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Research Paper

Correlation Between Percentage Of Body Fat And Osteoarthritic Changes In Both Knee Joints In Female : A Radiological Study

Medical Science

KEYWORDS : Femur, Tibia, Patella, Fibula, knee osteoarthritis, osteophytes, hyline cartilage, Subchondarl sclerosis and cyst, Subluxation, triceps, suprailium

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ABSTRACT

Aim-To correlate the effects of percentage of body fat on both knee joint radiological morphology in female.

Material & Methods- 50 obese and 50 nonobese female aged between 30 yrs to 50yrs and above were selected . Measurements were taken by slim guide skinfold caliper. Calculation of percentage of body fat and Grading of obesity was done by the standard tables given in caliper booklet. Total 100 radiograms of knee joints in anterioposterior view in standing position were obtained . The radiographs were carefully analysed. Correlation between percentage of body fat and changes in radiological morphology of knee joint was done. Statistics (t test) was applied.

Results- 84% obese female in all age groups showed more radiological changes in knee joints as compared to 20% nonobese female control that difference was highly significant statistically (P <0.01).

Conclusion- Obese female have higher risk of knee joint osteoarthritis than nonobese female.

INTRODUCTION-

Obesity is defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic) or an increase in fat cell number (hyper plastic) or a combination of both [1] . Obesity is defined as a chronic disease characterized by an excessively high amount of body fat in relation to lean body mass [2].Obesity is most commonly caused by a combination of excessive dietary calories, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness.Body fat can be classified in to two categories essential fat and storage fat. Essential fat is needed for normal physiological function without it we can not be healthy. Storage fat is the fat stored in adipose tissue, mostly beneath the skin i.e. subcutaneous and around major organ of the body, waist hip, and thigh. This storage fat may be hazardous to the body if it is more than normal limit. It may cause hypertension gall stone, gout diabetes, cancer. Obese person always have some problem in his/her knee joints. Knee joint is the main weight bearing joint in our body which is mostly affected by person's weight. The effect of obesity is on knee joints is well known i.e. osteoarthritis or osteoarthrosis but correlation between obesity and osteoarthritis of knee joints is controversial[3].The present study is designed to study the correlation between percentage of body fat and changes in radiological morphology of knee joints and an attempt to create awareness about hazards of obesity in obese female.

MATERIAL AND METHODS-

The present study was conducted on hundred subjects out of these fifty obese female served as study group and fifty non obese female served as control group. The cases were selected from the department of orthopedic of M.Y. hospital Indore.

INCLUSIVE CRITERIA

Obese and nonobese female with and without any complaints of knee joints. Obese female with positive clinical history of joint pain, difficulty in walking , joint deformity and clicking sound in knee joint movements.

EXCLUSIVE CRITERIA

Obese female due to any metabolic disease (diabetes mellitus, Thyroid disorder) ,having infection of knee joints (tuberculosis, sepsis),having knee joint injury and fracture, Rheumatic disease, congenital malformation of knee joint was excluded.

The subjects under study were divided into 3 age groups ranging from 30 years to 50 years and above (Age group I- 30 to 39 years, II- 40 to 49 years and III - 50 years and above).

Detailed history was taken regarding the complaints of knee joints. Careful clinical examination was done 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 i.e. Suprailium, thigh, triceps. The skin was pinched to raise a double layer of skin and adipose tissue, but not the muscle. The caliper was applied 1 cm below and at right angle to the pinch and reading in millimeter was taken . Percentage of body fat was calculated by using Standard Table (Table no. 1) from HOEGER w. k. & HOEGER s. 1999, Baseline skin fold caliper booklet by Indiana state university Deptt, of physical education. The sum of 3 skin folds was utilized to calculate the percentage of body fat and Grading of obesity was done by using standard Table (Table no.2) from same Baseline skin fold caliper booklet.

X-ray in standing Anterioposterior view of both knee joints was taken and assessed for radiological changes like Joint space narrowing, Osteophytes, Subchondarl sclerosis and l cyst, Total loss of joint space and Subluxation (figure 1&2). All observations were recorded .Association between obesity and radiological finding was analysed in all age groups .For statistical analysis SPSS software was used. For comparison of different parameters small samples 't' test was used.

RESULTS -- 84% obese female and 20% nonobese female were affected by knee joint osteoarthritis that difference was highly significant statistically (P <0.01). To analyse radiological findings in control as well as study group a comparison was done amongst female in all age groups. In I age group 71.1% obese female subject presented with positive radiological findings as compared to only 14.2% nonobese female subjects presented with positive radiological findings (p value <0.01), which is highly significant. In age group II 90.90% obese female subject presented with positive radiological findings as compared to 27.27% nonobese showed positive findings (p value <0.01), which is highly significant. In age group III 85.71 % obese female subject presented with positive radiological findings as compared to 14.2% showed positive findings (p value <0.01), which is highly significant.(Table no. 3)

DISSCUSION- The present study is to ensure the effect of obesity on knee joint morphology. The studies all over the world have shown that obese female are at increased risk of knee osteoarthritis.

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Devid T. Felson et al [4] found a definitive association between weight and knee osteoarthritis . According to there study this association was stronger in female.

Changhai Ding et al [5] reported that obese female had significantly higher knee joint defects than nonobese female.

T D Spector et al [6] studied incidence of osteoarthritis in obese female. They concluded that middle age women with unilateral disease will progress to bilateral knee osteoarthritis having obesity as a strong risk factor.

Hochberg MC et al [7] studied the association of body fat distribution with knee osteoarthritis. That study concluded that body weight is associated with bilateral knee osteoarthritis in obese female .

CONCLUSION—

The study concluded that Obese female have higher risk of knee joint osteoarthritis than nonobese female. Obesity is the major preventable risk factor for the onset and progression of the morphological changes in knee joints. Obesity can be modified by simple measures like weight loss, correction of diet pattern and exercise. Hence creating awareness towards hazards of obesity is an important step towards reducing the incidence of osteoarthritis and making quality of life better.

Table-1 Percentage of fat estimate for female Sum of triceps, suprailium, & thigh skin fold

AGE OF THE LAST YEAR							
Sum of skin fold (mm)	28-32	33-37	38-42	43-47	48-52	53-57	Over 58
23-25	10.2	10.4	10.7	10.9	11.2	11.4	11.7
26-28	11.5	11.7	12.0	12.3	12.5	12.7	13.0
29-31	12.8	13.0	13.3	13.5	13.8	14.0	14.3
32-34	14.0	14.3	14.5	14.8	15.0	15.3	15.5
35-37	15.3	15.5	15.8	16.0	16.3	16.5	16.8
38-40	16.5	16.7	17.0	17.2	17.5	17.7	18.0
41-43	17.7	17.9	18.2	18.4	18.7	18.9	19.2
44-46	18.8	19.1	19.3	19.6	19.8	20.1	20.3
47-49	20.0	20.2	20.5	20.7	21.0	21.2	21.5
50-52	21.1	21.3	21.6	21.8	22.1	22.3	22.6
53-55	22.1	22.4	22.6	22.9	23.1	23.4	23.6
56-58	23.2	23.4	23.7	23.9	24.2	24.4	24.7
59-61	24.2	24.5	24.7	25.0	25.2	25.5	25.7
62-64	25.2	25.5	25.7	26.0	26.7	26.4	26.7
65-67	26.2	26.4	26.7	26.9	27.2	27.4	27.7
68-70	27.1	27.4	27.6	27.9	28.1	28.4	28.6
71-73	28.0	28.3	28.5	28.8	29.0	29.3	29.5
74-76	28.9	29.2	29.4	29.7	29.9	30.2	30.4
77-79	29.8	30.0	30.3	30.5	30.8	31.0	31.3
80-82	30.6	30.9	31.1	31.4	31.6	31.9	32.1
83-85	31.4	31.7	31.8	32.2	32.4	32.7	32.0
86-88	32.2	32.5	32.7	32.9	33.2	33.4	33.7
89-91	33.0	33.2	33.5	33.7	33.9	34.2	43.4
92-94	33.7	33.9	34.2	34.4	43.7	34.9	35.2
95-97	34.4	34.6	34.9	35.1	35.4	35.6	35.9
98-100	35.1	35.3	35.5	35.8	36.0	36.3	36.5
101-103	35.7	35.9	36.2	36.4	36.7	36.9	37.2
104-106	36.3	36.3	36.8	37.1	37.3	37.5	37.8
107-109	36.9	37.1	37.4	37.6	37.9	38.1	38.4
110-112	37.5	37.7	38.0	38.2	38.5	38.7	38.9
113-115	38.0	38.2	38.5	38.7	39.0	39.2	39.5
116-118	38.5	38.8	39.0	39.3	39.5	39.7	40.0
119-121	39.0	39.2	39.5	39.7	40.0	40.2	40.5
122-124	39.4	39.7	39.9	40.2	40.4	40.7	40.9
125-127	39.9	40.1	40.4	40.6	40.9	41.1	41.4
128-130	40.3	40.5	40.8	41.0	41.3	41.5	41.8

TABLE 2-

Body composition classification according to percentage of body fat for female

Age (yrs)	Percentage Of Body Fat				
	Excellent	Good	Moderate	Overweight	Obese
30 - 39	19	19.1 – 24	24.1 – 29	29.1 – 34	>34.1
40 - 49	20	20.1 - 25	25.1 - 30	30.1 - 35	>35.1
> 50	21	21.1 - 26.5	26.1 – 31	31.1 – 36	>36.1

Table No. 3.

Comparison of positive radiological finding in study and control group in female

Age Groups in years	Study group		Control group		P value	Significance
	Total no. of subject	Total no. of subject showing positive radiological finding	Total no. of subject	Total no. of subject showing positive radiological finding		
Group I	14	10	14	2	< 0.01	Highly significant
Group II	22	20	22	6	<0.01	Highly significant
Group III	14	12	14	2	<0.01	Highly significant

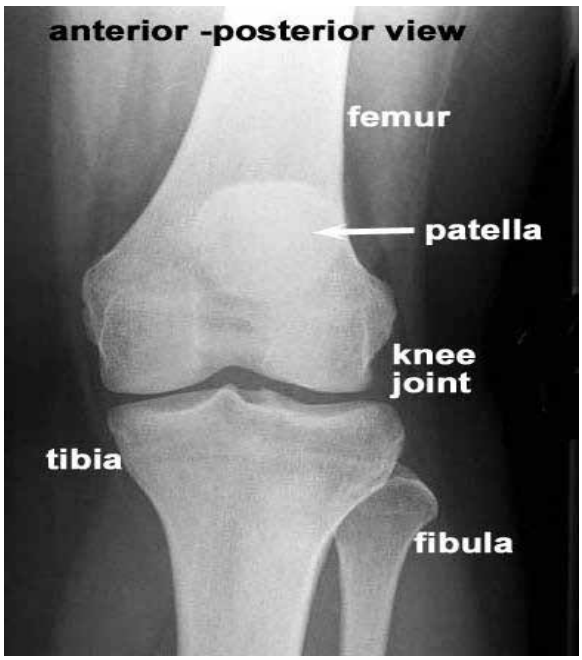

Fig. 1- X ray of normal knee joint (anterio posterior view)

Fig.2- X ray of knee joint osteoarthritis (anterio posterior view)

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