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# CPREVALENCE OF OSTEOARTHRITIS OF KNEE AMONG ELDERLY PERSONSUSING AMERICAN COLLEGE OF RHEUMATOLOGY (ACR) CRITERIA

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## ABSTRACT

The prevalence of osteoarthritis among elderly is high and it majorly affects the quality of life. Knee osteoarthritis is the most common form of osteoarthritis. Timely diagnosis using clinical criteria and effective intervention is of utmost importance. To estimate the prevalence and determinants of osteoarthritis of knee joint among elderly persons using ACR clinical criteria. Materials and Methods: We did a community-based cross-devotional study among 496 elderly (>= 60 years) persons .India from December 2009 to February 2010. The American College of Rheumatology (ACR) criteria was used to clinically diagnose osteoarthritis knee. Statistical Analysis: Bivariate analysis using Chi-square test and multivariate analysis was done to identify the determinants. Sensitivity and specificity of individual factors to diagnose osteoarthritis knee was calculated. The prevalence of osteoarthritis was estimated to be 41.1% (95% C.I., 36.7-45.6). Female sex and age >= 70 y were found to be independent risk factor for osteoarthritis knee. Among those having knee pain, presence of crepitus and tenderness were the most sensitive factors whereas bone overgrowth and bone warmth were most specific factors. The prevalence of osteoarthritis knee was high among this elderly population and increased with age. Overall, individual factors of ACR criteria were both sensitive and specific in diagnosing osteoarthritis knee. In

resource constrained setting of urban India, it can be an effective tool in clinical diagnosis of osteoarthritis knee.

**Keywords: Osteoarthritis, Knee, American College of Rheumatology (ACR) Criteria**

## INTRODUCTION

Osteoarthritis, though having a huge burden among the elderly, is not given the importance it deserves in public health. Osteoarthritis may not directly lead to mortality, but influences the Quality of Life (QoL) largely. Presence of osteoarthritis in older adults was associated with more pain, functional limitations, and lower Quality of Life (physical component) **[1]**. After achieving high life expectancy for the country, the next responsibility of public health is to provide good quality life without any disability. Osteoarthritis is believed to be a disease of old age with three fold increase in prevalence among elderly when compared to the younger counterpart **[2, 3]**. With India witnessing demographic transition leading to proportionate as well as absolute increase in number of elderly, the magnitude of osteoarthritis is bound to increase **[4]**. Osteoarthritis of knee joint contributes to nearly 80% of total osteoarthritis burden **[5]**. Radiological assessment remains the mainstay of diagnosis of osteoarthritis of knee. Most of the cases of osteoarthritis seek treatment very late, only when the condition hampers with the physical activity. Moreover, elderly persons residing in urban slums are likely to have even worse health seeking behaviour. Definitive treatment in form of total knee replacement is costly, and unaffordable in Indian setting. Thus, prevention and early diagnosis remains the most cost effective strategy. At a community level, it is difficult to perform radiography for diagnosis. In Indian setting, where health system is already overburdened with more important public health activities, concern for osteoarthritis takes a backseat. Thus, costly treatment and delayed diagnosis hampers the effective intervention for osteoarthritis of knee joint. In wake of this, clinical assessment for diagnosis of osteoarthritis of knee joint is of utmost importance. American College of Rheumatology (ACR) clinical classification criteria is one of most widely used tool for clinical diagnosis of osteoarthritis of knee joint in epidemiological studies. In this backdrop, we aimed to estimate the prevalence and determinants of osteoarthritis of knee joint among elderly persons using ACR criteria as clinical tool to diagnose osteoarthritis knee in community based resource constrained setting of India. This might be useful for concerned policy makers to implement

effective strategy for timely intervention in such cases.

**MATERIALS AND METHODS**

We conducted a community-based cross-sectional study among elderly persons (≥ 60 y of age) region of pondicherry 2016 - 18.

Sample size was calculated based on estimated prevalence of osteoarthritis in a community based study among elderly in pondicherry using clinical criteria. The prevalence of osteoarthritis knee was reported to be 34%. Sample size was calculated using the formula N = 4p q / d2 where N= Sample size, p= reported prevalence, q= complement of prevalence (1-p) and d= absolute precision which was taken as 4.5% for the purpose of calculation of sample size. The sample size thus estimated was 443. Assuming a non-response rate of 15%, the final sample to be achieved was 521. Since, population of elderly residing in this slum was largely unknown, a rapid enumeration of all elderly in the study area was done. Rapid enumeration yielded a total of 545 elderly persons residing in the study area. All 545 persons aged 60 y and above were included in the study if residing for more than six month in the same area. Person who were unable to comprehend and answer the questions, or were physically not capable of getting the physical examination done, were excluded from the study.

We did a house to house survey interview of all eligible participants using a semi-structures interview schedule in Tamil. Information regarding basic socio-demographic characteristics, self-reported chronic condition and its treatment history was obtained. Maximum three visits were made in case participant was not interviewed in the first visit. Clinical examination of both the knee joints was done using ACR criteria. All the history taking and examination was done by the first author himself.

American College of Rheumatology (ACR) criteria: ACR criteria for diagnosing osteoarthritis of knee joint is presence of pain in knee joint plus any three of six factors listed below **[6]**.

1. Age more than 50 y
2. Presence of crepitus on active motion
3. Less than 30 min of morning stiffness
4. Bony tenderness
5. Bony overgrowth
6. No palpable warmth of synovium.

Since all the participant were >= 60 y, presence of any two factors out of last five were enough for diagnosis.

First author underwent a training of two days for clinical diagnosis of osteoarthritis knee using ACR criteria under an experienced professor of Orthopedics.

**Statistical Analysis**

Data was entered in Epi-Info software version 3.5.1. And analysis was done using STATA version 9. Wherever applicable, proportion and mean were calculated along with 95% confidence interval and standard deviation respectively. Chi-square t-test was applied for bivariate analysis to find the association between outcome and predictor variables. p-value<0.05 was taken as significant. All the predictor variables significant at the level of $p < 0.25$ were included as a factor in the multivariate model for logistic regression. Results of bivariate and multivariate analysis are presented as unadjusted Odds' Ratio and adjusted Odds' Ratio respectively. Sensitivity and specificity was calculated for each of the factors in ACR criteria and is reported along with 95% confidence interval.

**RESULTS**

During the period of cross-sectional survey, there were 545 (290 males: 255 females) eligible elderly in the area; of these, 496 (91%) participated in the study. Socio-demographic characteristics are presented in **(Table 1)**. The prevalence of osteoarthritis knee (any joint) was 41.1% (95% C.I., 36.7-45.6), out of which 37.7% (95% C.I., 33.4-42.1) had bilateral osteoarthritis whereas 3.4% (95% C.I., 2.0-5.4) had unilateral osteoarthritis **(Table 2)**. Presence of osteoarthritis knee was found to be significantly higher among females (OR=3.23, 95% CI 2.03-5.14) and participants aged 70 y and above (OR=2.77, 95% CI 1.66-4.61) **(Table 3)**.

Positivity rate of various factors of ACR criteria is given in **(Table 4)**. In presence of pain in knee joint, all the five factors were highly specific in diagnosing osteoarthritis knee. Tenderness and crepitus were the most sensitive of all the five factors and were able to capture all the positive cases of osteoarthritis knee. Morning stiffness, bony overgrowth and bone warmth were not very sensitive though they had a very high specificity **(Table 5)**.

**Table 1: Socio-demographic characteristics to participants (n=496)**

| Variable | Total n=496 (%) |
|---|---|
| Age 60- 64 years | 283 (57.1) |
| Females | 238 (48.0) |
| More than 25 years of migration | 240 (48.4) |
| Married | 361(72.8) |
| Living with family | 428 (86.3) |
| Economically dependent | 310 (62.5) |
| Working presently | 190 (38.3) |
| Illiterate | 328 (66.1) |
| Smoker | 193 (38.9) |
| Tobacco chewer | 163 (32.9) |

**Table 2: Prevalence of osteoarthritis knee (n=496)**

| Variable | | Number | % (95% C.I.) |
|---|---|---|---|
| Osteoarthritis knee (Any knee) | | 204 | 41.1 (36.7-45.6) |
| Osteoarthritis knee | Bilateral | 187 | 37.7 (33.4-42.1) |
| | Unilateral | 17 | 3.4 (2.0-5.4) |

**Table 3: Association of osteoarthritis knee (any joint) with various socio-demographic characteristics**

| Variable | Category | Unadjusted OR (95% C.I.) | Adjusted OR* (95% C.I.) | P value |
|---|---|---|---|---|
| Sex | Male | Referent category | | |
| | Female | 3.22 (2.21-4.67) | 3.23 (2.03-5.14) | <0.001 |
| Age group (years) | 60-64 | Referent category | | |
| | 65-69 | 1.27 (0.81-1.99) | 1.26 (0.78-2.04) | 0.34 |
| | >=70 | 2.45 (1.55-3.89) | 2.77 (1.66-4.61) | <0.001 |
| Living status | With spouse | Referent category | | |
| | With family | 0.42 (0.21-0.85) | 0.44 (0.21-0.93) | 0.03 |
| | Living alone | 0.11 (0.04-0.37) | 0.11 (0.03-0.38) | <0.001 |

***Results presented only for those factors which were significant on multivariate analysis. Adjusted for all socio-demographic variables and co-morbid conditions like diabetes and hypertension**

**Table 4: Positivity rate of various factors of ACR criteria with respect to presence of Osteoarthritis knee (n=496)**

| Variable | Right Joint | | | | Left Joint | | | |
|---|---|---|---|---|---|---|---|---|
| | Osteoarthriti present (n=196) | | Osteoarthritis absent (n=300) | | Osteoarthritis present (n=193) | | Osteoarthritis absent (n=303) | |
| | No. | % | No. | % | No. | % | No. | % |
| Pain | 196 | 100.0 | 65 | 21.7 | 193 | 100.0 | 70 | 23.1 |
| Crepitus | 196 | 100.0 | 19 | 6.3 | 193 | 100.0 | 20 | 6.6 |
| Tenderness | 189 | 96.4 | 5 | 1.7 | 186 | 96.4 | 5 | 1.7 |
| Morning stiffness | 102 | 52.0 | 1 | 0.3 | 101 | 52.3 | 1 | 0.3 |
| Bone warmth | 62 | 31.6 | 0 | 0.0 | 59 | 30.6 | 0 | 0.0 |
| Bony overgrowth | 32 | 16.3 | 0 | 0.0 | 31 | 16.1 | 0 | 0.0 |

**Table 5: Sensitivity and specificity of various individual factors of ACR criteria for diagnosing osteoarthritis knee (right joint*)**

| | Sensitivity (95% C.I.) | Specificity (95% C.I.) |
|---|---|---|
| Pain | 1.00 (0.98 - 1.00) | 0.78 (0.73 - 0.82) |
| Crepitus | 1.00 (0.98 - 1.00) | 0.94 (0.90 - 0.96) |
| Tenderness | 0.96 (0.92 - 0.98) | 0.98 (0.96 - 0.99) |
| Morning stiffness | 0.52 (0.45 - 0.59) | 0.99 (0.98 - 1.00) |
| Bone warmth | 0.32 (0.25 - 0.38) | 1.00 (0.98 - 1.00) |
| Bony overgrowth | 0.16 (0.11 - 0.22) | 1.00 (0.99 - 1.00) |

***Results presented for one joint (right joint) since results of the both the joints were almost similar**

**DISCUSSION**

The elderly population studied here was relatively younger with sex ratio skewed towards male as compared to the national statistics. Since, the entire study population was migratory, this is explainable and similar phenomenon is also noted in various previous studies **[4, 7]**.

The prevalence of osteoarthritis knee was estimated to be 41.1 % in the present study. The prevalence was lower when compared to as study done in urban elderly population of pondicherry where prevalence of osteoarthritis was estimated to be 56.6% **[8]**. The difference may be explained by the fact that they estimated the prevalence of osteoarthritis of all joint and used different criteria to ascertain the presence of osteoarthritis. The age group in this study was also 65 y and above. Osteoarthritis was considered if patient was suffering from pain, swelling, limitation of movement of a large joint. Other rheumatologic conditions may also present with similar symptoms, which are differentiated from osteoarthritis by absence of crepitus and a longer duration of stiffness. Another study done in similar setting in an urban elderly population of pondicherry using the clinical criteria for estimation of osteoarthritis knee, reported a similar prevalence of 34% **[9]**. This study has found a considerably high prevalence of osteoarthritis knee among elderly.

Out of all the predictor variables studied, osteoarthritis knee was found to be significantly associated with female sex and age 70 y and above. Zeng *et al*., in Taiwan and Sharma et al., in India also reported a significantly higher prevalence of knee osteoarthritis in females and older age group **[3, 8]**. Living arrangement was also found to be a predictor. Person either living alone (OR=0.11 95% CI 0.03, 0.38) or living with family (OR=0.44 95% CI 0.21, 0.93)) had lesser risk of osteoarthritis knee than those who were living with spouse only. Person living alone due to lack of family support and person living with family due to more burden of household work may be more active in their household activities and thus may be having a lesser body mass index. There is evidence showing a higher risk of knee osteoarthritis with a higher body mass index **[3]**. A lower body mass index may put them at a lower risk of getting osteoarthritis knee.

We determined the sensitivity and specificity of various individual factors. Tenderness and crepitus were found to be highly sensitive whereas all the five factors were highly specific in diagnosing osteoarthritis knee. Thus, in this backdrop, ACR criterion seems to be a good tool in community based Indian setting where osteoarthritis is quite prevalent. Diagnosis using ACR criteria required only short

training and is not a cumbersome modality. It could be performed by para-medical staff as well as volunteers in community based settings. ACR criteria showed a high inter observer agreement of 0.94 when performed by experienced hands **[10]**. However, ACR criteria are not without any limitations. Though, the ACR classification criteria correlate well with articular cartilage damage in patients with OA. In another study, it was found to have low sensitivity and moderate specificity when compared with symptomatic radiographic osteoarthritis (sensitivity 41% and specificity 75%).

Nevertheless, this study has some limitations. Since, the study was done among elderly who have a higher prevalence of osteoarthritis than the general population. The higher sensitivity and specificity may be an overestimation and may not be applicable for the general population. Also, since the test was applied only among those who presented with pain in knee joint, thus increasing the baseline risk of osteoarthritis knee, it is likely that sensitivity and specificity would have been overestimated. Ideal scenario would have been to apply this criterion to entire study population and compare with any of the gold standard test. So, our result of validity may be applicable in diagnosing osteoarthritis only when presented with pain in knee joint, in elderly population.

**CONCLUSION**

With India currently witnessing a demographic transition, the absolute number of elderly is going to increase leading to a higher magnitude of burden of osteoarthritis. The elderly are by themselves a vulnerable section of society and with increasing age they become more prone to chronic conditions, osteoarthritis being one of them. Due to lack of affordable and accessible health care services, there is need for community based efforts to effectively screen, diagnose and treat various prevalent conditions in urban slums, osteoarthritis being one of them. Due to costlier treatment of osteoarthritis, early community based diagnosis using easy tools such as ACR and implementing appropriate intervention so as to halt the course of disease at an earlier stage, seems to be an adequate solution. With the new programme focusing on urban health in the pipeline, the present study may be of use to policy makers for strategic implementation of interventions which may reduce the burden and impact of osteoarthritis by preventing and treating it at a relatively early stage.

Results presented only for those factors which were significant on multivariate analysis. Adjusted for all socio-demographic variables and co-morbid conditions like diabetes and hypertension. *Results presented for one

joint (right joint) since results of the both the joints were almost similar.

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