

## Socio-Demographic and Risk Factors Associated with Knee Osteoarthritis

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### ABSTRACT

Knee Osteoarthritis (KOA) is a degenerative joint disease and a major public health problem all over the world. The present study is focused to evaluate the Socio-demographic and Risk factors associated with radiographic evidence of KOA subjects who were attended to Government Ayurveda Hospitals in Jaffna District from January 2013 to August 2014. There were 177 (70.8%) female and 73 (29.2%) male with a mean age of 57.02 (SD±8.78) years and highly significant association between age and gender ( $P < 0.05$ ) and BMI and gender ( $P < 0.05$ ) of KOA subjects. The findings of this study had indicated that risk factors as age, gender, family history, menopause and BMI were similar to the findings of KOA studies of other research studies.

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### Introduction

Knee Osteoarthritis (KOA) is a degenerative joint disease and a major public health problem all over the world, especially in the elderly [1], [2]. Relatively the prevalence of KOA is higher in Asians than in Western populations [3]. Recent study mentioned that KOA is likely to become the fourth most common cause of disability in women and the eighth most common cause in men [4].

KOA is more environmental disease that results from manmade problems than just a genetic one [5]. KOA is associated with a range of intrinsic, behavioural and environmental risk factors and determinants. Risk factors and determinants may have a synergistic or cumulative effect and the systematic factors include a person's age, gender, and inherited susceptibility to KOA – among other factors- that all, or in part, make cartilage and sub-chondral bone more vulnerable to daily injuries and less capable of repair [6]. Therefore, identifying risk factors for KOA become important component of this study. The present study was focused to evaluate the Socio demographic and Risk factors associated with radiographic evidence of KOA subjects.

### Methodology

#### Study Design

It was an observational study, as a part of PhD Research.

#### Study Area

This study was conducted in selected Government Ayurveda Hospitals in Jaffna District, Sri Lanka.

Jaffna District is divided into four major divisions. They are *Valikamam*, *Thenmaradchchi*, *Vadamaradchchi*, and *Island*. For the administrative purposes, these major zones are further divided in to 15 Divisional Secretariats (DS) divisions namely, Jaffna (1 DS division), *Nallur* (1 DS division), *Valikamam* (5DS divisions), *Thenmaradchchi* (1DS division), *Vadamaradchchi* (3 DS divisions), *Islands* (4 DS divisions). At present, fifty three (53) Ayurvedic Institutions are functioning under the 13 DS divisions except *Vadamaradchchi East* and *Delft DS* divisions. 60% of

Ayurveda Hospitals in 13 DS divisions were covered for this research study.

The thirty two hospitals were sampled from thirteen DS divisions. Suitable KOA subjects were selected in twenty five (78.12%) out of thirty two Ayurveda Hospitals.

#### Study Unit

The study unit consists the subjects with KOA, who attended Out Patients Department (OPD) of twenty five Ayurveda Hospitals in Jaffna District.

#### Study Duration

This study was carried out from January 2013 to August 2014 (20 months).

#### Study Population

**Inclusion Criteria:** Subjects of either gender  $\geq 40$  years age; Pain visual analogue score (VAS)  $\geq 4$ cms in one or both knees while performing a weight bearing activity (e.g. walking, standing, climbing staircase); Diagnosis of KOA based on history, clinical examination findings and classical radiological findings, and fulfilling the American College of Rheumatology (ACR) classification criteria [7] except that the lower age limit was reduced to 40 years; and Radiographic evidence of OA was based on the ranking score of the Kellgren-Lawrence radiographic system [8].

**Exclusion Criteria:** Subjects who have non-degenerative joint diseases or other joint diseases such as rheumatoid arthritis, psoriatic arthritis, gonococcal arthritis and haemarthrosis; Subjects with severe disabling arthritis and / or the patient are bedridden; Those that had history of intra-articular knee injection within the month preceding the study; Those with evidence of severe unstable renal, hepatic, diabetic, haemopoietic, cancer, hypertensive, cardiac disorder and mentally affected as revealed by history and / or investigation.

#### Ethical Approval

Prior to the commencement of study, certificate of ethical clearance for the clinical trial was obtained from the Ethical Review Committee of the Faculty of Medicine, University of

Jaffna, Sri Lanka on 2012. The subjects were assured that strict confidence would be maintained in respect of this study.

Online registration was done at Sri Lanka Clinical Trials Registry (SLCTR). Online trial registration (Reg. no: SLCTR/2012/ 009) confirmation certificate for the clinical trial was obtained from the Sri Lanka Clinical Trials Registry of Sri Lanka Medical Association, Colombo, Sri Lanka.

Prior to data collection, permission and written approval were obtained from the following Departments for conduct this study at Ayurveda Hospitals in Jaffna District: Commissioner of Ayurveda, Department of Ayurveda, Nawinna, Maharagama; Provincial Commissioner of Indigenous Medicine, Provincial Department of Indigenous Medicine Northern Province; Regional Assistant Commissioner, Office of the Regional Assistant Commissioner of Local Government; and Commissioner, Municipal Council, Jaffna, Sri Lanka.

#### Pilot Study

Prior to the commencement of main study, the pilot study was carried out on 16 knee osteoarthritis subjects who attended Ayurveda Hospitals in Jaffna District and tested the adequacy of the research instrument questionnaire.

After the pilot study analysis, minor changes have been done in the questionnaire. Subjects selected for the pilot study were not included in the main study.

#### Study Procedure

Based on American College of Rheumatology (ACR) classification, 837 KOA subjects were screened and 250 KOA subjects of both genders, aged  $\geq 40$  years were randomly selected and obtained their informed written consents.

Data were collected by interviewer administered questionnaire, which was prepared by the researcher based on specific objectives. Questionnaire focused on socio demographic and possible risk factors (family history, obesity, occupation, physical activity, trauma, and menopause). Measurements such as height, weight and body mass index (BMI) were recorded.

#### Statistical Analysis

The collected data were processed and analyzed by the standard statistical software program SPSS (Statistical Package for the Social Sciences) version 16. The probability level was set as  $P < 0.05$ .

Analyses were conducted using the chi-square test to assess the association between risk factors and KOA.

#### Results and Discussion

The study was carried out on two hundred and fifty KOA subjects who attended the twenty five Ayurveda Hospitals/ Dispensaries in Jaffna District showed in figure 1.

#### Distribution of Selected Ayurveda Hospitals by KOA Subjects

Higher number of subjects 35 (14%) were selected at District Ayurveda Hospital/ Jaffna, 29 (11.6%) subjects were selected at Free Siddha Ayurvedic Dispensary/ Nallur, 27 (10.8%) subjects were selected at Free Ayurvedic Dispensary/ Uduvil and 20 (8%) subjects were selected at Government Ayurvedic Hospital/ Kaithady (Figure 1).

#### Distribution of KOA Subjects by Age and Gender

Age was divided into eight categories and Chi-square ( $\chi^2$ ) analysis was done to determine the association with age and gender of KOA subjects. There was a significant association ( $\chi^2 = 29.02$ ;  $P = 0.000$ ) between age and gender of KOA subjects at 5% level.

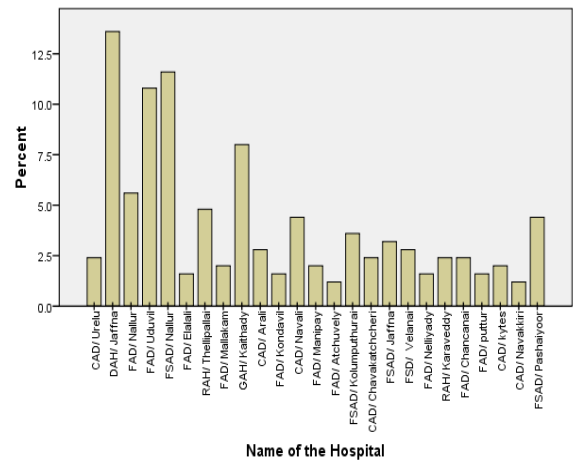


Figure 1. Percentage of KOA subjects in each selected Ayurveda Hospitals.

There were 177 (70.8%) female and 73 (29.2%) male with a mean age of 57.02 (SD  $\pm$  8.78) years. Majority of subjects 61 (24.4%) were between 55-59 years of age (Figure 2).

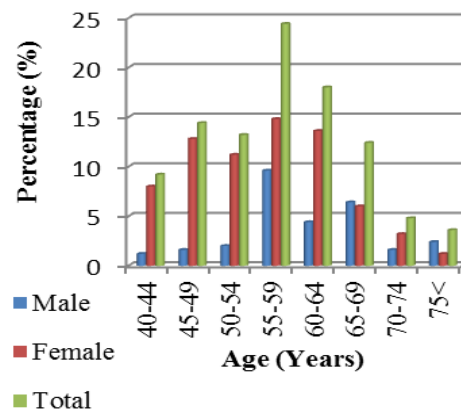


Figure 2. Percentage distributions of Subjects by age and gender.

This finding was almost comparable with the previous studies stated that, women are more prone to developing osteoarthritis than men [9], [10]. Number of previous studies stated that the KOA are affected above the age of 50 years old people [11], [12], [13]. No similar observation was made in previously conducted studies in Sri Lanka by Jeyalath and Fonseka, (2009) have found that females (16.9%) were at statistically significant ( $P < 0.000$ ) 3.2 times higher risk compared to males (6%) in their cross sectional KOA study ( $n=1750$ ,  $> 50$  years) in Colombo District [14]; Amaratunga et al., (2011) have identified that, there were 96 (94.1%) females and 6 males (46 - 80 years) with a mean age of  $64.2 \pm 8.3$  in a preliminary study on characteristics of patients with primary KOA [15] and Fernando, Wettasinghe and Dissanayake (2014) have also found in their descriptive cross sectional analytical study ( $n=100$ ; 40-60 yrs) that, mean age for patients with KOA was  $51 \pm 5.42$  years [16]. These differences may be dependent on selection criteria, number of subjects, and area of the study, etc.

#### Distribution of KOA Subjects by Religion and Gender

A majority of the subjects 170 (68%) were Hindu and rest 80 (32%) were Christian. Geographical proportion of Hindus in the District may be reason for its higher incidence in Hindu. Dahaghin et al., (2009) have stated that, ethnicity and religion showed no extra risk of KOA [17].

### Distribution of KOA Subjects by Civil Status

A majority of subjects 190 (76%) were married and 60 (24%) were single. Unmarried, divorced, separated and widowed were included within the group singles.

### Distribution of KOA Subjects by Level of Education

The literacy level was high (99.6%). Only one male was illiterate. Of the 249 who had schooling; majority of subjects 126 (50.4%) had studied up to advanced level (GCE O/L - A/L) and 114 (45.6%) had studied below the advanced level (Grade 1-10). Further analysis was not done, as the population of higher education was relatively low 9 (3.6%). There was no significant association between level of education and gender of KOA subjects at 5% level. Dahaghin et al. (2009) have stated that, Higher education was a protective factor against KOA [17]. Pereira, Ramos and Branco (2014) have also mentioned that low socio-economic status measured by a low educational level is related with a higher prevalence of OA [18].

### Distribution of KOA Subjects by Occupation

In this study 151 (60.4%) KOA subjects were housewives and 40 (16%) are unskilled workers (Table 1).

**Table 1. Number of KOA subjects by Occupation.**

Occupation	Number	Percent
Professional	04	01.6
Non professional	10	04.0
Skilled worker	16	06.4
Unskilled worker	40	16.0
House wives	151	60.4
Retired person	16	06.4
Unemployed	13	05.2
Total	250	100.0

Housewives were mostly affected by KOA may be due to heavy household duties. This was almost equal to the previous study done by Shah et al. (2010) who stated that 62.85% patients were housewives in their clinical study of KOA [19]. Rossignol (2004) has found that in occupations significant risks of OA were identified in male unskilled labourers and skilled labourers in nationwide population survey in Canada [20]. Another study done by Allen et al. (2012) have found that the exposures to an increasing number of household tasks were associated with lower pain scores with radiographic KOA in the Johnston County Osteoarthritis study [21].

### Distribution of KOA Subjects by Affected side

A majority of the subjects 147 (58.8%) were affected by unilateral KOA and 103 (41.2%) were affected by bilateral KOA. Whereas in the unilateral cases, majority of the subjects 86 (34.4%) were affected by the right side knee than left side knee 61 (24.4%). Since P- value is greater than 0.05 ( $\chi^2=0.40$ ) there was no significance association between affected side and gender of KOA subjects at 5% level.

Boon, Colledge and Walker (2006) have reported in their text book that, most KOA subjects, particularly in women are bilateral and symmetrical and unilateral in men [22]. This statement was not matched to this present study except unilateral in men.

### Signs and Symptoms of the KOA

Considering all 250 subjects, majority of the subjects (> 94%) have had the pain, tenderness, crepitus and restricted movements on single or both knee joints and 84.4% have had the morning stiffness on knee joint/s (Table 2). According to the ACR criteria, these subjects were suitable for this study.

### Duration of KOA

Considering all 250 subjects, it is seen that 131 (52.4%) have had the KOA for less than 1 year, 108 (43.2%) of

subjects have had the KOA for a period between 1-5 years and balance 11 (4.4%) have had the KOA for more than 5 years.

**Table 2. Distribution of the signs and symptoms of the KOA subjects.**

Sign and symptoms	n	(%)
Pain on Knee joint/s	250	100.0
Morning Stiffness	211	84.4
Swelling	171	68.4
Crepitus	234	93.6
Tenderness	249	99.6
Warmness	24	09.6
Restriction of the- movements	249	99.6

n- Number; %- Percentage

An approximately similar result has also been reported by the Joshi et al. (2011) mentioned that 56.03% of subjects had duration of KOA up to one year [23].

Further the Chi-square analysis gave no significant association ( $\chi^2=22.53$ ;  $P=0.07$ ) between the categorized age of the subjects and duration of KOA.

### Other Risk Factors Associated with KOA

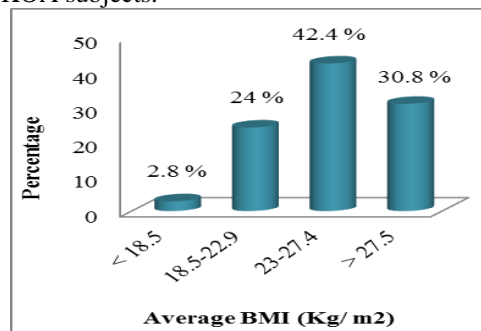
**Traumatic History:** Considering that all 250 subjects, 96 (38.4%) have had the past traumatic history on knee joint/s, 34 (13.6%) have had history of fall, 5 (2%) have had past history of leg fracture. Boon, Colledge and Walker (2006) have reported that the trauma is the most important risk factor in men and may result in unilateral KOA [22].

**Stress:** Majority of subjects 166 (66.4%) complained about history of stress. In these subjects, 122 (73.49%) have had mental stress and 30 (18.07%) have had Physical and mental stress. Miranda et al. (2002) have mentioned that the psychosocial elements of work were more involved in the persistence of the symptoms in the knee [24].

**Family History:** Of the 250 subjects, 145 (58 %) stated that they had family history of KOA and 2 (0.8%) stated that not known about the family history of KOA. Genetic factors play a part in osteoarthritis of the knee. Klussmann et al. (2010) have reported that in both genders, KOA within parents, brothers, or sisters was a significant predictor for symptomatic KOA in the investigated person [25].

**Overweight and Obesity:** Among the 250 subjects, the mean Body mass index (BMI) of the total subjects was  $25.65 \pm 4.14$  and minimum and maximum range of BMI was found from 15.23 to 39.84. Majority of subjects 106 (42.4%) were in the overweight group (23.0 - 27.4); 77 (30.8%) subjects were in the obese group ( $\geq 27.5$ ) and 60 (24.0%) subjects had a normal BMI (18.5-22.9) (Figure 3). Most of the female subjects 79 (31.6%) and 64 (25.6%) and male subjects 27 (10.8%) and 13 (5.2%) were in the overweight, obese respectively.

The Chi-square analysis showed that there was highly significant ( $\chi^2=24.02$ ,  $P=0.000$ ) association between BMI and gender of KOA subjects.



**Figure 3. Percentage distributions of Subjects by average BMI.**

BMI is suggested as the most appropriate determinate of healthy weight range [15].

Several studies in western societies confirmed that elderly, females, overweight and obese people were at higher risk to develop KOA [6], [26], [27], [28], [29], [30]. This statement was similar to the present study finding.

At the same time, in this present study result was fairly comparable with the previous studies done in Sri Lanka by Amaratunga et al. (2011) have found that the mean BMI of the subject was  $26.59 \pm 4.3$  and 23 patients (22.5%) had a normal BMI (18.5-22.9), 41 patients (40.1%) were in the overweight group (23.0-27.5) and 38 patients (37.2%) were found to be in the obese group (27.6-40.0) in their preliminary study on characteristics of patients with primary KOA [15]. Fernando et al. (2014) have also stated that the body weight of the group with KOA was significantly higher ( $p < 0.05$ ) than that of the control group [16].

Further, Western country studies reported that the risk of incident radiographic KOA was significantly increased among subjects with higher baseline BMI [31], [32].

Menopause: A majority of female subjects 132 (74.58 %) have had menopause and were over the age of 50 years (Table 3). Among the 132 subjects 53 (40.2 %) had the period of menopause between 1-6 years; 30 (22.7%) had between 7-12 years.

**Table 3. Menstruation associated with KOA**

Menstruation	n	%
Regular	31	17.50
Irregular	14	07.91
Menopause	132	74.58

n- Number; % - Percentage

The Chi-Square test shows there was no significant association ( $P > 0.05$ ) between duration of KOA and period of menopause in the female study population at 5% level.

Similar to present result, previous studies information revealed that after age 50, women have a higher prevalence and incidence which is consistent with the role of postmenopausal oestrogen deficiency in increasing the risk of OA [6], [33]. Pereira, Ramos and Branco (2014) have mentioned that reduced oestrogen levels in post-menopausal women may be associated with the development of OA [18]. Mahajan et al. (2005) have also described in their review article that menopause is associated with the onset and progression of OA in women [34].

Associated Disease: Of the 250 subjects studied 111 (44.4 %) stated that they had associated disease conditions with KOA. In these subjects, 41 (36.94%) stated that they had back pain with KOA. Also 17 (15.3%), 15 (13.5%), and 10 (9.01%) stated that they had body aching pain, gastritis, and constipation with KOA respectively.

Previous Diseases: Of these 250 subjects, 139 (55.6 %) stated that they have had history of previous diseases. In these subjects, 26 (18.7%) stated that they have had skin diseases and herniotomy. Also 22 (15.83%), 9 (6.47%), and 8 (5.76%) were stated that they had gastritis, chickengunia and hysterectomy respectively.

### Conclusion

The findings of the present study indicated that there was significant association between age, sex and BMI with KOA. Further, risk factors as age, gender, family history, menopause and BMI were similar to the findings of KOA studies of other research studies.

### Acknowledgment

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