



## Risk factors of knee osteoarthritis : A cross sectional study

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### ABSTRACT

The present study was aimed to assess, understand and study the prevalence, risk factors and pharmaco-economic details of Osteoarthritis (OA). We conducted a prospective, observational, cross sectional study on 68 OA patients for a period of 6 months in a tertiary care referral hospital, Kerala. A data collection form was designed to collect information necessary for the study. We arranged the study into 3 phases as the preparatory, data collection and analytical phase. The prevalence of OA and prevalence of each risk factor to causing OA was separately analyzed. The cost of illness in OA patients was also evaluated. Among 68 patients selected for the study, 32 patients were from the age group 56-65 followed by the age group 66-75 of 18 patients. Out of 68 patients, 47 patients were females and 21 patients were males. Our study found that 40 patients were overweight, 19 were obese and only 9 were normal weight. The assessment of prevalence of risk factors showed that among the various risk factors, age (36%) was found to be the most statistically significant prevalent risk factor followed by female gender (69%) and trauma (16%). The average monthly cost of treatment of osteoarthritis was calculated from the collected data and it was found that direct medical cost was more than the direct non medical cost. Our study concluded that a high prevalence rate of knee osteoarthritis among elderly. Also females were predominantly affected than men and prevalence of risk factors was also higher in this gender. Our study suggested that as the number of people with OA increases with age, preventive measures can be taken in the earlier age groups by lifestyle changes and by careful watch on body weight and daily activities. So that Osteoarthritis can be prevented.

### INTRODUCTION

Osteoarthritis (OA), commonly known as osteoarthrosis, is a long-term chronic disability disease characterized by the deterioration of cartilage in joints which results in bones rubbing together and creating stiffness, pain, and impaired movement.[1,2] About 100 million people suffer from OA and it is ranked as the eighth leading cause of disability.<sup>[1]</sup> Worldwide estimates are that 9.6% of men and 18.0% of women aged over 60 years have symptomatic osteoarthritis. About 80% of those with osteoarthritis will have limitations in movement, and 25% cannot perform their major daily activities of life.[1,2]

OA commonly affects middle aged and elderly but as a result of injury or over use of joints it may begin earlier.[3] The major risk factor of OA is age and is also associated with both modifiable and non modifiable factors like obesity, lack of exercise, genetic predisposition, occupational injury, trauma, and gender. [1]

Oxidative damage, thinning of cartilage, muscle weakening are the individual factors which show relationship between age and OA. Also, with increasing age basic cellular mechanism maintaining the tissue homeostasis declines and leads to an inadequate response to stress or joint injury and results in joint tissue destruction and loss.[4] The prevalence of OA is greater among women than men and it dramatically increases around the time of menopause because of the decline in level of estrogen at that time.[5]

One of the main mechanism by which obesity causes knee or hip OA is by the increased loading on the joints. Overloading could lead to cartilage breakdown and failure of ligamentous and other structural support.[6] Jobs and occupational activities requiring continuous stair climbing, squatting, kneeling are associated with high risk of developing OA.[7]

The present study is aimed to analyze the prevalence, risk factors and cost of treatment of osteoarthritis patients in a tertiary

care hospital. This type of prevalence studies have been conducted only in small numbers to date in India especially in Kerala.

## MATERIALS AND METHODS

### STUDY PERIOD

A prospective observational cross sectional study was conducted for a period of 6 months commencing from December 2015 to May 2016 with the aim to study the prevalence, risk factors and management of osteoarthritis in the orthopedic outpatient department of a 750 bedded multispecialty tertiary care referral KIMS AL SHIFA hospital in Kerala.

### STUDY DESIGN AND PROCEDURE

A total of 68 patients diagnosed with knee osteoarthritis were enrolled in the trial after obtaining their informed consents. Patients of either sex attending the orthopedic outpatient department diagnosed with knee osteoarthritis and are willing to take part in the study were included in the study. Patients having the privilege of insurance schemes, psychological morbidities, cognitive impairment, hearing disabilities, tumour, malignancy and those who are not native speakers were excluded from the study. A data collection form was designed to collect information necessary for the study which focuses on sex, age, height, weight, BMI and other relevant risk factors like history of injury to the knee, obesity, trauma, climbing stairs regularly, kneeling, family history of OA, and pharmacoeconomic details including direct medical, direct non medical and indirect cost to the patients for the treatment. The study was approved by ethics committee of KIMS AL SHIFA HOSPITAL with no. IEC/KAS/2015/19 on 17/11/2015.

We arranged the study into 3 phases. First phase was the preparatory phase includes the identification and documentation of risk factors and preparation of well structured data collection form and patient informed consent form. Second phase was the data collection phase in which patients who satisfied the inclusion and exclusion criteria were included as subjects of the study. The demographic data, details of co-morbid conditions were collected through direct patient and bystander interview. Information regarding the risk factors was prospectively recorded. Prevalence of each risk factor among patients with OA was compared between men and women. Patients case records were reviewed to collect the details of lab tests, medications etc. The details of costs

such as consultation fee, laboratory charges, cost of medication, cost of transportation and food, lost wages and cost occurred due to accompanying person were collected during OP visit. Telephone interview was also performed whenever necessary to collect the details. Third phase was the analytical phase where the collected data were compiled and analyzed using chi square test.

## RESULTS

A total of 68 patients with osteoarthritis were enrolled for the study of whom 47 patients (69 %) were females and 21 patients (31%) were males. Majority of the patients belongs to the age group 56-65 years. Mean age of patients was found to be 64.18 and SD is 9.22 years (Table 1, Figure 1).

About 40 patients (59%) were overweight, 19 (28%) were obese and 9 (13%) were normal weight (Table 2). Significantly there is a higher number of patients were belongs to overweight category in the sample. Hypertension and diabetes were the most prevailing co-morbid conditions with 51.47% suffering from hypertension and 30.88% from diabetes mellitus and 11.8 % from hypothyroidism (Figure 2). ( $\chi^2 = 17.121$ ,  $df = 2$ ,  $p < 0.001$ ).

While analyzing risk factors associated with osteoarthritis, age of the patient was found to be the most statistically significant factor followed by female gender and trauma. ( $\chi^2 = 163.729$ ,  $df = 8$ ,  $p < 0.001$ ). (Table 3).

In a detailed separate analysis of risk factors in both males and females, a majority of risk factors were commonly found in females (Table 4).

The average monthly cost of treatment of OA was calculated from the collected data and it was found that direct medical cost was more than the direct non medical cost (Table 5).

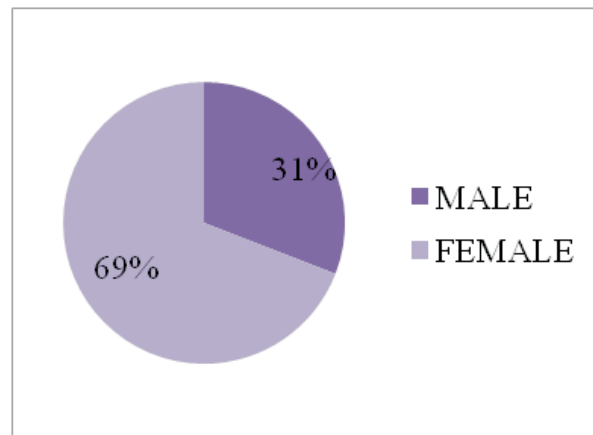
## DISCUSSION

OA is commonly seen in individuals after 40 years of age. There are various risk factors associated with the occurrence of OA such as age, female gender, obesity, physical activities, trauma and family history.

The worldwide prevalence of OA has been estimated to be 9.6% in men and 18.0% in women over the past 60 years. In our study it was found that the prevalence of knee OA was 3.8 %. The prevalence rate of OA was reported as 5.8 % by NishaElizabeth Ajit (et al).[8]

**Table 1 :** Age wise distribution of patients.

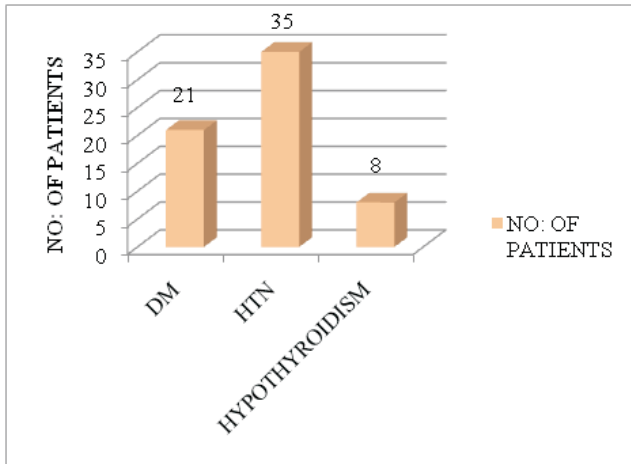
AGE ( in years)	NO: OF PATIENTS	PERCENTAGE
35-45	0	0
46-55	10	14.7058824
56-65	32	47.0588235
66-75	18	26.4705882
76-85	7	10.2941176
>85	1	1.47058824



**Fig. 1 :** Gender wise distribution of patients.

**Table 2 :** Body mass index wise distribution of patients.

Category	No: of patients	Percentage
NORMAL WEIGHT	9	13
OVER WEIGHT	40	59
OBESE	19	28



**Fig. 2 :** Co-morbid conditions

Among 68 patients selected for the study, 32 patients (47.06%) were from the age group 56-65 followed by the age group 66-75 (26.47 %) with a mean age of  $64.18 \pm 9.22$  years. The prevalence rate was very less in patients below 45 years. This result was comparable with the findings of Arvind Kumar Singh et al.,[8] Nisha Elizabeth et al.,[9] that also showed a high prevalence rate of knee osteoarthritis among elderly. A similar study conducted by Pushpa S Patil[10] showed that majority of patients with OA were in the age group of 55-59 years. A study conducted by S.D Ganvir and B.R.Zambare[11] observed that the percentage of people affected with OA was more with an increasing age.

About 69% of patients were females and only 31% were males. The p value is less than 0.001 and the result was statistically significant. The prevalence rate was shown to be higher among females of age > 45. This result was consistent with the study reports of Manoj Kumar S et al[12] in which they reported more than two third of the study subjects to be females.

This study found that 40 patients ( 59%) were overweight, 19 (28%) were obese and only 9 (13%) were normal weight. Therefore being both overweight and obese can be considered as risk factors for developing OA. Obesity as a significant risk factor for OA was supported by many studies. According to Anu Anna George et al [13] severity of OA was significantly higher among obese patients compared to the non obese patients. A study

RISK FACTORS	NO: OF PATIENTS	PERCENTAGE
AGE	68	100
FAMILY HISTORY	4	5.882352941
FEMALE GENDER	31	45.58823529
OBESITY	10	14.70588235
TRAUMA	30	44.11764706
REPETATIVE KNEE TRAUMA	2	2.941176471
CONTINUOUS STAIR CLIMBING	9	13.23529412
KNEELING	22	32.35294118
SQUATTING	11	16.17647059

**Table 3 :** Prevalence of risk factors.

RISKFATORS	MALE	FEMALE
AGE	21	47
FAMILY HISTORY	2	4
FEMALE GENDER	0	47
OBESITY	2	8
TRAUMA	9	22
REPETATIVE KNEE TRAUMA	1	3
CONTINUOUS STAIR CLIMBING	6	7
KNEELING	7	15
SQUATTING	5	8

**Table 4 :** Comparison of risk factors among male and female.

**Table 5 :** Cost of illness analysis in osteoarthritis

NO: OF PATIENTS	COST		AVERAGE MONTHLY COST ( IN RUPEES)
68	DIRECT MEDICAL COST	PHYSICIAN CONSULTATION COST	160
		LAB INVESTIGATION COST	80
		DIAGNOSTIC COST	170
		MEDICATION COST	1170
	TOTAL COST		1580
	DIRECT NON MEDICAL COST	TRAVELLING COST	900
		FOOD COST	150
TOTAL COST		1050	
NO: OF PATIENTS	COST	MEAN ( IN RUPEES)	STANDARD DEVIATION ( IN RUPEES)
68	DIRECT MEDICAL COST	1266.6	743.4
	DIRECT NON MEDICAL COST	1054.853	556.9

conducted by Manoj Kumar S et al[12]found a significant association between obesity and OA and explained that a force of three to six times the body weight is transmitted across the knee during a single leg stance and this mechanical stress on the joints predisposes to OA.

The assessment of prevalence of risk factors showed that among the various risk factors, age (36%) was found to be the most prevalent risk factor followed by female gender (69%) and trauma (16%). All the patients selected were > 35 years and a vast majority being > 45 years. Family history of OA was present only in a few ( 5.9% ). Our study found that female gender is another risk factor for being an OA patient because most patients (69%) were females. Trauma was analyzed to be another risk factor (16%). A study conducted by Manoj S Kumar et al[12] found that subjects with history of trauma and fracture were found to be significantly associated with developing OA in the near future. About 32.35% patients were involved in kneeling as part of their religious practice and in various knee bending activities as part of daily life acts or occupational needs, and hence we could also conclude knee bending and kneeling was contributing to be a risk factor for osteoarthritis. A study done by Cyrus Cooper et al found that occupational knee bending is a positive risk factor for development of OA[14]. Also these results were consistent with the observations of Pushpa S Patil.[10]

In a separate analysis of risk factors among male and female most of the risk factors were common in females. Chi square test showed that there was a statistically significant difference ( $p < 0.001$ ) while comparing the risk factors such as age, female gender and trauma among male and female subjects. There was no

significant difference detected while comparing the risk factors - family history, gender, obesity, trauma, continuous stair climbing, kneeling and squatting among male and female subjects.

In the present study group both direct medical and direct non medical cost for one month were collected and analyzed. The average direct medical cost for the 68 study subjects upon calculation was found to be around Rs. 1266.6 and direct non medical cost around Rs.1054.85 for one month. About 74.05 % of direct medical cost was charged for medications from the subjects followed by diagnostic test cost (10.76%), physician consultation charge (10.13%) and laboratory investigation charge (5.06%). In a similar study conducted by G.Leardini et al direct cost came to € 934 per year.[15]

### CONCLUSION

Our study concluded that  $64.18 \pm 9.22$  years to be the mean affected age. Also females were predominantly affected than men and prevalence of risk factors was also higher in this gender. Excluding female gender, age, trauma and kneeling were the prominent risk factors. In line with various previous studies we could also conclude that obesity and overweight are contributing factors that can gradually predispose individuals to develop OA in the near future. Majority of subjects showed comorbid conditions like DM and HTN.

Cost analysis was done for one month which exhibited the results as the average direct medical costs and direct non-medical costs to be Rs.1266.6 and Rs.1054.85 respectively. Major portion of these costs contributed to cost of medications followed by diagnostic test costs and then physician consultation and

laboratory test costs. OA can largely be avoided by lifestyle changes and by careful watch on body weight and daily activities.

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