Section: Orthopaedics

Original Research Article

PREVALENCE OF KNEE OSTEOARTHRITIS AND ITS DETERMINANTS AMONG ADULTS ABOVE 40 YEARS USING ACR CLINICAL CRITERIA IN AN URBAN SLUM OF METROPOLITAN CITY IN INDIA

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ABSTRACT

Background: Osteoarthritis (OA), disease of cartilage degradation, results in pain, especially in knee joint. Clinical symptoms and radio-diagnosis are used for diagnosis of OA. Conducting radiological investigation on a large scale is cumbersome, hence this study was done using the American College of Rheumatology (ACR) criteria for finding prevalence of knee osteoarthritis. The aim is to estimate the prevalence of knee osteoarthritis among adults aged above 40 years using ACR clinical criteria and to assess its associated factors, health-seeking behaviour, and socio-demographic correlates.

Materials and Methods: Participants were interviewed about socio-demographic details, personal history, details of knee pain and associated factors, followed by examination of knee joint and classifying as knee osteoarthritis based on ACR criteria. Its association was checked with socio-demographic & details.

Results: Prevalence of knee osteoarthritis was 38%. Factors showing association was being female, among Muslims, being over-nourished, having central obesity, having non sedentary lifestyle, lifting heavy weights, kneeling. Majority visited public hospital for treatment, and had restricted movement.

Conclusion: Osteoarthritis of knee, a multifactorial disease affecting general population, should be detected at an early stage to prevent damage to the joint and improve quality of life.

Keywords: Knee Osteoarthritis, Age, Urban slum, ACR clinical criteria.

INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative disorder of joints characterized by the loss of articular cartilage, and alterations of the synovial membrane and joint capsule.[1] Symptoms include pain, particularly after prolonged activity and weight bearing, whereas stiffness after inactivity.[2] It may not directly lead to mortality, but it significantly causes deterioration in the Quality of Life (QoL). Osteoarthritis of knee is estimated to be the 10th leading cause of nonfatal burden and fourth leading cause of Year Lived with Disability (YLDs).[3] At individual level, chronic pain in osteoarthritis causes increasing difficulty in performing the usual activities of daily living and vocation. It also increases economic burden on the patient.

The demographic transition coupled with increased life expectancy will lead to further increase in the absolute number of elderly population in our country. Logically, the absolute number of osteoarthritis patient seeking for treatment is bound to increase in next few decades putting a large load on our healthcare system. While increased utilization of hospital and medical services for symptomatic treatment or arthroplasty results in high direct cost, the indirect costs through lost productivity of individuals and their careers, are also high.[4] Although being such a huge burden especially among the elderly, is not given the importance that it

deserves in public health. Studies of knee OA have used radiological classification for diagnosis; however it is not feasible to do radiological investigation at community level, hence, clinical criterion like ACR criterion are widely used in the prevalence studies all over the world.[5,6] Definitive treatment of knee OA in form of total knee replacement is costly, and unaffordable in Indian setting to many patients. Thus, prevention and early diagnosis remains the most cost effective strategy in this population.

To compound this problem, most of the cases of osteoarthritis seek treatment very late, only when the condition hampers with the physical activity. Especially, elderly persons residing in urban slums are likely to have even worse health seeking behavior, necessitating to study this aspect of the disease as well. Thus, this study was planned to estimate the prevalence of osteoarthritis & its determinants in urban slums.

Objectives:

1. To estimate the prevalence of knee osteoarthritis among adults above 40 years of age using ACR clinical criteria.
2. To determine various factors associated with it.
3. To understand their health seeking behaviour.
4. To co-relate the social demographic factors with presence of knee osteoarthritis.

MATERIALS AND METHODS

The present community-based study to determine the prevalence of osteoarthritis was conducted in an urban slum in a metropolitan city, among both males & females above 40 years of age, residing in the study area for more than 6 months & who gave their consent for participating in the study. The study was conducted after getting approval from the Institutional Ethics Committee and written informed consent from the study participants. Those who gave history of unilateral or bilateral knee replacement surgeries or had infective arthritis were excluded from the study.

Sample Size: For calculating the sample size, prevalence of knee osteoarthritis of 10.2% in Maharashtra state, India, in a study done by Azad CS was taken.[7] The formula used to calculate sample size was, $n = 4pq/L^2$, where n= sample size, p = prevalence, q = 100 – p, L =5%. Calculating the sample size as per the formula, we got, n = 4×10.2 x [100-10.2] /5 X 5 = 146. To get more accurate prevalence, the sample size was rounded of to 200.

Study Area: The study area, an urban slum is the field practice area attached to the Department of Community Medicine of the parent college. It consists of 50 plots. Each plot is divided into 2 parts, with each plot having 10 lines and each line having 9 houses. So, with 180 houses in each plot, there are a total of 9000 houses in 50 plots.

Sampling Technique: Sample size being 200, to get proper representation of all plots, 4 samples from each plot (200/50 = 4) were taken. From each of the 50 plots, 1st house was selected randomly and after that using systematic random sampling, every 10th house was selected till 4 samples were collected from each plot. If any house was found locked or inclusion criteria not fulfilled, then the consecutive house was targeted. From each house only one individual was taken randomly. Similar procedures were repeated in all plots.

Methodology: The participants who consented to be part of the study were explained in detail about the study in the language they understood and a detailed history of the participants was taken which included their socio-demographic details, personal history, family history, presence of knee pain, whether, unilateral or bilateral, its duration and presence of knee stiffness. An examination was conducted which included taking their height, weight, waist circumference & hip circumference. Based on this data, Body Mass Index (BMI) for overweight/ obesity, hip waist ratio for central obesity was calculated. Body weight and height was measured with portable weighing scale and a plastic height meter tape respectively. A detailed examination of the knee joint was carried out among those who gave history of knee pain and checked for warmth, tenderness, bony enlargement and presence of crepitus. The examination was done by the principal investigator after undergoing a thorough training for clinical diagnosis under an experienced Professor of Orthopaedics. Those having knee pain were classified as having osteoarthritis based on the clinical classification criteria developed by the American College of Rheumatology (ACR), recommended for clinical and epidemiological studies.[2,3] Participants who fulfilled the ACR clinical criteria for knee OA were further interviewed to collect various information on clinical history of knee OA and its determinants. At the end of the study, the participants with history of knee pain were taught muscle strengthening exercises to strengthen muscles around the knee joint, which they were instructed to do regularly, so as to prevent further damage to the knee joint and also for pain relief.

ACR Criteria for diagnosis based on clinical features
Osteoarthritis of knee can be diagnosed if the patient has Knee joint pain, with any 3 positives of the following:
i. Age > 38 years,
ii. Presence of crepitus
iii. Morning Stiffness < 30 min
iv. Bony enlargement
v. Bony tenderness
vi. Absence of palpable warmth

Statistical analysis: The data collected was checked for completeness and entered into Excel sheet. Tables and graphs were prepared wherever required. The data was further analysed using SPSS version 20. Frequency and percentages were calculated for categorical variables. Mean and standard deviation were calculated for continuous variables. To check for correlation, Chi square test was applied. Logistic

Regression Analysis was done to determine association of Osteoarthritis with various correlates. After adjusting for various confounders Backward elimination method was used to select the final model.

RESULTS

As [Table 1] shows the socio-demographic profile of the study participants. Total of 200 participants were included in the present study, among which 44% (88) belonged to age group 40 – 50 years (Mean age – 53.85 SD = 9.342), 69% (138) were females, 48% (96) of them were illiterate. Out of them, 54% (108) were housewives, 79% (158) were Muslims, 76.5% (153) were married, 98% (196) belonged to Nuclear families and based on the socioeconomic status, 36% (72) belonged to Middle class.

As [Table 2] shows the personal details of the study participants. It was seen in this study that, 63.5% (127) of the participants had moderate lifestyle. The nutritional status revealed that 52% (104) of the participants were over nourished, while 60% (120) of them were having central obesity. Among the participants, only 35.5% (71) gave history of any form of addiction. Among the 138 female participants, details of their history related to reproductive tract, revealed that 74.6% (103) had attained menopause, while 13.8% (19) had undergone hysterectomy.

Table 1: Socio-demographic profile of the study participants

Socio-demographic Factors	Frequency (%) (N=200)
Age group (in years)	
40 - 50	88 (44)
51 – 60	67 (33.5)
Above 60	45 (22.5)
Gender	
Male	62 (31)
Female	138 (69)
Education	
Illiterate	96 (48.0)
Primary	95 (47.5)
Secondary	9 (4.5)
Occupation	
Housewife	108 (54.0)
Semiskilled	24 (12.0)
Skilled	37 (18.5)
Unemployed	3 (1.5)
Unskilled	28 (14.0)
Religion	
Hindu	42 (21)
Muslim	158 (79)
Socio-economic Status	
Upper Class	58 (29)
Middle Class	72 (36)
Lower Class	70 (35)

Table 2: Personal Details of the study participants

Personal Factors	Frequency (%)
Lifestyle	
Heavy	21 (10.5)
Moderate	127 (63.5)
Sedentary	52 (26)
Nutritional Status	
Normal	96 (48)
Over nourished	104 (52)
Central Obesity	
Yes	120 (60)
No	80 (40)
H/o Addiction	
Yes	71 (35.5)
No	129 (64.5)
Menopause (N=138)	
Yes	103 (74.6)
No	35 (25.4)
Hysterectomy (N=138)	
Yes	19 (13.8)
No	119 (86.2)

Table 3: Correlation of Socio-economic factors of the Participants and Osteoarthritis

Socio-economic Factors	Osteoarthritis		OR (95% CI)	p-value
	Yes (n=76) No. (%)	No (n= 21) No. (%)		
Age (in years)				0.406
40 – 50	33 (43.4)	07 (33.3)	0.652	
Above 50	43 (56.6)	14 (66.7)	(0.236 - 1.797)	
Gender				
Male	15 (19.74)	09 (42.86)	0.328	0.030*
Female	61 (80.26)	12 (57.14)	(0.117 - 0.921)	
Religion				0.009*
Hindu	10 (13.16)	8 (38.10)	4.062	
Muslim	66 (86.84)	13 (61.90)	(1.347 - 12.246)	
Education				0.124
Uneducated	36 (47.4)	6 (28.6)	2.250	
Educated	40 (52.6)	15 (71.4)	(0.789 - 6.419)	
Occupation				0.148
Working	30 (39.5)	12 (57,1)	0.489	
Not Working	46 (60.5)	9 (42.9)	(0.184 - 1.302)	
Socio-economic Status				
Upper & Middle Class	43 (56.6)	15 (71.4)	0.521	0.219
Lower Class	33 (43.42)	06 (28.6)	(0.182 - 1.1489)	

(*Significant for Chi-square test)

For studying the correlation of various factors with osteoarthritis, only those having knee pain were included in the analysis and were classified as either having osteoarthritis or not. Studying the correlation of various socio-economic factors with osteoarthritis, it was seen from Table 3 that statistically significant association was seen in Gender, where 80.26% (61) of the females were seen to have osteoarthritis (OR = 0.328. CI =0.117 – 0.921). Religion also showed significant association, where 86.84% (66) of those having osteoarthritis were Muslims (OR = 4.062, CI= 1.347 – 12.246)

Table 4: Correlation of Personal Factors with Osteoarthritis among Study Participants

Personal Factors	Osteoarthritis		OR (95%CI)	p-value
	Yes (N= 76) No. (%)	No (N=21) No. (%)		
Nutritional Status				
Normal	25 (32.9)	12 (57.1)	2.720	0.043*
Over-nourished	51 (67.1)	09 (42.9)	(1.013 – 7.305)	
Central Obesity				
Yes	57 (75)	07 (33.33)	6.000	< 0.001*
No	19 (25)	14 (66.67)	(2.109 – 17.066)	
Lifestyle				
Non - Sedentary	56 (73.7)	09 (42.9)	0.268	0.008*
Sedentary	20 (26.3)	12 (57.1)	(0.098 – 0.731)	
Duration of knee pain				
Less than 1 year	30 (39.47)	14 (66.67)	3.067	0.027*
More than 1 year	46 (60.53)	07 (33.33)	(1.109 – 8.481)	
H/o daily lifting heavy weight				
Yes	46 (60.53)	07 (33.33)	3.067	0.027*
No	30 (39.47)	14 (66.67)	(1.109 – 8.481)	
H/o kneeling more than 1 hour in a day				
Yes	59 (77.63)	09 (42.86)	4.627	0.002*
No	17 (22.37)	12 (57.14)	(1.671 – 12.818)	
H/o sitting crossed legs				
Yes	04 (5.26)	02 (9.52)	0.528	0.473
No	72 (94.74)	19 (90.48)	(0.90 – 3.102)	

(*Significant for Chi-square value)

As [Table 4] shows the correlation of various personal factors with osteoarthritis among the study participants. It is seen from the above table that the various factors which showed statistically significant association with osteoarthritis were Nutritional status, where 67.1% (51) of the study participants who were over-nourished were seen to have osteoarthritis (OR = 2.720, CI – 1.013 – 7.305). Central obesity among the study participants was also seen to be significantly associated as 75% (57) of those having central obesity were seen to have osteoarthritis (OR = 6.000, CI- 2.109 – 17.066). Lifestyles of the study participants also showed significant association, as 73.7% (56) of those study participants who showed non sedentary lifestyle were seen to have osteoarthritis (OR = 0.268, CI – 0.098 – 0.731). As per the duration of knee pain, 60.53% (46) of those having knee pain for more than a year were among those who had osteoarthritis & showed statistical significance (OR – 3.067, CI = 1.109 – 8.481). Among the study participants, 60.53% (46) who gave history of daily lifting weights were seen to have osteoarthritis and this relation was statistically significant (OR = 3.067, CI – 1.109 – 8.481). History of kneeling for more than one hour a day was also seen to have significant association in

this study as 77.63 % (59) of those who gave the history of kneeling were seen to have osteoarthritis (OR = 4.627, CI = 1.671 – 12.818). Among the female participants who gave history of knee pain, 87.28% (48) of the participants who had attained menopause had osteoarthritis and 70.58% (12) of them who had undergone hysterectomy had osteoarthritis. However, statistical significance was not seen in either of these 2 factors.

Table 5: Multiple Logistic Regression Analysis

Factor	Unadjusted OR (CI)	p-value	Adjusted OR (CI)	p-value
Nutritional Status	4.659 (0.942 – 23.052)	0.059	4.991 (1.049 – 23.744)	0.043
Central Obesity	28.246 (3.174 – 251.378)	0.003	17.497 (3.114 – 98.296)	0.001
Lifestyle	5.609 (1.238 – 25.418)	0.025	5.132 (1.214 – 21.696)	0.026
Duration of pain	9.293 (1.613 – 52.921)	0.13	8.960 (1.652 – 48.586)	0.011
Kneeling for > an hour	12.154 (1.561 – 94.613)	0.17	10.801 (2.230 – 52.312)	0.003
Daily Lifting weights	5.159 (1.089 – 24.430)	0.39	4.200 (1.004 – 17.568)	0.049

As [Table 5] shows Multiple Logistic Regression Analysis for various factors of Osteoarthritis. The factor showing highly statistically significance in this study was Central Obesity among the study participants (OR – 17.497, p value = 0.001).

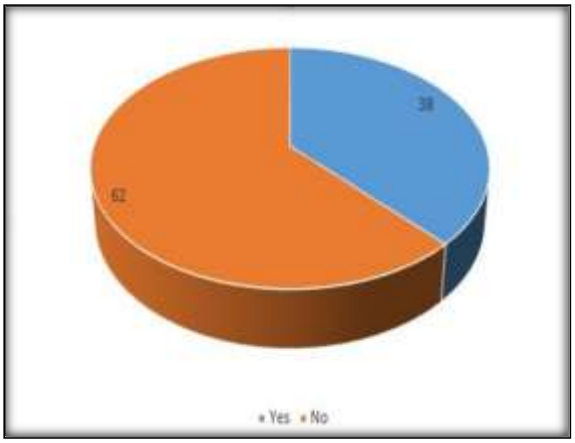

Figure 1: Prevalence of Osteoarthritis among Study Participants (N=97)

Among the total study participants, 48.5% (97) gave history of knee pain, out of these, based on the ACR clinical criteria, it is observed from Figure 1 that 38% (76) of them were shown to have Osteoarthritis.

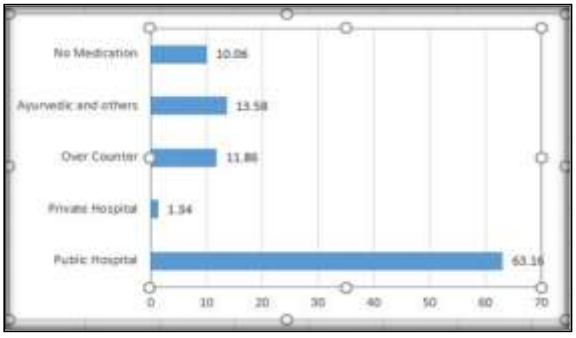

Figure 2: Treatment seeking behaviour of Osteoarthritic patients among the study participants

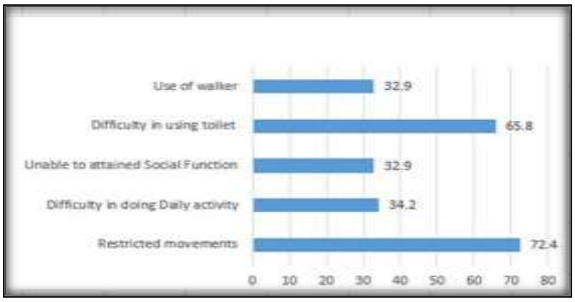

Figure 3: Effect of knee osteoarthritis on day-to-day life in study participants with knee osteoarthritis

As [Figure 2] shows the treatment seeking behaviour among the study participants. It is seen from the findings, that 63.16% (48) of the study participants preferred going to public hospital to seek treatment for their knee osteoarthritis.

As [Figure 3] shows the Effect of knee osteoarthritis on the day to day life of the study participants. It is seen from the figure that majority of them i.e. 72.4% (55) of the study participants gave history of restricted movements.

DISCUSSION

The present study was conducted in an urban slum area to estimate the prevalence of osteoarthritis using the ACR clinical criteria. It was seen in the study that majority of the study population were in the age group of 40 – 50 years. Similar findings were seen in a study done by Narsimha.[8] Maximum of the study population were females. This could be because, the study was done during the day time when mostly only females are at home. Findings similar to this were seen in studies done by Ajit NE,[5] & Shadab M.[9]As per their educational level, majority were illiterate, which was similar to the study findings of Akinpelu,[2] Ajit NE,[5] & Sood A,[10] and majority belonged to middle socioeconomic class as seen in study done by Kaur R,[11] & Salve H.[12] The study area being an urban slum, importance among the population about education was less. The population in the study area was predominantly Muslim by religion, hence majority of the study participants were Muslims in our study. Study done by Shadab M,[9] also showed similar findings. Maximum of them

were married, as seen in study done by Ajit NE,[5] and belonged to Nuclear families. As per the personal details of the participants, majority of them had a moderate lifestyle. The nutritional status revealed that majority were over nourished and also had central obesity. Study by Shadab M,[9] showed findings similar to this. History of addiction was not given by many. Among the females, majority had attained menopause, while a few had undergone hysterectomy. Prevalence of knee osteoarthritis in the present study was found to be 38%. Similar findings were seen in a study done by Bala K,[13] Mishra N.[14] While studying the various socioeconomic factors associated with osteoarthritis, the current study revealed that, osteoarthritis was seen among those above 50 years of age, which is similar to study done by Narsimha.[8] Damage from mechanical stress could be the primary cause of osteoarthritis. With advancing age, self-repairing capacity of body gets lowered, increasing the risk of development of Osteoarthritis of knee. As per the gender distribution, majority of the females were shown to be affected by knee osteoarthritis. Findings are similar to study done by Ajit NE,[5] Singh AK.[15] The cause may be multifactorial, i.e. differences in knee anatomy, kinematics, previous knee injury, and hormonal influences may play a role. Postmenopausal women have an increased risk of developing arthritis and this has been linked to the decrease in oestrogen. The current study shows that majority of Muslims had osteoarthritis of knee and this association was statistically significant. This could be due to the fact that the study area was dominant by Muslim population. Findings similar to this was seen in a study done by Shadab M.[9]

As per the educational status osteoarthritis of knee was seen mostly among illiterates though significant association was not seen. Illiterate adult population are mostly dependent on heavy workload occupation or labour work for daily living that causes more wear and tear of knee joint, which could be one of factor of knee osteoarthritis thus we found more patients of osteoarthritis of knee among illiterates. Similar findings were found in a study done by Venkatachalam J,[16] & Ganvir S.[17] Majority of the housewives with knee pain, were seen to have osteoarthritis of knee, though this relationship was not seen to be significant, this could be due to the fact that maximum participants were housewives and in females' risk of osteoarthritis of knee is more. Similar finding was seen in study done by Ganvir,[17] & Desai.[18] It is known that knee osteoarthritis is predisposed due to joint overuse. Among housewives, certain stereotyped activities carried out by them daily can be the cause of knee osteoarthritis.

As per the socioeconomic status, majority of the study population belonging to lower class were seen to be having osteoarthritis of knee. Similar findings seen in study done by Das AK,[19] & Shadab M.[9]

Nutritional status was seen to be having significant relation with development of osteoarthritis in present study, as majority of the participants who were over nourished i.e., with high BMI had osteoarthritis of knee. The pathophysiology of obesity-related osteoarthritis of knee is likely to be multi-factorial. Three to six times body weight is exerted across the knee during single leg stance in walking, suggesting it causes disease, probably through excess loading. Similar findings were seen in studies done by Narsimha,[8] Shadab M,[9] Sharma M,[20] Pal CP.[21] From the current study it was clear that participants having central obesity are more prone to develop osteoarthritis and association is significant. More the central obesity, more is the weight exerting on knee joint, causing damage to knee joint which in turn is responsible factor for developing knee osteoarthritis. In present study we found that, out of all participants with knee pain, 87.03% participants with moderate lifestyle had osteoarthritis of knee. The relationship between lifestyle and osteoarthritis of knee was statistically significant. Excessive physical activity, joint use and mechanical stress could be associated with an increased risk of osteoarthritis of knee. However, there were studies done by Kaur R,[11] & Pal CP,[21] which gave contrasting findings that osteoarthritis of knee was seen more among those with sedentary work. Certain personal factors which showed significant association with presence of osteoarthritis in the present study were longer duration of knee pain, lifting of heavy weights and kneeling for more than an hour in a day. These findings were similar to studies done by Desai,[18] Mishra N,[14] Das A.K,[19] respectively. Heavy weight lifting causes excessive joint use and more mechanical stress which in turn increases the risk of knee osteoarthritis. Repetitive loading might directly induce cartilage loss, prolonged periods of kneeling might also increase the risk of meniscal or ligamentous damage to the knee, and such lesions are known risk factors for knee osteoarthritis.

In the present study, majority of the women who had attained menopause or had history of hysterectomy done showed presence of osteoarthritis, however statistical significance was not seen in either of the 2 factors. Loss of oestrogen after menopause and also after hysterectomy could increase the women's risk for developing osteoarthritis. Studies done by Kaur R,[11] & Spector,[22] showed significant association. Majority of the study participants in the current study were seen to take treatment from public health facility. Findings similar were seen in study done by Narsimha,[8] & Salve H.[12] Though Osteoarthritis of knee is not a very severe disease, regular treatment for pain could have a high economic impact on the family. This could be the reason for using Public health facility. Quality of life was affected of the study participants in the current study as majority experienced restrictions of movement, also trouble in using toilet. Such similar findings were seen in study done by Narsimha.[8]

CONCLUSION

Prevalence of knee osteoarthritis among the study participants was 38%. The factors which showed significant association with knee osteoarthritis in the current study was being a female, more among Muslims. The personal factors which showed significant association were being over-nourished, having central obesity, and having non sedentary lifestyle, daily history of lifting weights, kneeling for more than an hour a day. As per the treatment seeking behaviour, majority visited public hospital for their treatment, and had restricted movement due to their disease condition.

Limitations

As the present study is a house to house survey conducted during working hours, hence most of time only women were found at home and males were out for work, so majority of participants are female. And is done in one slum area of metropolitan city, it may not represent the picture of the entire community.

Recommendations

1 Health workers at community level can be trained to diagnose knee osteoarthritis, using ACR criteria as done in present study, which can help in early diagnosis and treatment of the individuals as well as decrease in the social and financial burden of knee OA in the community.

2 Proper treatment and rehabilitative services in the form of physiotherapy and advanced therapy such as joint replacement could be made more easily available at affordable cost for patients with osteoarthritis in the community.

3 Awareness can be created among the general population by Health education and preventive measures which should start from earlier stage of life.

4 Intervention is also needed through self-care programs such as exercise for preventing osteoarthritis, weight control programs, exercises for strengthening knee joints, proper positioning of the knee joint during daily activities and control over the other modifiable known risk factors such as obesity specially among housewives.

5 Recommended to have more studies to emphasize the importance of knee osteoarthritis.

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