Original Research Article

Prevalence and risk factors of osteoarthritis of knee joint among adult population in rural area of Kancheepuram district, Tamil Nadu

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Abstract

Background: Osteoarthritis is one of the most common type of arthritis with joint failure and pathologic changes1.Literature search showed that very few attempts were made to find the prevalence and determinants of osteoarthritis in South India. **Aim and objective:** to estimate the prevalence of Osteoarthritis and to study the various risk factors of osteoarthritis of knee joint among adult population in a rural area of Kancheepuram district, Tamil Nadu. **Methodology:** It is a community based cross-sectional observational study conducted in a rural area of Kancheepuram district, Tamil Nadu among adult population of age 18 and above. The study was done with pre-estimated sample size of 250 who met the inclusion criteria were included by systemic random sampling method. The participants were interviewed and examined along with anthropometric assessment with prior written consent. The data collected was analyzed using SPSS version 21 and described in terms of percentages. The association between the variables was done using chi-square and multiple logistic regression. The odds ratio was calculated for the determinants leading to the risk of development of Osteoarthritis among the study population. **Results:** The overall prevalence of Osteoarthritis in the present study was estimated to be 27.2%. Also, higher prevalence was seen among female population with age being the strongest risk factor with p value <0.001. The study found that factors like tobacco usage, physical activity, high BMI along with presence of comorbidities have significant association with the development of osteoarthritis with higher odds. **Conclusion:** Osteoarthritis, as one of the raising Non-communicable disease in the present times needs to be addressed and screened for risk factors at root level in community.

Key Word: Osteoarthritis, rural, prevalence, risk factors.

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INTRODUCTION

Osteo arthritis is one of the most common form of arthritis characterized by pain, swelling and limitation of joint movements along with complications.[1]It is a slowly progressive disease with feature of pain, enlarged and deformed joints as well as limitation of the motion[11].Estimated to be the fourth leading cause of disability worldwide it has been studies vastly[2]. Many studies Worldwide show that 9.6% of men and 18% of women ≥ 60 years have symptomatic Osteoarthritis[3]. Previous literature has shown a higher prevalence in India[4], Pakistan[5] and Bangladesh[6]. A study conducted in India among adults had showed significant difference in prevalence of OA between rural and urban areas[7]. The higher prevalence has been attributed to the lifestyle habits followed by Asians due to relatively excessive squatting and day to day activities especially among

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women leading to higher risk of knee joint arthritis when compared to Americans and Europeans[8].Also, women show an increased prevalence of knee and hand joint osteoarthritis while men have a high prevalence of hip osteoarthritis. Regardless hip osteoarthritis is comparatively uncommon in India.[9] While studying the factors contributing to the condition evidence for genetic basis of osteoarthritis are increasing.[10,19] Twin studies have shown 65 % concordance for developing osteoarthritis[9].Emerging evidence has identified genetic mutation that confers a high risk of osteoarthritis, one of which is a polymorphism within the growth differentiation factor 5 genes.[19] However no specific genetic abnormality has been found so far related to osteoarthritis. The major risk factors found associated with the knee joint arthritis include elderly age, female sex, obesity, occupational knee bending and physical labour. [15,16].Studies have shown that workers whose jobs involve physical labour have high rates of knee osteoarthritis[18].Occupational activities, including climbing stairs, walking on uneven ground, standing, and sitting, have been inconsistently linked to osteoarthritis risk[20].Based on American College of Rheumatology criteria[10] the following procedure is used for diagnosing osteoarthritis knee joint clinically.

"Pain in knee and

1. Age >50 years
2. Morning stiffness
3. Crepitus in motion
4. Bony tenderness
5. Bony enlargement
6. Absence of palpable warmth

Of the above criteria pain in knee should be positive followed by any 3 of the other criteria".[10] Among the various risk factors studied so far age is the most dominant risk factor for osteoarthritis responsible for both the higher prevalence and severity[15].This is supported by the fact that radiographic evidence of osteoarthritis is rare in individual below the age of 40. Aging increases the joint weakness through certain mechanisms. Aged cartilage is less responsive to the stimuli of loading stress[9]. Women above the age of 60 are among the vulnerable population prone for the condition with more complications. While hormone loss with menopause may contribute to this risk, there is little understanding of the vulnerability of older women vs men to osteoarthritis. Osteoarthritis is a highly heritable disease, but its heritability varies with joints. Many people with osteoarthritis have disease in multiple joints, this generalized osteoarthritis phenotype is rarely inherited and is more often a consequence of aging. Literature search showed that very few attempts were made to find the prevalence and determinants of osteoarthritis in South India. The aim of the study was to estimate the prevalence of Osteoarthritis and to study the various risk factors of osteoarthritis of knee joint among adult population in a rural area of Kancheepuram district, Tamil Nadu.

METHODOLOGY

The study was a community based cross-sectional study conducted in the field practice area of a tertiary care hospital in Kanchipuram district, Tamil Nadu. The main occupation of the study population is agriculture and sculptor. Adults aged 18 years and above of both sexes were included in the study. People who are not willing to participate r found to be critically ill during the study period along with history of injury to knee joints and paralysis were excluded from the study. The participants who met the inclusion criteria were informed about the study followed by which written consent was obtained. The Sample size was calculated based on 17% prevalence of Osteoarthritis from previous studies and assuming 95% significance with5% absolute precision which lead a sample size of 225. To account from non-participant and dropout's total of 250 subjects were included. Ensuring an equal probability among the participants systemic random sampling methodwas used**.** Each participant was identified and with informed written consent they were subjected to a pretested questionnaire containing questions on socio-demographic details, presence of symptoms or signs of Osteoarthritis and history of risk factors. Followed by the interview the anthropometrical measurements like weigh, height along with blood pressure were measured and noted. The Data collected was compiled and entered in Microsoft Office Excel version 2007 and analyzed using Statistical Package for Social Sciences software version 21.

RESULT

The present study was done among 250 adult populations from the rural area of Kancheepuram district, to find out the prevalence and risk factors of osteoarthritis using ACR clinical criteria using history and physical examination. Among the study population 139(55.6%) were above the age of 50 years and, 159 (63.6%) of the study subjects were females and 91 (36.4%) were males. Analysis of the marital status among study participants showed that most of them were married i.e. 201 (80.4%) while 26 (10.4%) were unmarried and 23(9.2%) were widowed. The educational status among the participants maximum were illiterate i.e. 106 (42.4%) followed by 40 (16%) who had high school education. Analysis of thesocio-economic status concludes that maximum of the participants belongs to socio economic class 4 (43.2%) followed by class 5 (32.8%), according to modified B.G Prasad's classification. In the study, the prevalence of

osteoarthritis based on ACR clinical criteria in rural population of Kancheepuram District was 27.2 %.The study participants with family history of osteoarthritis were found to be having 2.6 times more risk for developing osteoarthritis knee when compared with participants without any family history of osteoarthritis (OR 2.6, 95% CI= 1.3-5.1.More than two third of the population (69.2%) under study has never used any tobacco product while 28.4 % were current users and 2.4 % were past users. More than three fourth of the study subjects 203 (81.2%) never consumed alcohol while41(16.4%) were current users and 6(2.4%) were past users. Considering the diet habits, we found that most of the study participants (96.4%) were having mixed diet while 3.6% were vegetarians.

Table 1: Distribution of study participants based on the socio demographical factors

Socio demographical factors	Frequency
Age group	
<50	111(44.4)
>50	139(55.6)
Religion	
Hindu	243(97.2)
Christian	5(2)
Muslim	2 (0.8)
Marital Status	
Married	201 (80.4%)
Unmarried	26 (10.4%)
Widower	23(9.2%)
Educational Qualification	
Illiterate	106(42.4)
Primary	39(15.6)
Middle	38(15.2)
Secondary	40(16)
Higher secondary	13(5.2)
Graduate and above	14(5.6)
Occupation	
Professional	3(1.2)
Semi- professional	4(1.6)
Clerical and shop owner	6(2.4)
Skilled	62(24.8)
Semiskilled	71(28.4)
Unskilled	21(8.4)
Unemployed	19(7.6)
Dependents	64(25.6)
Socio economic status	
Class 1	3(1.2%)
Class 2	15(6%)
Class 3	42(16.8%)
Class 4	108(43.2%)
Class 5	82(32.8%)

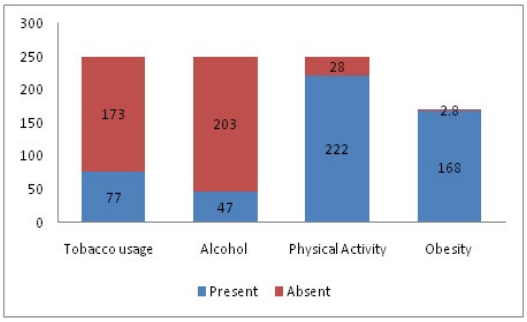

Figure 2: Distribution of various risk factors among the study participants (N=250)

With regards to the nutritional status among the study participants more than half (54%) were having normal BMI and 22.4% of them were over weight. Around half (50.8%) of the study participants were doing some moderate physical activity regularly while 29.2% of them were doing light physical activity. Among the study participants 7.2% i.e. 18 had history of previously diagnosed with knee joint osteoarthritis. The most common chronic disease among the study population was found to be backache (43.6%) i.e. 109 followed by visual impairment or cataract (25.2%) i.e. 63, hypertension (11.2%) i.e. 28, diabetes (10.4%) i.e. 26, Asthma (7.6%) i.e. 19 and hypothyroidism(2%) i.e. 5.Diabetic patients were found to be having 2.5 times more risk for developing osteoarthritis (OR = 2.5, 95% CI=1.1-5.8) compared to non-diabetic patients. Hypertension patients were having 6.1 times more risk for developing osteoarthritis compared to normotensive persons (OR=6.1, 95% CI=2.6-14.2). Thus, after adjusting for confounders age above 50 years, female gender, illiteracy, positive family history, tobacco use, hypertension and body massindex were individual risk factors for osteoarthritis knee joint. Diabetes and physical activity were found to be confounders.

Table 3: Multivariate logistic regression model for determinants of Osteoarthritis knee joint

Determinants	Odd's ratio (95% CI)	p value
Age>50	14.1(6.7-29.6)	0.00
Female gender	3.1(1.6-6.2)	0.00
Illiterate	9.6(1.2-76)	0.00
Positive family history	2.6(1.3-5.1)	0.00
Tobacco usage	3.5(1.9-6.3)	0.00
Physical activity	3.1(1.2-7.6)	0.00
Diabetes	2.5(1.5-5.8)	0.01
Hypertension	6.1(2.6-14.2)	0.00
Body mass index	5.7(3.1-10.4)	0.00

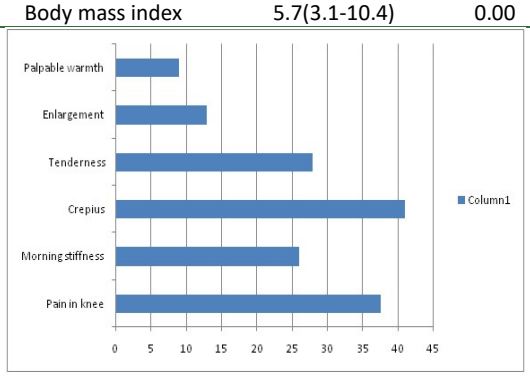

Figure 3: Distribution of various signs and symptoms among the study participants(N=250)

DISCUSSION

The present study estimated the prevalence of Osteoarthritisin rural population of Kancheepuram District to be 27.2 %. based on ACR clinical criteria. This is similar to the study by Chopra A *et al* done among adult population above 18 years in a rural area of Western India (n=746)reporting the prevalence of knee joint OA as 5.8%[4]. In another study done in a rural area of Bangladesh the prevalence of knee joint OA was found as 14% (n=2601) among persons aged above 15 years[6]. The reason for the high prevalence in our study may be attributed to predominance of females among the study subjects (63.6%) and because the main occupation among the rural population is agriculture. The present study reported higher prevalence of Osteoarthritis in the elderly age group especially above 50 with an Odds Ratio = 14.1. This is in accordance to the review article by Felson *et al* which stated that 50% of people over the age of 65 have arthritis in at least one joint and over 80% of people over the age of 75 have arthritis in at least one joint[13].The increase in the prevalence and incidence of OA with age is known and is probably a consequence of cumulative exposure to various risk factors and biologic changes that occur with ageing that may make a joint less able to cope with adversity, such as cartilage thinning, weak muscle strength, poor proprioception, and oxidative damage[11].In this study Osteoarthritis was present in 81% of females, whereas it was present in only 13% of males of the study participants. (Odd's Ratio = 3.1) which is similar to Srikanth VK *et al* in their meta-analysis found that women are more likely to have osteoarthritis. Under age 45, more men than women have osteoarthritis while over the age of 55, more women than men have osteoarthritis. But overall, males have a significantly reduced risk for prevalence of Osteoarthritis in the knee.[17] Results of the present study revealed a clear link between tobacco consumption and osteoarthritis. People who consumed tobacco were found to be at a higher risk of developing osteoarthritis. People who smoke had 3.5 times more risk of osteoarthritis than non-smokers Although statistically insignificant, Alcohol users were found to be at a lower risk for developing osteoarthritis compared to non-alcoholic, the same reported by Huidekoer *et al* in his study conducted on arthritis and alcohol has shown that arthritis patients who consume less alcohol than normal people. This may suggest that alcohol may protect the individual from arthritis or there is an inverse relationship which is not supported by biological plausibility[21].This study showed that with respect to physical activity, people who did no physical activity were at a higher risk of developing osteoarthritis, compared to those who did some amount of physical activity, with Odds Ratio of 3.1 (95% CI =1.2-7.6) This association was found to be statistically significant. Felson DT *et al*, in his study on Physical activity, alignment and knee osteoarthritis, done on 2,073 subjects (3,542 knees) reports that physical activity in its highest score does not increase the risk of

developing Osteoarthritis.[12] In this study Osteoarthritis was found to be more common among obese persons (5.7%) when compared with normal persons OR 5.7, 95% CI=3.1-10.4. Similarly, in the study done by Paans N *et al*, the authors found significant associations of knee osteoarthritis with obesity. Long-term obesity was present in persons with asymptomatic osteoarthritis of the knee.[14]These findings strongly suggest that obesity is risk factor for osteoarthritis. From the United States National Health and Nutrition Examination Survey, osteoarthritis (OA) was examined for 3,905 adults aged 45 to 74. Obesity was associated with both bilateral and unilateral Osteoarthritis. Findings from these data are not supportive of a metabolic link between obesity and knee Osteoarthritis[12].In the present study Diabetic patients were found to be having 2.5 times more risk for developing osteoarthritis (OR = 2.5, 95% CI=1.1-5.8) compared to non-diabetic patients. Nieves *et al* hypothesized that the reason for this could be that diabetes mellitus patients (both type 1 and type 2) have increased risk for fracture and their bone mineral density is deranged due to metabolic alterations like increased calcium excretion, insulin release, growth factor resistance, advanced glycosylated end products in ECF and microangiopathic and neuropathic complications[21]. The above reasoning was supported by Francis Berenbaum, who in his study, found that 30% of osteoarthritis population had diabetes mellitus (DM), while only 12% of normal population had diabetes mellitus[20].Also, the present study reported that Hypertension patients were having 6.1 times more risk for developing osteoarthritis compared to normotensive persons (OR=6.1, 95% CI=2.6-14.2).Ettinger WH *et al*, demonstrated that the presence of symptomatic knee Osteoarthritis was associated with reported difficulty in functions which used the lower extremity (ambulation and transfer).[22]These findings suggest that knee Osteoarthritis is associated with long-term physical disability, and that the presence of coexistent chronic disease may increase the amount of long-term disability from knee Osteoarthritis. Despite the larger sample size and sampling technique there were few limitations in the study. Firstly, being a cross-sectional study design, the strength of association could not be demonstrated in a real sense since the measurement of exposure and disease were collected at the same time, so a temporal sequence could not be established. Secondly the inability to contact all the adult aged 18 years and above proved to be difficult and not feasible. Thirdly the criteria for diagnosing osteoarthritis was done using only ACR criteria of Osteoarthritis with only a history and physical examination which though a proven criterion there are other criteria which could not be applied. In spite of all limitations the study proved the higher prevalence of Osteoarthritis among rural population with various risk factors having significant association. Future studies are recommended with in depth analysis of the risk factors of osteoarthritis involving a prospective longitudinal follow-up study to throw light on the true risk factors.

CONCLUSION

With the raising trends of Non-communicable diseases and the concepts of risk factor assessment osteoarthritis carries a major burden among the population of developing nations which is often ignored. The Osteoarthritis being the fourth major reason of poor quality of life among elderly persons needs to be addressed with measures taken to uproot the risk factors for the future generations thereby ensuring a productive life of work force of a nation.

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