A Cross-sectional Study to Estimate the Proportion and Ascertain Risk Factors for Osteoarthritis Knee among Women above 45 Years of Age Attending a Tertiary Care Hospital

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Abstract

Background: With aging, women face various health issues, the most common of which are musculoskeletal disorders. Osteoarthritis accounts for 15% of all musculoskeletal disorders in patients above the age of 45 years but receives little attention. This study aims to estimate the proportion of women above 45 years suffering from Osteoarthritis (OA) knee and to ascertain its risk determinants. **Materials and Methods:** A cross-sectional study was conducted among 380 women above 45 years of age attending the Orthopedic outpatient department of a tertiary care hospital over a period of 18 months. American College of Rheumatology clinicoradiological criteria were used for the diagnosis of OA knee. A predesigned case record form was used to collect information on sociodemographic profile and other risk factors. **Results:** Data were analyzed using SPSS version 16.0. Our study found the overall proportion of OA knee to be 69.2%. The Chi-square test was used to find the association of various factors with OA knee. On logistic regression, diabetes mellitus, hypertension, menopause, and increased body mass index were found to be significant for OA Knee. **Conclusion:** The study concludes the possibility of prevention of disabilities by early screening for OA Knee in those with risk factors as a part of wellness clinics.

Keywords: Diabetes, obesity, osteoarthritis, wellness clinics

INTRODUCTION

Osteoarthritis is a chronic degenerative joint disease that commonly affects the middle-aged and elderly, although younger people may be affected due to injury or overuse. The disease usually affects the joints in the knees, hips, hands, feet, and spine. The knee joint is most commonly affected. It results from aging and repetitive mechanical loads to the joint.

OA has a slow, chronic progression, or of stable periods with intermittent worsening. With the new onset of pain or if there is an increase in pain, there is a natural tendency for patients to restrict activity.[1,2] As activity decreases over time, muscle bulk and strength decrease, leading to decreased joint stability, worsening of joint degeneration, and a further decline in functional status.[1,2] There is no permanent medical cure for OA and the main goal of treatment is pain relief and prevention of disability. Joint replacement surgeries become the ultimate treatment of choice for such patients presenting

in the debilitating stage.[3] Adequate preventive measures such as weight loss, exercise, and lifestyle changes help in slowing down the progression of OA, thus preventing disability and improving quality of life.

Women are not aware of the disease and the disability it results in. They keep neglecting the knee pain and do not consult the physician unless they have difficulty in doing their daily activities. Most of the people presenting at a later stage may not respond to the symptomatic management and may warrant surgery. Further, the total cost of the surgery is high, and most of our population are resource crunched which restricts their

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affordability. Also, many of the elderly population may not be fit for surgery due to age-related complications and other comorbidities, which may increase the risk of mortality during surgery. Thus, they end up living with disability throughout their life, living a sedentary life which puts them in a vicious circle of OA and at increased risk of stroke and cardiovascular diseases. Thus, there is a missed opportunity to diagnose, treat, and prevent disability from the disease at an early stage resulting in reduced quality of life. Most of the elderly women are dependent on someone and this burdens them both financially and emotionally.

OA is a major public health concern globally and the trend in the prevalence of OA knee varies by geographical location, and hence etiological factors for OA knee must be explored. OA is a major health problem among women due to loss of estrogen as they attain menopause, and the condition is more debilitating. Though there are few studies on OA knee in India, there is the scarcity of research focusing on women and there are no policies addressing osteoarthritis in our country. If the focus is laid on educating women and disease prevention, we can delay the progression of the disease, ultimately improving their healthy life years free of disability. Thus, this research study aims to estimate the proportion of women above 45 years suffering from OA knee and ascertain its risk determinants and, thus, help in planning preventive strategies at an earlier age so as to improve the quality of life in women.

Materials and Methods

A cross-sectional study was conducted at the orthopedic OPD of a tertiary care hospital from March 2018 to September 2019. The outpatient department provides services from Monday to Saturday every week from 8.30 am to 12.30 pm. We included women above 45 years of age who visit the orthopedic outpatient department. We excluded those with rheumatoid arthritis, Sjogren's syndrome, and other rheumatological disorders and those who are either seriously ill or have injuries or fractures. American College of Rheumatology (ACR) clinical and radiographic criteria (knee pain and any one of the following- >50 years of age, morning stiffness >30 min, crepitus plus osteophytes), which has a sensitivity of 91% and specificity of 86%, was used for diagnosis of knee osteoarthritis.[4] Using the formula $n \geq Z^2$ PQ/ e^2, substituting the prevalence of osteoarthritis knee as 55%(P),[5] Q as $100 - P$ (45%), Z as 1.96 at 95% C.I., and allowable error(e) as 5%, we calculated the sample size to be 380. Convenient sampling technique was used. After obtaining informed consent, they were enrolled for the study based on the inclusion and exclusion criteria and data collection was done using a predesigned case record form until our adequate sample size was achieved. An X-ray knee was also done. Ethical clearance was obtained from the institutional ethics committee.

An interview schedule including information on the sociodemographic profile, details on risk factors, and history regarding pain or swelling over the joints was first obtained after which a clinical examination was carried out. The interview was conducted in a separate room on an individual basis so as to ensure privacy. Measurements such as height, weight, and waist circumference were taken using stadiometer, digital weighing machine, and nonstretchable measuring tape, respectively, as per the standard protocol.[6] All the instruments used for the study were calibrated periodically. Body mass index (BMI) was calculated using the formula weight (kg)/height (m²) and categorized as underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), and obese (>30) based on WHO criteria.[7] Waist-hip ratio (WHR) of ≥0.85 cm is considered as increased in women.[8] Statistical analysis was performed by using SPSS software version 16. Chi-square test was used to find the association of various factors with OA knee and $P \leq 0.05$ was considered as statistically significant at a 95% confidence limit. Binary logistic regression was applied to assess the effect of risk determinants on OA knee.

Results

The mean age of the study subjects was 57.14 ± 8.065 years. Out of 380 study participants, 148 (38.9%) were in age group of 46–55 years, 168 (44.2%) were between 56 and 65 years, and 64 (16.9%) were aged above 65 years. In total, 300 (78.9%) were married, 9 (2.4%) were divorced, and 71 (18.7%) were widow. Two hundred eighty nine (76.1%) belonged to Hindu, 14 (3.7%) were Christians, 75 (19.7%) were Muslim, and 2 (0.5%) were Buddhist. About 13 (3.4%) of study participants belong to the upper middle class, 89 (23.4%) were lower middle class, 231 (60.8%) belonged to the upper lower class, and 47 (12.4%) were lower class as per modified Kuppuswamy scale. The proportion of OA knees among women above 45 years of age in our study was found to be 69.2%.

Bivariate and Binary logistic regression show the association of various factors with OA knee among women above 45 years of age [Table 1]. The logistic regression model was statistically significant, $P < 0.005$. The model explained 50.2% (Nagelkerke R^2) of the variance in OA knee and correctly classified 82.6% of cases. Those with the presence of diabetes mellitus (DM) had 5.4 times higher odds (95% C.I – 2.793, 10.525) of developing OA knee. Those with hypertension had 14.2 (95% C. I. – 5.001,40.459) times higher odds for developing OA knee compared to those without hypertension. Those who attained menopause had 2.6 times higher odds (95% C.I – 1.048,6.643) of developing OA knee. Obese individuals had 2.3 times (95% C.I – 1.103,6.643) and overweight individuals had 6.1 times (95% C.I – 2.676,14.057) higher odds of developing OA knee.

Discussion

The proportion of OA Knee among women above 45 years of age in our study was 69.2%. The prevalence reported in our study is more as compared to the study done in Bangalore and Delhi,[5,9] where the prevalence of osteoarthritis knee in women above 40 years of age was found to be 55% and 47.3%, respectively, due to the fact that our study is hospital based in orthopedic

Table 1: Association of various risk determinants with OA knee

Risk determinants	Total number of study subjects (n)	OA Knee n (%)	OA Knee Absent n (%)	P (Bivariate)	Adjusted OR (95% C.I.)
Age					
46–55 years	148	86 (58.1)	62 (41.9)	<0.001*	0.767 (0.357,1.649)
56–65 years	168	134 (79.8)	34 (20.2)		1.017 (0.405,2.553)
>65 years	64	43 (67.2)	21 (32.8)		Reference
Educational qualification					
Illiterate	51	33 (64.7)	18 (35.3)	0.736	
Primary	78	53 (67.9)	25 (32.1)		
Middle School	119	88 (73.9)	31 (26.1)		
High School	114	77 (67.5)	37 (32.5)		
Diploma or graduate	18	12 (66.7)	6 (33.3)		
Occupational Status					
Homemakers	282	211 (74.8)	71 (25.2)	<0.001*	0.890 (0.152,5.210)
Unemployed	71	31 (43.7)	40 (56.3)		1.916 (0.510,17.220)
Unskilled	17	14 (82.4)	3 (17.6)		1.046 (0.114,9.563)
Skilled or Semiprofessional	10	7 (70.0)	3 (30.0)		Reference
Socioeconomic Status					
Lower	47	31 (66.0)	16 (34.0)	0.037*	0.667 (0.273,1.631)
Upper lower	231	172 (74.5)	59 (25.5)		1.861 (0.694,4.989)
Lower middle	89	52 (58.4)	37 (41.6)		1.078 (0.197,5.888)
Upper middle	13	8 (61.5)	5 (38.5)		Reference
Diabetes Mellitus					
Yes	206	159 (77.2)	47 (22.8)	<0.001*	5.422 (2.793,10.525)*
No	174	104 (59.8)	70 (40.2)		Reference
Hypertension					
Yes	176	135 (76.7)	41 (23.3)	0.004*	14.244 (5.001,40.459)*
No	204	128 (62.7)	76 (37.3)		Reference
Family History					
Yes	67	56 (83.6)	11 (16.4)	0.005*	1.932 (0.788,4.735)
No	313	207 (66.1)	106 (33.9)		Reference
Menopause Attained					
Yes	329	244 (74.2)	85 (25.8)	<0.001*	2.638 (1.048,6.643)*
No	51	19 (37.3)	32 (62.7)		Reference
Body Mass Index					
Obese	206	164 (79.6)	25 (20.4)	<0.001*	2.364 (1.103,5.065)*
Overweight	89	64 (71.9)	25 (28.1)		6.133 (2.676,14.057)*
Normal/Underweight	85	35 (41.2)	50 (58.8)		Reference
Physical Activity					
Never	99	68 (68.7)	31 (31.3)	0.193	
<2 h/week	241	173 (71.7)	68 (20.3)		
>2 h/week	40	22 (55.0)	18 (45.0)		
Waist Hip Ratio					
≥0.85	260	186 (71.5)	74 (28.5)	0.148	
<0.85	120	77 (64.2)	43 (35.8)		
Tobacco Consumption					
Yes	28	23 (82.1)	5 (17.9)	0.124	
No	352	240 (68.2)	112 (31.8)		

*$P \leq 0.05$. The table is combined only for presentation purpose. Only the significant factors in bivariate analysis are taken up for Binary logistic regression

OPD setting and we used ACR clinicoradiological diagnostic criteria which has a sensitivity of 91% and specificity of 86% for diagnosis. On the other hand, other studies were community based and ACR clinical criteria which have a sensitivity of 95% and 69% specificity were used for the diagnosis of OA knee.

Our study found aging to be significantly associated with OA knee similar to that reported in other studies.[9-11]

However, our study did not show a progressive increase of OA knee with an increase in age. The prevalence of OA knee was less (67.2%) in the age group of >65 years of age compared to 79.8% in the age group of 55–65 years. It may be possible that women above 65 years might already have developed disability, or they have accepted it as a part of aging process.

Osteoarthritis knee was found to be more prevalent in unskilled workers followed by homemakers, which is similar to the findings of a study done by Venkatachalam *et al.*,[12] and may be attributed to the increased work done by homemakers which creates increased stress over knee joint leading to wear and tear and joint destruction. Education status was not found to be a significant determinant of osteoarthritis knee. Few of the studies found the prevalence of OA knee to be higher in illiterates compared to literates.[9,12] OA knee was more prevalent in the upper-lower class as per the modified Kuppuswamy socioeconomic scale and was found to be significant and can be because the upper socioeconomic status people might be seeking care at private hospital. Similar findings were also reported in studies conducted by Salve *et al.*[9] at Delhi and Yuan Liu *et al.*[13] in China.

DM damages cartilage by deposition of advanced glycated products over the joints and it was found to be a significant risk factor for OA knee in our study and is similar to the study conducted by Ho Sun Kim *et al.*[14] at Korea. Subchondral ischemia occurs in hypertension which causes cartilage destruction and it was found to be significantly associated with OA knee in our study, supported by literature.[15] A case-control study conducted by Askari *et al.*[16] found that there is a higher chance of acquiring metabolic syndrome in those with osteoarthritis knee. However, our study did not evaluate serum triglycerides and high-density cholesterol.

The prevalence of OA knee was found to increase with an increase in BMI, which is similar to other studies reported in literature.[4,15,17] Studies have found that obesity affects the joint cartilage both systemically and mechanically. However, WHR was not significantly associated with OA knee in our study, which is similar to the findings of K.L. Holliday *et al.*[18]

Menopause is found to be a significant risk factor for OA knee, which is supported by literature,[19] the reason for which being estrogen deficiency, which leads to OA by causing an increase in cartilage turn over and erosion. Since OA is associated with menopause, supplementation of estrogen helps in reducing the progression of OA. Few studies have suggested that it gets metabolized to estradiol in cartilages which mediates cartilage damage leading to OA.[20] The association of Hormone replacement therapy (HRT) with OA knee is uncertain. The association between hormone replacement therapy and OA knee could not be established in our study as only 2 (0.5%) of the study participants have used hormone replacement therapy.

Our study did not show any significant association between physical inactivity and OA knee which is in contrast to other studies reported in literature, which suggests that patients with osteoarthritis knee tend to follow a sedentary lifestyle due to pain and dysfunction.[12] A positive family history of OA knee increases the progression of OA knee and it suggests the role of the genetic component in OA. Our study also found it to be a significant risk factor for OA, which is similar to a study conducted at Kanchipuram.[12]

Our study could not find an association between a past history of knee surgery and osteoarthritis knee as very few participants had a previous history of joint surgery. There was no significant association between joint injury and osteoarthritis knee in our study which is contrary to other studies as injury to the knee causes damage to the joint cartilage leading to early wearing down of cartilage, resulting in OA.[21] Both joint injury and surgery reduce the ability of repair mechanisms of the cartilage, thus accelerating the occurrence of osteoarthritis.

Tobacco consumption is found to be a risk factor for cartilage loss and may result in OA knee over time as per literature evidence.[12] However, there was no significant association between tobacco consumption and OA knee in our study, which is similar to a study done in Korea.[14] Smoking is found to be protective in few of the studies.[13,22,23] In our study, we could not find the association between OA knee and alcohol consumption as only 4 (1.1%) of the study subjects gave a history of alcohol consumption. Studies suggest that alcohol increases the proteoglycan loss in knee joint articular cartilage by causing activation of enzymes involved in cartilage degradation and inhibiting the anti-inflammatory molecules resulting in OA knee.[24] Few studies documented an inverse relationship with alcohol consumption,[12] the reason being unclear.

The scope of our study is limited to the fact that it is hospital based and convenient sampling was used, thus results cannot be generalized to the entire population. The study does not reflect the true prevalence of OA knees in the community. This study is cross-sectional and hence causation could not be established. Also, this study did not assess the dietary habits. However, the study highlights the possibility of prevention of OA knee by increasing its awareness among women and ensuring its early detection and reducing its severity, thereby improving their quality of life. It is recommended that future research involves larger sample size and carried out in different states to find out the true prevalence in the country. Case control studies could be done to establish the risk factors in our population.

CONCLUSION

In total, 69.2% of women visiting orthopedic OPD suffered from OA knee. Our study suggests the need for increasing awareness about OA among women and preventive screening from 40 years of age, which includes screening for hypertension, obesity, DM, and osteoarthritis knee. It can be made a part of Wellness clinics. During routine surveys or screening for other noncommunicable diseases, provisions can be made for screening for OA knee to ensure early detection and prevent disability. Also, physiotherapy units must be well established at the peripheral institutes.

Conflicts of interest

There are no conflicts of interest.

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