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Original Research Article

TO ESTABLISH ASSOCIATION BETWEEN PERCENTAGE OF BODY FAT AND KNEE JOINT OSTEOARTHRITIS.

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Abstract

Background & Methods: The aim of the study is to establish association between percentage of body fat and knee joint osteoarthritis. The measurements in case of female subjects were recorded with the help of female coworker. The skin was pinched at the appropriate site to raise a double layer of skin and adipose tissue, but not the muscle.

Results: It was observed that in age group I having percentage of body fat 38.6 in female & 31.6 in male and BMI 32.83 & 32.55 respectively, 71.1% obese female and 28.57% obese male showed the positive radiological findings. In age group II having percentage of body fat in female 41.25& 35.9in male and BMI 35.97 & 34.19 respectively, 90.90% obese female and 45.45 % obese male showed the positive radiological findings. In age group III having percentage of body fat in female 40.47 & 34.77in male and BMI 33.51 & 33.35 respectively, 85.71% obese female and 42.85 % obese male showed the positive radiological findings

Conclusion: Percentage of body fat was calculated by the help of standard tables given in baseline skin fold caliper booklet. BMI was calculated each subject. Total 200 radiograms of both knee joints in anterioposterior view in standing position were obtained from both study and control group. The radiograph was carefully analyzed with the help radiologist. Correlation between percentages of body fat, BMI of knee joint was done. The study concluded that obese female in all age groups showed more radiological changes in knee joints as compared to non-obese female control that difference was highly significant statistically ($P < 0.01$).

Keywords: association, body fat, knee joint & osteoarthritis.
Study Design: Observational Study.

1. INTRODUCTION

The knee joint is exposed to high compressive and shear forces during weight bearing. Compressive loads can exceed three times body weight during walking and six times body weight during stair climbing in healthy-weight individuals[1]. As body weight increases, the loads to which the knee joint is subjected also increase. This loading occurs disproportionately across the medial compartment of the tibial plateau and, therefore, knee OA affects this area of

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the joint almost five times more frequently than the lateral compartment[2]. The external knee adduction moment is the biomechanical variable most frequently studied with knee OA based on its correlation with medial loading and ability to distinguish the proportion of load borne by the medial compartment[3].

A number of studies support the finding that higher peak external knee adduction moments are present in individuals with medial compartment knee OA relative to asymptomatic, healthy populations. The adduction moment is also correlated with disease severity. In addition, this higher peak moment is one of the most consistently-found characteristics of the gait of obese individuals[4]. Thus, in obese individuals with knee OA, the peak values are disproportionately higher and the disease progresses faster. The magnitude of the peak external knee adduction moment is also influenced by the knee joint alignment, which can be compounded by obesity[5].

Obese individuals exhibit lower levels of limb strength and power measures than non-obese individuals, per unit of body weight. Impaired strength, particularly of the quadriceps muscles, is a risk factor for the development of knee OA. Studies investigating isometric and isokinetic knee extensor strength have found lower torque values in obese individuals, when normalized to body mass, however, knee flexion strength is unchanged or lower compared to healthy-weight individuals[6].

2. MATERIAL AND METHODS

Present study was conducted at ESICMC and PGIMSR, Rajajinagar, Bangalore for 01 Year on 200 cases out of these 100 obese cases served as study group and 100 non obese cases as control group. The cases were selected from the department of orthopedic department. Careful clinical examination was done under guidance of expert from orthopedic department and Signs were recorded.

Skin fold thickness was measured in millimeter (mm) by the help of slim guide skin fold caliper at three standard anatomical sites around the body. All measurements were taken on the right side of the body with the person standing. The measurements in case of female subjects were recorded with the help of female coworker. The skin was pinched at the appropriate site to raise a double layer of skin and adipose tissue, but not the muscle.

INCLUSIVE CRITERIA

1. Obese subjects without any complaints of knee joints.
2. Non-obese subjects with or without complaint of knee joint

EXCLUSIVE CRITERIA

1. Subject is obese due to any metabolic disease like diabetes mellitus, Thyroid disorder.
2. Any kind of knee joint injury and fracture.
3. History of Rheumatic disease of knee joints.

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Fig 1: Standing Scanogram of Lower Limb

Fig 2: Knee X-ray

Fig 3: Callipers

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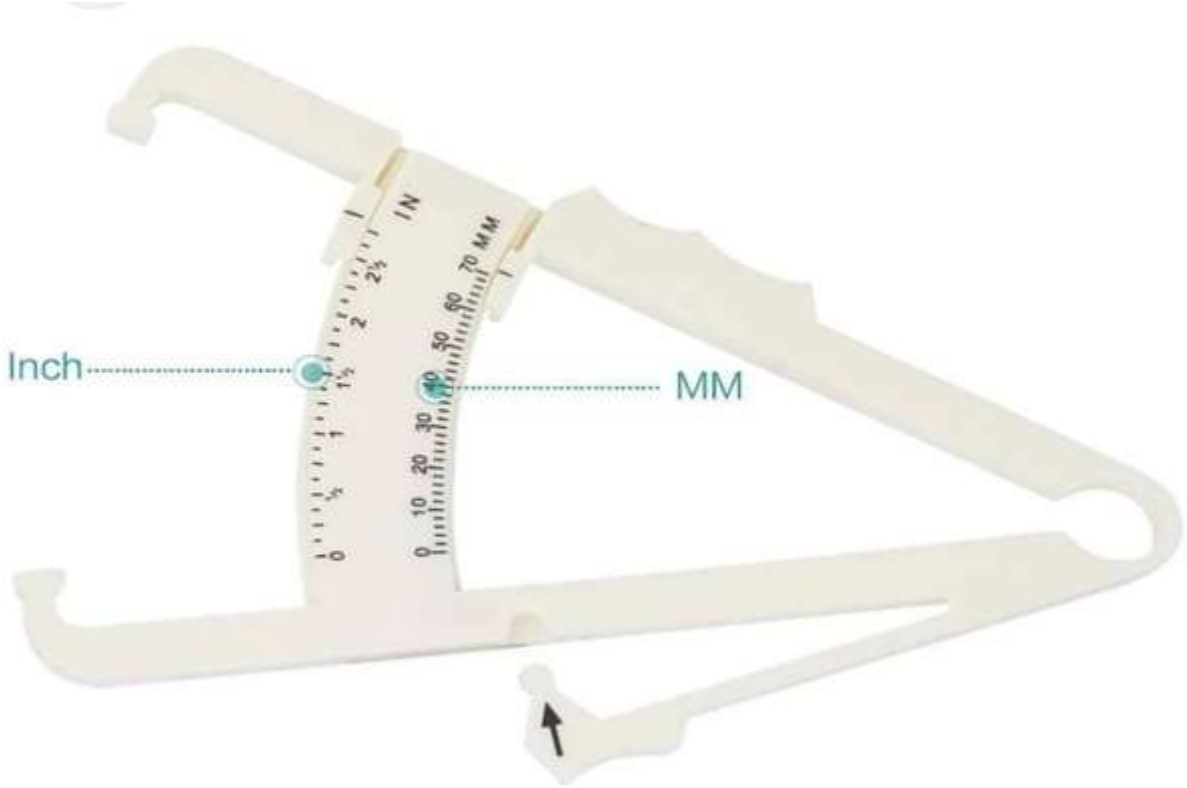

3. RESULT

Table No 1: Body composition classification according to percentage of body fat for men

Age	Percentage Of Body Fat				
	Excellent	**Good**	**Moderate**	**Overweight**	**Obese**
30-39	14	14.1-19	19.1-24	24.1-29	>29.1
40-49	15	15.1-20	20.1-25	25.1-30	>30.1
>50	16	16.1-21.5	21.1-26.5	26.1-31	>31.1

Major complaints were recorded carefully. Obesity and major complaints in each age group were analyzed.

Table No. 2: Correlation between percentage of body fat and positive radiological findings in study group

Age Groups in years	Percentage of body fat		Percentage of positive radiological findings	
	Female	**Male**	**Female**	**Male**
Group I	38.6	31.6	71.1%	28.57%
Group II	41.25	35.9	90.90%	45.45%
Group III	40.47	34.77	85.71%	42.85%

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Table No. 3: Correlation between body mass index and positive radiological findings in study group

Age Groups in years	Body mass index		Percentage of positive radiological findings	
	Female	Male	Female	Male
Group I	32.83	32.55	71.1%	28.57%
Group II	35.97	34.19	90.90%	45.45%
Group III	33.51	33.35	85.71%	42.85%

To analyze the percentage of body fat, BMI and positive radiological findings a comparison was done in both sex in all age groups. It was observed that in age group I having percentage of body fat 38.6 in female & 31.6 in male and BMI 32.83 & 32.55 respectively, 71.1% obese female and 28.57% obese male showed the positive radiological findings. In age group II having percentage of body fat in female 41.25& 35.9in male and BMI 35.97 & 34.19 respectively, 90.90% obese female and 45.45 % obese male showed the positive radiological findings. In age group III having percentage of body fat in female 40.47 & 34.77in male and BMI 33.51 & 33.35 respectively, 85.71% obese female and 42.85 % obese male showed the positive radiological findings

4. DISCUSSION

Obesity is the major concern in the developed countries like India. The prevalence of obesity has risen due to unhealthy diets and physical inactivity in view to combat this epidemic of obesity the action should be taken for better recognition of effect of obesity on musculoskeletal problems[7].

Obesity has been found to precede osteoarthritis of knee joint. The studies all over the world have shown that people who are overweight in their mid-thirties are at increased risk of developing knee osteoarthritis. When in there seventies, initial weight correlate with risk of future development and worsening of osteoarthritis[8]. The progression of osteoarthritis of knee also increased with obesity**.**

Nisha J. Manek et al [9] (2003) studied the association of BMI and Knee osteoarthritis (genetic and environmental influence). Their study showed the strong association between high BMI and knee osteoarthritis. In present study it was observed that subjects having high BMI have more chances of knee osteoarthritis.

S A Mazzuca et Al [10] (2005) evaluated risk factor for progressive radiographic changes of KOA using a standardized fluoroscopically assisted protocol for knee radiograph. Under there study 319 subjects with unilateral or bilateral OA underwent a x ray examination of knee in semi flex AP view. They concluded that progression of JSN was positively associated with patellofemoral OA. Osteophytes formation was directly related to baseline stiffness. In present

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study 84 % obese female subjects and 40% obese male subject demonstrated radiographically confirmed Joint space narrowing and out of these cases 44% female and 16% male demonstrated presence of osteophytes.

5. CONCLUSION

Percentage of body fat was calculated by the help of standard tables given in baseline skin fold caliper booklet. BMI was calculated each subject. Total 200 radiograms of both knee joints in anterioposterior view in standing position were obtained from both study and control group. The radiograph was carefully analyzed with the help radiologist. Correlation between percentages of body fat, BMI of knee joint was done. The study concluded that obese female in all age groups showed more radiological changes in knee joints as compared to non-obese female control that difference was highly significant statistically ($P < 0.01$).

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ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

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