 22% to 39% in India.^{1,3} OA is more common in women than men, but the prevalence increases dramatically with age.^{1,2,5} Nearly, 45% of women over the age of 65 years have symptoms while radiological evidence is found in 70% of those over 65 years.^{2,4,5} OA of the knee is a major cause of mobility impairment, particularly among females.^{2,5} OA was estimated to be the 10th leading cause of nonfatal burden.^{2,4}

Self report surveys may not accurately estimate OA as there could be unknown cases in the community.⁶ There are few studies of OA that have used a radiological classification of disease. X-ray findings do not always match symptoms, but prevalence based on radiography is probably a reasonable population estimate.⁷ OA of the knee is more prevalent as per the literature available.⁷

Therefore, for finding the current burden of OA and its association with lifestyle related factors, it was essential to undertake such a study on the prevalence of knee OA in Indian population.

MATERIALS AND METHODS

This study was performed to find the prevalence of knee OA in the Indian population and the factors associated with it by conducting a survey at community level in selected sample geographical areas. The study was a community based cross sectional study. The target population was from five sites or sample groups. To have geographical representation from all over India, the following sites were selected; (1) North hilly Dehradun/Nainital, (2) Central Agra, (3) Western Pune + Pimpri, (4) South Bengaluru/Hyderabad, (5) East Kolkata. Each site comprised one metropolis, one small city, one block headquarters (town), and five villages from that block. Approval from the Ethics Committee was obtained. A written consent was obtained from the respondents participating in the study.

The World Health Organization technical report series – 919, “The Burden of Musculoskeletal Conditions at the start of the New Millennium” containing the Community-oriented Program for Control of Rheumatic Diseases (COPCORDs) Bhigwan data on the prevalence of rheumatoid arthritis (RA) and OA among the Indian population was taken as a reference for sample size estimation. It was based on clinical American College of Rheumatology criteria (8). This was a community-based study and it estimated a total prevalence

of 5.5. Thus, we considered this for calculating sample size. We calculated a minimum sample size of $n = 4680$. This sample was further divided into five sites equally (936 from each site). It was rounded to a sample of 1000 from each site. Therefore, the total sample size was 5000. The further division of sample within each site was done proportionate to the population.

This evaluation study was conducted using the household as the primary sampling unit of the quantitative survey. The respondents for the study were above 40 years. One respondent from each household was selected based on the last birthday method. This method was used to ensure no bias and equal age and sex composition in the sample.

The exclusion criteria were as follows: Age <40 years, RA, inflammatory arthritis, bilateral end stage, knee OA, unable to walk without aids, systemic lupus erythematosus, polyarthralgia, previous history of fracture of lower limb or spine, any other surgical or medical condition that severely limits subjects’ functional ability.

Quantitative data were collected using structured questionnaire and X-ray investigation. This also included screening to rule out people who belonged to the exclusion criteria. Structured questionnaire was in the local language and consisted of the following sections informed consent, demographic profile age and sex, socioeconomic profile education, occupation, income, housing conditions, type of work and lifestyle related information, physical parameters height and weight, family history about OA and osteoporosis, respondents’ history related to osteoporosis presence of symptoms, whether diagnosed already and taking treatment, if not diagnosed, since when symptoms present.

This was followed by an X-ray investigation of both the knee joints in two views – anteroposterior view and lateral view. OA was graded using the Kellgren and Lawrence scale for OA. Analysis was done based on the X-ray grading. Grade 1 was considered sub-threshold for OA. Grade 2 and 3 were considered as a positive finding for OA.

RESULTS

The study used radiographic diagnosis for the confirmation of knee OA. The Kellgren and Lawrence scale of OA grading was used for the same. Analysis was done using SPSS software package for statistical analysis version 17. Chi-square test and *t*-test were used. The present study shows a prevalence of 28.7% in the overall sample [Table 1]. The prevalence was higher in villages (31.1%) and big cities (33.1%) as compared to towns (17.1%) and small cities (17.2%) [Table 2].

The association of gender and OA of this study is in congruence with the available literatures on knee OA. OA of the knees was found to be more prevalent in females (31.6%) than in males (28.1%). This finding is statistically significant ($P = 0.007$).

The study found that the prevalence of OA knees increased with increase in body mass index (BMI). Knee OA prevalence was significantly ($P = 0.007$) low in underweight people (28%) as compared to normal weight and obese participants (33%). Prevalence was found to be highest in people who are overweight and/or obese [Table 3]. The prevalence was highest among the age group of 60 and above and lowest in people in the age group of 40–50 years ($P = 0.001$) [Table 4]. The prevalence of knee OA was highest in participants who are unemployed. Although statistically significant ($P = 0.0001$), a cause–effect relationship cannot be derived. This is so because the unemployed group may include people who were retired. In such cases, the OA may have been due to age rather than being unemployed. Prevalence was lowest among participants who worked as daily

wage workers/laborers (22.2%). Prevalence was highest in participants who have a sedentary lifestyle followed by participants with a physically demanding lifestyle and active lifestyle. This difference was statistically significant ($P = 0.001$) showing that the prevalence of OA was lowest in participants who had a fairly active physical activity level [Table 5]. Since the study recorded the current level of physical activity, it may be possible of having OA that may be more due to age rather than lifestyle. Moreover, people with severe OA may have changed their lifestyle. OA prevalence was found to be significantly more ($P = 0.001$) in participants who used Western toilet (42.1%) as compared to those who used Indian toilet (29.7%) or both types (38.8%), but it reflects more a condition of difficulty to use Indian toilet than a predisposition to OA.

Prevalence was higher in participants who do not exercise (83.9%) compared to participants who exercise (36.0%). Although the questionnaire gathered information on the type of exercises done, there was no significant difference in the prevalence of OA among different exercise groups.

Table 1: Osteoarthritis status of Indian population

O.A status	No. of participants	Percentage
No O.A	3497	71.3
O.A	1412	28.7
Total	4909	100

Table 2: Site wise distribution of study sample

O.A status	No./prevalence	Big city	Small city	Town	Village
Site 1	Numbers	73	40	57	47
	Prevalence (%)	20.4	20.5	23.5	23.2
Site 2	Numbers	90	88	60	29
	Prevalence (%)	23.1	37.6	30.3	15.8
Site 3	Numbers	107	50	54	114
	Prevalence (%)	31.8	28.7	37.8	33.6
Site 4	Numbers	115	63	69	108
	Prevalence (%)	37.8	28.8	48.3	32.3
Site 5	Numbers	84	32	18	114
	Prevalence (%)	29.3	29.1	17	27.9
Total	Numbers	464	249	251	436
	Prevalence (%)	33.1	17.8	17.9	31.1

Table 3: BMI and osteoarthritis

O.A Status	Underweight		Normal		Obese		P
	No.	%	No.	%	No.	%	
O.A	117	28	616	28.7	618	33	0.007
No. O.A	301	72	1530	71.3	1257	67	

Table 4: Prevalence of osteoarthritis with age

O.A status	<50 years		50-59 years		60-69 years		70+ years		P
	No.	%	No.	%	No.	%	No.	%	
O.A	405	19.2	261	30.7	430	39.7	304	54.1	0.001
No O.A	1708	80.8	589	69.3	653	60.3	258	45.9	

DISCUSSION

OA indeterminately occurs in elderly age group.^{1,2,5} OA occurs commonly in females above 45 years of age while before 45 years, it is common in males.^{2,5} The studies done on females for identifying the relation between estrogen and the prevalence of OA in menopausal age showed contradictory results.

The prevalence of OA is available for the USA and European populations, but there are scare studies done in other regions.⁵ In 1990, it was the 10th leading cause of nonfatal diseases contributed 2.8% years of disability.⁷ An estimated prevalence of symptomatic OA is 18% in females and 9.6% in men.^{2,7} In global burden of diseases, in 2000, it was the 4th leading cause of years lived with disability (YLD) leading to 3% YLD.³

The COPCORD study also showed a higher prevalence in urban as compared to the rural prevalence of OA in Bangladesh.^{8,9} In a study done in Beijing’s urban population¹⁰ and Wuchuan’s rural population,¹¹ it was observed that Wuchuan men had a prevalence ratio (PR) 2.5, 95% confidence interval (CI) (1.6-3.8) and symptomatic knee OA (PR 1.9, 95% CI 1.3-2.9). A Chinese cohort study

Table 5: Activity level and osteoarthritis

O.A status	Sedentary		Active		Demanding		P
	No.	%	No.	%	No.	%	
O.A	548	36.8	696	26.6	134	30.4	0.001
No O.A	947	63.2	1919	73.4	307	69.6	

showed two to three times higher bilateral knee prevalence as compared to a Framingham study.¹¹ In an observational study done in rural Tibetan region, the prevalence of knee pain was 25% and significantly associated in 50 years as compared to younger people.¹² Similarly, a study done by Muraki *et al.* on Japanese population in symptomatic and radiographically confirmed knee OA cases, it was evidenced to have higher prevalence in two mountain regions as compared to rural and urban population.¹³

In a house-to-house survey done by Salve *et al.* in South Delhi among 260 perimenopausal women, the prevalence of OA was found to be higher in lower socioeconomic than higher socioeconomic population.¹⁴ A study done by Sharma *et al.* had similar results, but with lesser prevalence than this study.¹⁵ Recently, a cohort study done by Martin *et al.* showed that BMI is positively associated with knee OA in women and suggested that more active individuals have lower risk of knee OA.¹⁶ In a metaanalysis done by Blagojevo *et al.*, it showed that BMI is a risk factor for OA.¹⁷ The various modifiable risk factors are repetitive movement of joints, obesity, infection, and injuries. The occupational physical activities include monotonous motions and great forces such as kneeling, squatting on joints,¹⁸⁻²⁵ climbing,²⁶ and heavy weight lifting. Kellgren showed that the first-degree relatives of probands had twice higher risk than others. The genetic OA and progression study by Riyazi *et al.* in multiple sites showed the evidence of familial heritability of OA of hand, hip, and spine, but not in knee.²⁷

This study has evidenced a large percentage of subthreshold population, that is, K-L Grade 1 which is considered as borderline or doubtful as far as OA diagnosis is considered. This needs to be addressed. Awareness program should be initiated at community level which is needed for the prevention of OA of knee at early age. We would like to suggest that a longitudinal cohort study can be planned which, in long run, will prove the impact of physical activity, habits, and lifestyles. Stress on early diagnosis on the onset of symptoms should be encouraged among the general population. Studies to understand how many people with symptoms of OA seek medical advice are required to understand the treatment seeking behavior and pain tolerance associated with OA.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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