Influence of Age and Weight Change Patterns on Knee Osteoarthritis

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KEYWORDS	ABSTRACT
American College of Rheumatology, body mass index levels, Knee osteoarthritis, prevalence, young age	Background: Knee osteoarthritis is a globally alarming condition. People are now dependent and adapting to new living standards and not taking all the necessary precautions to lead day-to-day life, somehow this is accelerating the degenerative process in the body. So, aiming to find out the prevalence of knee osteoarthritis will help improve the activity of daily living performance and reduce the economic burden of society due to knee osteoarthritis. Methodology: An observational descriptive analytic study, the target population was individuals between the age group 25 to 50 years of both genders. Results: From a total of 5514 individual participants, those aged <40 years had a 7.28%, and ages $\geq$40 years had a 16.32% prevalence of knee osteoarthritis. Participants with BMI level <25 kg/m2 had 5.08%, and others having BMI of $\geq$25 kg/m^2 had a 22.23% prevalence of knee osteoarthritis. Conclusion: The participants of the age group $\geq$40 years and with BMI $\geq$25 kg/m^2 reported a high prevalence of knee osteoarthritis. Abbreviations: Knee osteoarthritis (KOA), & body mass index (BMI).

1. Introduction

Millions of people are affected with the disabling disease Knee osteoarthritis (KOA) has a painful keen, hampered quality of life creates a negative impact on physical function and psychological status of the mind. KOA is a chronic disease involving the entire knee joint, including articular cartilage, ligament, meniscus, and periarticular muscle that may result from multiple pathophysiological mechanisms. So, it's not a localized disease of the knee joint but of the whole joint [1]. Age is the strongest non-modifiable factor for KOA [2, 3], there is a combination of changes that takes place in the capacity of joint tissues to adapt to biomechanical stresses due to age [4]. Few studies conducted to see the risk factors for the development of KOA in childhood or early adulthood KOA [5].

People are developing multiple comorbidities and simultaneously the prevalence of obesity is growing alarmingly in the world [6]. Obesity is the strongest modifiable risk factor for the development of KOA [1,7]. Obese or overweight people are nearly three times more likely to develop KOA, as shown in a meta-analysis [7]. In KOA both mechanical and systemic mechanisms are affected by obesity. In obese individuals depending upon the degree of fat and lean mass accordingly, there is a development of systemic effects in the body [4,8].

The individual's occupation, the dietary factors, as well as physical activity are the other modifiable factors of KOA [4,3]. Repeated joint loading through squatting or kneeling is associated with an increased risk of KOA [4,9], in overweight people this risk is even greater [4].

The assessment of the development of risk factors, and particularly the modifiable risk factors for KOA is seen generally in older individuals but the time to develop OA is longer. If done in younger populations, it will be helpful if earlier identification of individuals at high risk of developing OA may prevent or delay the development of OA [10].

KOA of overweight individuals has considerable grounds for disease severity, medical costs burden of treatment, and unproductivity [11]. There is a high risk of death in OA patients as compared to the general population. The presence of a walking disability and a history of diabetes, cancer, or cardiovascular disease are major risk factors. Excess mortality is observed for all diseases with specific causes of death but is particularly pronounced for cardiovascular complications.

KOA reported a high prevalence rate in comparison to other types of OA [12]. To find out the role of age and

obesity as being risk factors for the causing of KOA few attempts have been made to investigate in early life. There are several studies conducted on the elderly, and geriatric population but there is no availability of studies on the younger population ranging between the age group of 25-50 years.

So, such a study is needed to carry out and see the occurrence of KOA, to create awareness, lifestyle, workplace, and leisure time modification. The objectives or goals of the study: 1. To determine and compare the prevalence of KOA in the age group 25-50 years i.e. <40 and ≥40 years. 2. To determine and compare the prevalence of KOA of BMI range <25 kg/m^2 & ≥25 kg/m^2.

2. Methodology

This study focused on the survey to find out the occurrence of KOA in the age group of 25 to 50 years and its association with BMI (weight change pattern) levels <25 kg/m^2 and ≥25 kg/m^2, the research design was an observational descriptive analytic study, target population the Individuals coming to hospitals, institutions, various community set up, gyms, sports clubs, and workplaces irrespective of their job profile, outcome measure a structured questionnaire. The screening of the population was done through a structured questionnaire which was validated by the expert and the screening of KOA was done using the clinical American College of Rheumatology (ACR) criteria for KOA.

As per the inclusion and exclusion criteria, the individuals were included in the study. Further, on the basis of the structured questionnaire, the participants were divided into ages 25 to 40 years, and 40 to 50 years and they were screened for KOA. Simultaneously, the same individuals were also divided in terms of BMI levels <25 kg/m^2 and ≥25 kg/m^2 and were also screened for KOA.

Inclusion criteria: Participants with ages > 25 to 50 years of both genders and the participants fulfilling the clinical American College of Rheumatology (ACR) criteria KOA which is as follows [13] inference drawn from, KOA present if the following items 1, 2, 3, 4, or 1, 2, 5 or 1, 4, 5 are present. (1) Knee pain for most days of the prior month, (2) Crepitus on active joint motion, (3) Morning stiffness < 30 min in duration, (4) Age > 38 years, (5) Bony enlargement of the knee on examination.

Obesity is BMI ≥ 25 kg/m^2, formula {weight (kg) / height (m)^2} [14]. World Health Organization (WHO) categorized Asians as (1) BMI < 18.5 kg/m^2 (underweight), (2) ≥ 18.5 to < 23 kg/m^2 (normal), (3) ≥ 23 to < 25 kg/m^2 (overweight), (4) ≥ 25 to 30 kg/m^2 class I obese, & (5) ≥ 30 kg/m^2 class II obese [15].

Exclusion criteria: Individuals who had a joint replacement surgery, have a history of meniscal or other knee surgery in the past 6 months, past/previous history of fractures at the knee joint, have deformity at lower limb, osteoporosis, neurological deficits, COVID-19 symptoms, and pregnant females.

General Procedure: Permission was obtained from the Ethical Committee, the Respected Supervisor, and the Guide of Meenakshi Academy of Higher Education & Research (MAHER) Chennai, for conducting the research. After obtaining the consent, followed by explaining the individuals regarding the nature of the study and fulfilling the inclusion criteria, the structured questionnaire, height, and weight were recorded. The collected data was tabulated in the Master chart and analyzed for the results.

3. Statistical Analysis

Descriptive statistics was used and the values were mentioned in numbers and in the percentages. Quantitative data was represented in figures and tables. The prevalence ratio was calculated by a 2 X 2 contingency table. The difference was considered statistically significant if the 95% Cl for prevalence ratios included 1.

4. Results

The prevalence of KOA was calculated for 5514 individuals as per the division of age groups and BMI level. 1) Prevalence of knee osteoarthritis between different age groups: In the study total of 5514 individuals participated, from this 3376 exist of aged <40 years, and 2138 were ≥40 years. Out of 3376 participants, 246 reported KOA with a prevalence of 7.28% (<40 years). Of the 2138 participants, 349 had KOA so the prevalence was found to be 16.32% (≥40 years). Hence, the KOA prevalence was found to be higher in the age bracket of ≥40 years (Figure 1).
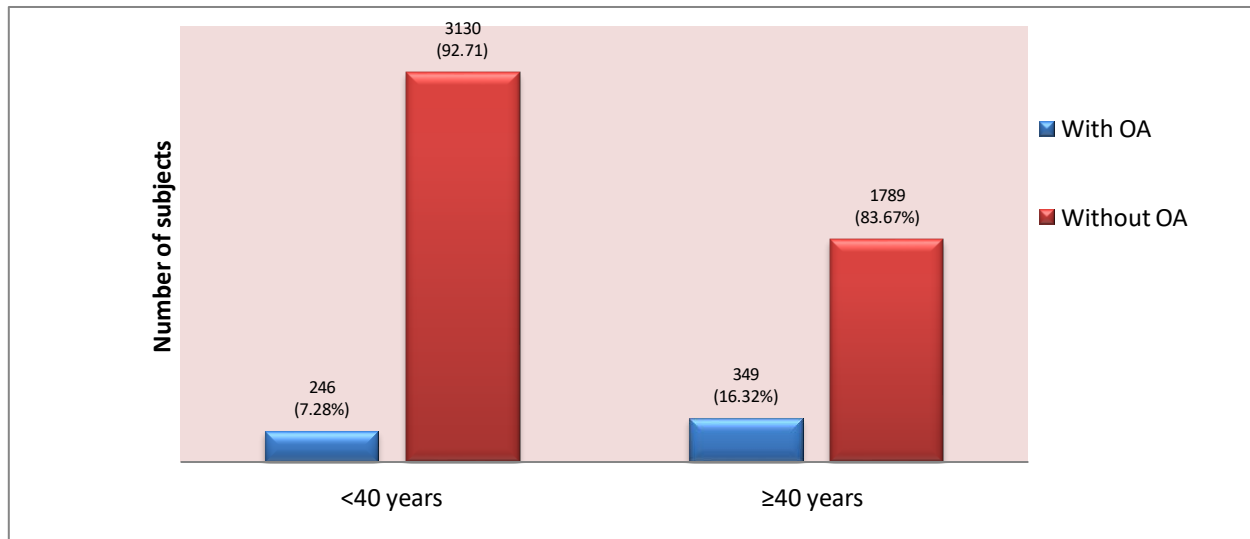
Figure 1: Prevalence of KOA among different age groups

Prevalence Ratio: The prevalence ratio was calculated to measure the strength of association between KOA and age group.

Table 1: Prevalence ratio of KOA between different age groups

	With KOA	Total subjects	Prevalence
≥40 years	349	2138	16.32
<40 years	246	3376	7.28
Prevalence Ratio = (349/2138) / (246/3376) = 2.24 95% CI: 1.88 to 2.66			

From the above table, it can be interpreted that in the age group ≥40 years the prevalence of KOA is 2.24 folds greater than in the age group <40 years.

2) Prevalence of knee osteoarthritis by the BMI levels: A total of 5514 individuals participated of which 3679 participants having a BMI <25 kg/m^2 and 1835 participants of BMI ≥ 25 kg/m^2. Of 3679 participants having a BMI range <25 kg/m^2 187 presented KOA having 5.08% prevalence. Of the 1835 participants having BMI of ≥25 kg/m^2 408 had KOA with 22.23% prevalence. Thus, the prevalence of KOA is higher in individuals whose BMI was ≥25 kg/m^2 (Figure 2).
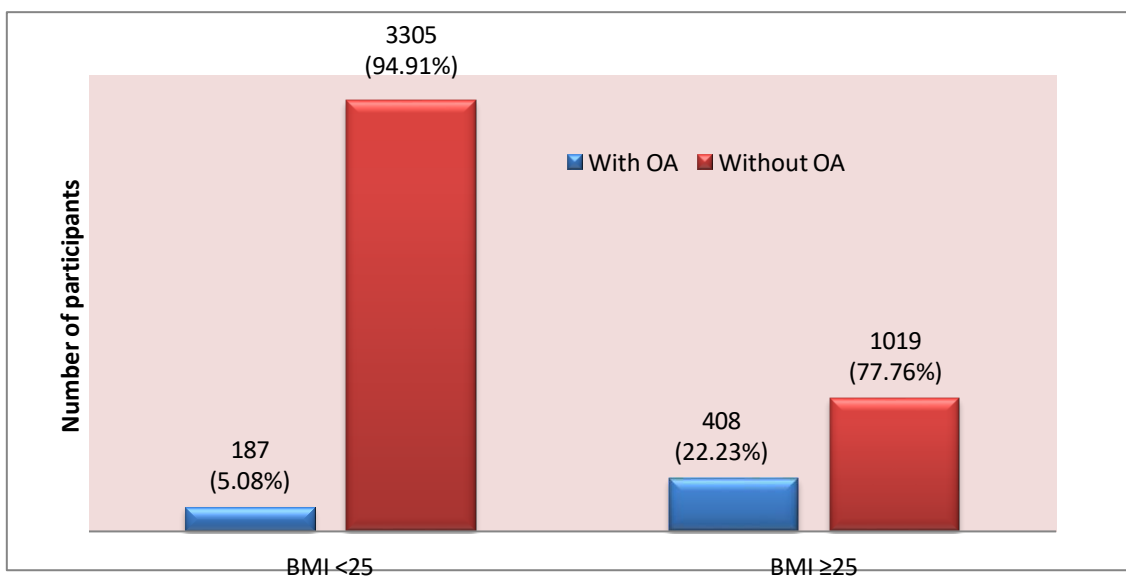

Figure 2: Prevalence of KOA by the BMI levels

Prevalence Ratio: The prevalence ratio was calculated to measure the strength of the association between KOA

and BMI levels.

Table 2: Prevalence ratio of KOA between different BMI levels

	With KOA	Total subjects	Prevalence
BMI ≥25 kg/m^2	408	1835	22.23
BMI <25 kg/m^2	187	3679	5.08
Prevalence Ratio = (408/1835) / (187/3679) = 4.37 95% CI: 3.64 to 5.24			

From the above table, it can be interpreted that the prevalence of KOA is 4.37 folds greater in participants having BMI ≥25 kg/m^2 compared to those has normal BMI.

5. Discussion

This study, aimed to find out the prevalence of KOA in the age bracket 25-50 years with various BMI levels.

A total of 5514 individuals participated from these 3376 (< 40 years), 246 having KOA prevalence of 7.28%. And out of the 2138 (≥40 years), 349 had a KOA prevalence of 16.32%. Hence, the high prevalence of KOA in the ≥40 years age category was with 2.24 folds greater than in the age group <40 years which could be due to the degenerative changes and in the individuals below the age group <40 years not having the pain as one of the chief complain may be due to good musculature strength across the knee joint that is quadriceps and hamstrings. A study by Chandra Prakash Pal [16] found 19.32% prevalence of KOA in the age <50 years which is around the values obtained in the present study i.e. 16.32%.

A total of 5514 individuals participated from these 3679 (BMI <25 kg/m^2), participants 187 had a KOA prevalence of 5.08%, and 1835 (BMI ≥25 kg/m^2) participants having, 408 had a KOA prevalence of 22.23%. The prevalence of KOA is higher in persons whose BMI is ≥25 kg/m^2. The results obtained in this present research are in agreement with the findings of Omar et.al [17] they reported a high prevalence of KOA in obese.

The clinical research of Coriolana et.al. [18] proposed that through a diet program, a weight loss of 16.5% in body weight causes a significant improvement in knee function and pain, and the necessity of total knee replacement surgery was postponed in KOA patients. A cohort study done by Gersing et.al. [19] found that slower cartilage deterioration is associated with weight loss, especially in the medial compartment this could be due to reduced joint loading.

One of the important risk factors varus malalignment is responsible for the progression of KOA [20]. In a study done by Sharma et. al. [21] found that individuals with varus knees and higher BMI had severe KOA as compared to those having valgus knees. In another study by Webb et. al [22], Obese individuals had increased symptoms of knee pain which may or may not correlate radiologically.

The weakness of the knee extensor muscle in men and women leads to an increased risk of developing KOA [23]. The knee joint surfaces are protected during movement and loading this is done by knee extensors as they work as shock absorbers and stabilizers of the knee [24]. The degenerative process is induced at the knee joint due to excessive mechanical stress on articular cartilage due to muscle weakness [25, 26].

The KOA prevalence in the age around 25 years onwards is in itself alarming and a point of concern, being obese leads to systemic illness, cardiovascular, and other deadly health conditions, and the arthritic disease cannot be spared. Sometimes early KOA is not visible on x-ray or presentable symptoms. However, the individual may face stiffness and day difficulties which are overlooked by individuals around the age of 25-40 years. People of different ages now need to modify their lifestyle as per their activities of daily living, incorporate planned exercise programs for the knee joint, hip, and lower limb according to their body type, maintain their weight throughout the life span, and have proper diet plan as per the daily requirement of the body, use of appropriate suitable footwear, braces for knee whenever required, work station exercises concerning their nature of work.

6. Conclusion

The present study concluded that high KOA prevalence in the age bracket ≥40 years compared to <40 years. Also greater in the participants of BMI range ≥25 kg/m2 than those with a BMI <25 kg/m^2.

Conflict of Interest

The Authors declare that there is no conflict of interest.

Funding Source

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