



# Prevalance of lowerlimb postural changes in overweight and obese females age 21-50yrs

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## ABSTRACT

**Summary background:** Recent studies have shown evidence of relationship between overweight and obesity with skeletal abnormalities.especially knee angular changes.The study is aimed to reveal relationship of increase BMI in females age 21-50yrs and musculoskeletal abnormalities in lower limb.

**Methods:** A survey based on observational study is performed on 153 females (with BMI  $>25\text{kg/m}^2$ ) at Dr.ulhas patil college of physiotherapy jalgaon. informed consent and data was evaluated and BMI was calculated by dividing weight by height square, several non radiographic methods including Q angle measured by universal goniometer,distance between 2 knees (ICD) and, intermalleolar distance(IMD) was measured by measuring tape.

**Results :**In following study prevalence of lower limb postural changes in overweight and obese females. (84.33%)females are overweight and (15.69%)are obese. There was significant and adverse correleation of BMI with Q angle.The mean BMI of females age 21to35yrs is  $26.02\pm 2.43$  and age 36 to 50yrs is  $30.43\pm 1.55$  respectively.also Q angle of age 21 to35yrs of right side is  $19.76\pm 2.30$  and of left side  $19.38\pm 2.39$  whereas Q angle of age 36 to50 yrs of right side  $19.76\pm 2.30$  and left side  $22.87\pm 2.69$  (pvalue 0.000). also there is strong correleation with IMD.

**Conclusion :** There is strong and significant relationship between BMI and Q angle ,IMD. Prevalence of knee deformalities in obese females is higher and predictable especially in higher age group. There is inverse correleation of BMI with knock knees(genu valgum ) and no correleation with bow legs(genu varum).

**Keyword :** BMI,Qangle,IMD

## INTRODUCTION :

Obesity is related to various medical complications such as heart disease , daibetes , cancer, breathing problems and disabling musculoskeletal conditions that affects quality of living . obesity is also associated with postural changes . several systems such as visual , vestibular, proprioceptive senses and musculoskeletal system contribute to postural stability . Any deficits in this system result in postural instability . Obesity is affecting 300 million people in the world. It is most common eating disorder which increase risk of death & reduced life expectancy (2) . Risk factor for overweight and obesity include urbanization ,reduced physical activity ,increase calorie intake , and modern life . Due to major complications and high prevalence it is important to measure true BMI . According to world health organization Body mass index (BMI) is a person's weight in kilograms divided by the square of height in meters.

- BMI is an inexpensive and easy screening method for weight category—underweight, healthy weight, overweight, and obesity.
- BMI  $<18.5$  – underweight person, BMI 18.5 – 24.9 – normal nourished person, BMI 25 – 29.9 – overweight, BMI  $>30$  – obesity, BMI 30-34.9 – I degree (moderate) obesity, BMI 35- 39.9– II degree (extreme, severe) obesity, BMI  $>40$  – III degree(extreme, morbid) obesity

Due to obesity musculoskeletal system is impril by many factors including daily habbits , occupation ,culture and even enviorement. whenever there is raise in musculoskeletal abnormalities attention is paid to spinal abnormalities . while other parts of body can also

expose to multiple abnormalities. Hardly anyone is concerned about harmful effects of increase BMI on lower limb. Knee joint is one of the most susceptible joint in the body. as it plays very important role in supporting the body and transmitting its weight during static & dynamic activities. compressive & tensile forces are introduced into joint during various activities. But its support and stability is further enhanced through muscle and ligaments around it. knee joint disorders are divided into two general categories traumatic & non traumatic. Non traumatic problems include skeletal deformities, such as genu valgum, genu varum, rheumatoid arthritis, & joint degenerative diseases. Traumatic problems include bursitis, tendon injuries, meniscus damage, degenerative dislocation. Knee skeletal deformities are one of the most common disorders of knee. These disorders may be congenital, acquired and the most common ones are genu valgum & genu varum.

In genu valgum in case of weight bearing on knees lead to get knees away from each other and genu varum is characterized by bowing at knees. these deformities have high prevalence in overweight & obese females. presence of these deformities expose people at high risk of compensatory changes in ankle and foot joint and even increase risk of fractures.

Recent studies have shown evidence of relationship between overweight & obesity with musculoskeletal deformities. What we did in study is to determine lower limb postural changes in overweight and obese females age 21 -50 yrs with age indices in order to show age related postural changes in obese and overweight females.

#### **NEED FOR STUDY:**

The purpose of study is to determine lower limb postural changes in overweight and obese females age 21 -50 yrs with age indices in order to show age related postural changes in obese and overweight females. Thus, a study needs to be carried out to find out the changes lower limb posture due to overweight and obesity.

**AIM :** To study lower limb postural changes in overweight & obese females age 21-50 yrs.

#### **OBJECTIVES :**

1. To evaluate BMI of females age 21-50 years
2. To measure Q ANGLE of overweight and obese females
3. To measure distance between intercondylar spaces of overweight and obese females
4. To measure the distance between intermalleolar spaces of overweight and obese females
5. To compare lower limb postural changes in females between age 21-50 years

#### **Hypothesis :**

- **Null hypothesis :** there will be no significant correlation between overweight & obesity with lower limb postural changes in females age 21-50 yrs.
- **Alternate hypothesis :** there will be significant correlation between overweight & obesity with lower limb postural changes in females age 21-50 yrs.

#### **REVIEW OF LITERATURE :**

- **Aparijta Raizada et. Al (2019)** conducted a Study named changes in quadriceps angle (Q angle) with regard to gender and Different anthropometric parameters with 148 subjects, 80 girls and 68 boys from ACS medical college, Chennai India, between age 18 -20 yrs. The Q-angle measured on both sides using universal goniometer and then correlated with various parameter. Study concluded that no significant difference in both gender bilaterally but higher q angle were seen with high BMI, increased waist and hip circumference higher, *Int. Janat Res 2019; vol 7(3.1): 6756*
- **Shultz sj,nguien ad,2008** conducted study name differences in lower extremity anatomical and postural characteristics in males and females between maturation groups 173 young athletes were assessed age range from 9-18 years placed into one of three groups participants were measured from pelvic angle, hip antversion, quadriceps angle, TFA femer length, Tibial length, Tibial torsion. The conclusion of study is general change of posture with maturation that begin with greater knee valgus, knee recurvatum. Decrease in quadriceps angle and ant. Knee laxity were greater in males compared to females.

Females were observed to have more inwardly rotated hip and valgus knee posture compared to males. **Journal of orthopaedic and sports physical therapy.**

- **Reza Rajabi Hamudeh gorjian, seyed hasehmi (2015)** Conducted the study named Determination of knee alignment Index (genu valgum & genu varum) in different Age's group for women in Mazandaran province with 300 female subjects from Tehran payame -noor university physical Education Iran. Between 5 Different age group 9-14 years , 15-24 yrs, 25-44 years, 45-64 years and 65 years old higher has been tested .According to examination proforma in genu valgum and genu varum. IC and IM distance were measured with vernier caliper made up by USA 0.02 mm exactness and side instrument includes transformed caliper and scaled blades of internal measurement the datum analysis has been done by emphasis on determining mean standard deviation in age groups by aid of SPSS 18 software. The conclusion of study showed overall that in women increase with age over the course of normal knee genu valgum. **Int.J.sports science,2 (1)-6 2015**
- **Masashi matsumara et.al(2020)** conducted study on pelvis/lower extremity alignment and range of motion in knee o.a.A case controlled study in elderly japanese women 26 womens(13 with medial knee o.a and 13 healthy elderly were participated in study.)Pelvic tilt ,knee extension angle, Quadriceps angle,leg hell alignment were measured .ROM was measured at hip knee and ankle joints. The study concluded that people with medial o.a have different static alignment and ROM compared to those without knee **O.A J.back musculoskeletal rehabilitation 2020 (3)**
- **Noam Shohat, yossy machluf (2008)** Conducted study clinical knee alignment among Adolescents an association with BMI a large prevalence study. 47, 588 candidates for military service presenting to northern recruitment Centre during 11 year period was analysed between age group 16-18 years to identify clinical knee alignment based on standing skin surface IC & IM were measured with measuring Tape .The study Concluded that genu varum was prevalent among male subjects than females. and are also prevalent among under weight.And genu valgum was significantly more prevalent in Females than males and was also prevalent among obese and overweight **subject.Int.J.Sports sci(2018).**
- **Aikaterini E. Tsakoniti et al. (2011)** done a study to investigate whether an increased quadriceps angle (Q-angle) has an effect of on patellar positioning and thickness of knee articular cartilages and menisci, in a group of young asymptomatic individuals. Patellar positioning and the thickness of the articular cartilages were determined in 19 asymptomatic male individuals with high Q-angle (HQ-angle)( $18.5 \pm 2.6$ ) using magnetic resonance imaging (MRI). Our data revealed that healthy individuals with HQ-angle are unlikely to demonstrate any changes in the position of the patella and/or the thickness of the knee articular cartilages; **Surg Radiol Anat (2011) 33:97–104**
- **laurens de cock ,jan dauwe (2018)** conducted **study on knee alingment in adolescents is correlated with participation in weight bearing sports** the study was conducted on 1008 healthy adolescents 564 boys , 444girls aged 12-19 yrs .the alingment of knee was determined by measuring IC & IM distance using specially designed insider calliper the study concluded that there is significant correlation between participants in weight bearing sports and genu varum in each of three different groups **International orthopaedics (2018)42: 2851-2858**
- **Erica .D. Taylor, kelly ,R. Theim, Margaret.C. Mirch (2006)** conducted study on orthopedic complications of over weight in children and adolescents. 227 overweight and 128 non overweight children adolescents were enrolled in pediatrics clinical studies at National Institute of health from 1996-2004 medical history and musculoskeletal complains were assessed though aquestionarrie. Data. The study Concluded that Reported fractures, musculoskeletal discomfort, Impaired mobility and lower Extremity malalignment are more prevalent in overweight. orthopedic Difficulties may be part of cycle that perpetuates the accumulation of weight in children **American academy of pediatrics (2006)**
- **Sharon Bout - Tabaku, Justine shults (2015)** Conducted study by obesity associated with greater valgus knee alignment in pubertal children and higher BMI is associated greater variability in knee alignment in girls.155 healthy weight and 160 obese subject knee alignment [MDA]and [ATFA], fat mass were measured using dexa. National reference data were used to generate age and sex specific BMI( $(\text{kg}/\text{m}^2)$ ) zscores,Multivariable linear regression was used to Identify Independent factors associated with MDA and ATFA.The study concluded that greater variability in knee alignment among females at higher BMI zscores and greater valgus alignment in obese adolescents in late **puberty.J.Rheumatol 2015 ;42;126-33;**
- **PEHNA pj et.al .(2004)** conducted study Of postural assesment of girls between 7-10 yrs of age at department of physiotherapy brazil 33 girls in each of 4 groups between age of 7-10yrs of age were assesed to identify preventive measures

.the postural assesment was made through photos of students madein orthostatic posture in frontal & sagittal planesthe study concluded that high incidences of postural alterations occur in school age **CLINICS 60 (1):9-16,2005**

- **Veeramani raveendranath ,shankar nachiket (2009)** conducted study on the quadriceps angle in indian men & women at st.john’s medical college banglore .100 subjects 50 males & 50 females were studied of age group 18 yrs & above mean age of subjects was 23 yrs .the measurement was done with standered goniometer in supine position the study concluded that it was found that the mean Q angle was greater in females compare to males .
- **Rajeev chaudhary ,mudasir malik,deepak khurana (2017)** conducted study effect of various parameters on quadriceps on indian adults .450 healthy subjects age 18-35 yrs included in studies Q ANGLE of right & left side was measured with goniometer in supine & standing position the study concluded that females have higher q angle compared to males majority of subjects show increase in q angle in supine than in standing **journal of clinical orthopedics & taurma**
- **Mehmet arazi et.al (2001)** conducted study on **development of tibiofemoral angle in children** at department of orthopedic surgerey & traumatology university of kenya 590 turkish children aged 3-17 yrs were included in the study TF was measured with goniometer in standing position IC & IM distance were measured with measuring tape the study concluded that largest IM distance was obtained in overweight children **J. PEDIATR ortho ,vol 21 no.2 2001**
- **Orhan Ahmet Şener and Mehmet Durmaz (2019)** conducted a study entitled “Effect of Sport Training and Education on Q Angle in Young Males and Females” whose average age was found to be 19.16 for women and 21.120 for men. The Quadriceps Q angles of 240 female and 600 male subject were measured in both supine and standing positions by goniometer. The study found that the difference between mean Q angle of female and male subject was statistically significant ( $p < 0.001$ ). Finally, the mean dominant knee Q angle of young females and males seemed to be in normal range. Finally, the mean dominant knee Q angle of young females and males seemed to be in normal range; **Journal of Education and Training Studies Vol. 7, No. 7.**

#### **MATERIALS AND METHOD :**

1. 153 female subjects at the age group of 21 – 50 yrs were selected.
2. On the basis of age they were furthur divided in 2 groups.
3. Age group (A) : 21-35 years
4. Age group (B) : 36- 50 years
5. **Study design** - Observational study.
6. **Study setting** - Dr. Ulhas Patil college of physiotherapy Jalgaon .
7. **study duration** – 6 months
8. **study population** – overweight and obese females of age group 21 – 50 years of age
9. **Method of sampling** : convenient sample design is chosen

#### **SELECTION CRITERIA :**

Inclusion criteria:

- Subjects with informed consent
- Age group 21 – 50 yrs
- Overweight and obese females

for over weight BMI : 25.0 -29.9

for obese BMI : obese class 1 : 30.0 -34.9 ( moderate )

obese class 2 : 35.0 -39.9 ( severe )

obese class 3 :  $\geq 40.0$  ( very severe )

Exclusion criteria:

- Male subjects
- traumatic / surgical knee record
- Any congenital hip knee & ankle deformity
- Any cognitive or psychological impairment
- Subject refuses to participate

#### **Equipments required:**

1. Informed consent
2. Pen
3. Paper
4. Goniometer
5. Weighing machine
6. Ruler
7. Marker
8. Measuring tape

**PROCEDURE :** To conduct the following study permission is taken from Dr.Ulhas Patil College of physiotherapy Jalgaon. Ethical clearance was obtained from institutional ethical committee subjects were screened according to the inclusion and exclusion criteria. The informed consent was obtained from selected participants and procedure was explained

- Initially, the demographic data that is , name ,age weight & height of the subject was assessed and BMI was calculated Then Q angle ,ICD & IMD measurements were taken in standing position of right & left side.
- The 153 subjects are selected using simple random sampling technique from Dr. Ulhas Patil College of Physiotherapy Jalgaon between age 21-50 years

#### **Measurement of Q angle**

- The Q angle is defined as angle between quadriceps muscle and patellar tendon and represents the angle of quadriceps muscle force .
- Normally Q angle is  $13^\circ$  for males and  $18^\circ$  for females.
- Procedure was explained , data was collected and consent was taken from each subject .
- Q angle was measured using universal goniometer.
- Subjects were asked to be in standing position. With hip & knees in full extension. Anterior superior iliac spine (ASIS) , mid of patella and tibial tubercle were determined

- Skin marker was used to mark dots over anterior superior iliac spine (ASIS), mid of patella , tibial tubercle.
- Then line was drawn using marker and ruler from anterior superior iliac spine (ASIS)to mid of patella on the same side and from tibial tubercle to mid of patella . The angle formed by crossing this 2 lines is **Q ANGLE**.
- Furthur centre of goniometer was placed on mid of patella with proximal arm shifted on anterior superior iliac spine (ASIS) and distal arm over centre of tibial tubercle

#### Measurement of intercondyler distance (ICD) :

- Intercondyler distance is the distance measured between 2 medial epicondyles of femur
- Intercondyler distance should be  $\leq 1\text{cm}$
- Subjects were asked to be in standing position with hip and knees in full extension , neutral rotation, and legs close together so that knees and ankles touch each other
- Medial femoral condyles were determined and distance between the skin over medial epicondyles were measured with measuring tape

#### Measurement of intermalleolar distance (IMD):

- Intermalleolar distance is the distance measured between 2 medial malleolus of tibia .
- Intermalleolar distance should be  $\leq 5\text{cm}$ .
- neutral rotation, and legs close together so that knees and ankles touch each other .
- Medial malleolus were determined and distance between the skin over medial malleolus were measured with measuring tape .

#### DATA ANALYSIS :

##### Stastical method used :-

- Entire data of study was entered cleaned in MS excel before it was stastically analyzed.
- All the results are shown in tabular as well as graphical format to visualized stastically significant difference more clearly .
- The collected data i.e is Q angle,ICD ,& IMD is quantitative in nature .
- The stastical significance difference of mean values between groups ( i.e is age group 21-35yrs & 36 -50 yrs) was tested using unpaired t- test to rule out differences and maintain uniformity between both groups .
- The stastical significance of correleation between BMI & q angle (right & left side), BMI and ICD & BMI and IMD of each group is carried out using karl pearsons correleation coefficient test . The p value **less than 0.05** are considered stastically significant .

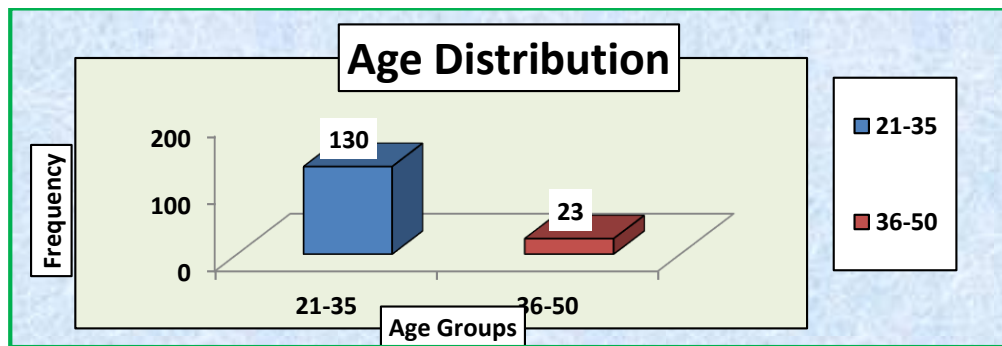
#### OBSERVATIONS AND TABLES :

**TABLE 1: The agewise distribution of subjects studied between two study group:**

Variable	Groups	Frequency	Percentage
Age (in years)	21-35	130	84.97
	36-50	23	15.03

In both study groups 130 subjects were between 21-35 yrs of age and 23 subjects were between 36-50 yrs of age

**Graph 1 : The age wise distribution of subjects studied between two study groups :**



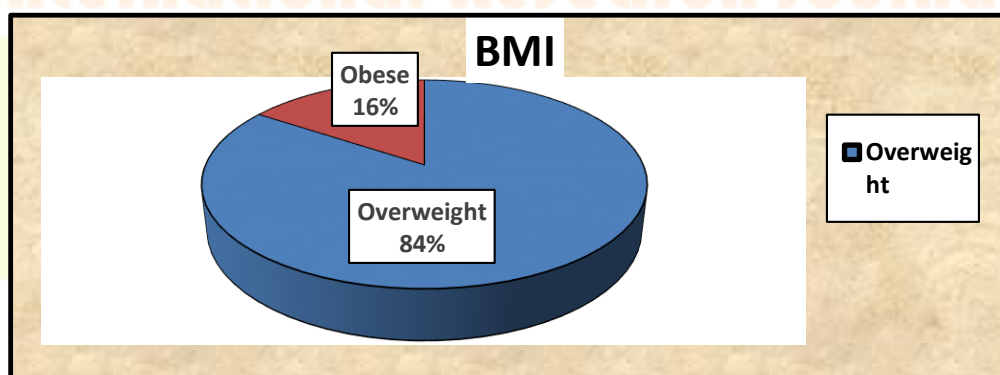
Bar graph shows 130 subjects between age 21-35 yrs of age and 23 subjects between 36 -50 yrs of age.

**Table 2 : Body mass index of overweight and obese females :**

Variable	Groups	Frequency	Percentage
BMI	Overweight	129	84.31
	Obese	24	15.69

Out of 153 subjects 129 ( **84.31%**) subjects are overweight and 24 ( **15.69%**) are obese .

**Graph 2 : BMI grade distribution :**



Pie daigram shows **84 %** subjects are overweight and **16%** subjects are obese

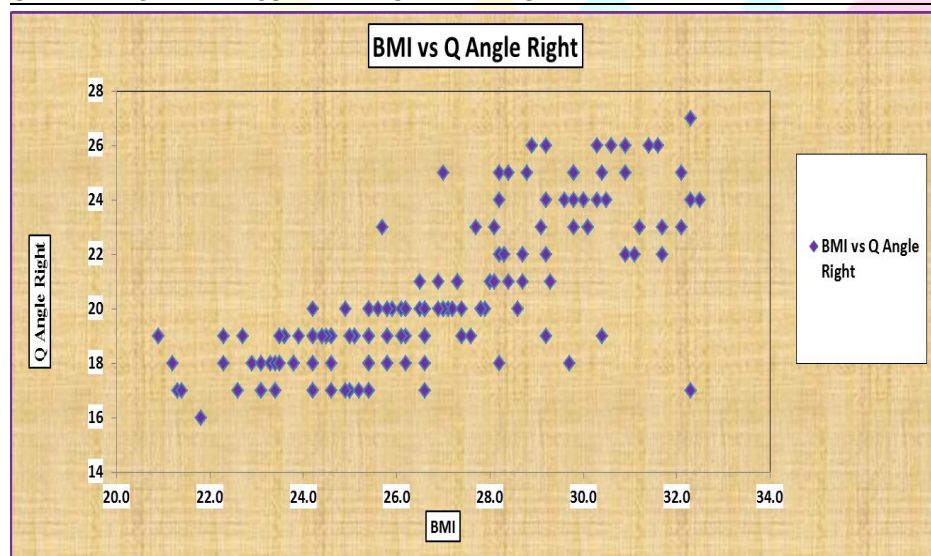
Parameter		Age 21-35		Age 36-50	
		Frequency	Percentage	Frequency	Percentage
Q angle Right	Normal	109	71.24	8	5.23
	Deformilty	21	13.73	15	9.80
Q angle Left	Normal	113	73.86	9	5.88
	Deformilty	17	11.11	14	9.15
IC	Normal	81	52.94	3	1.96
	Deformilty	49	32.03	20	13.07
IM	Normal	88	57.52	3	1.96
	Deformilty	42	27.45	20	13.07

**TABLE 4 : CORRELEATION OF BMI WITH Q ANGLE OF RIGHT SIDE**

r value	p value
0.77	0.00

- a) p-value and 'r'– correlation coefficient are obtained using karl pearsons correlation coefficient
- b) p value <0.05 is considered to be statistically significant.

**GRAPH 3 : CORRELEATION OF BMI WITH Q ANGLE OF RIGHT SIDE**



- a) There were fairly high degree of positive correlation (r= 0.77) found between BMI and Qangle of right side
- b) This means BMI increases Q angle also increases.

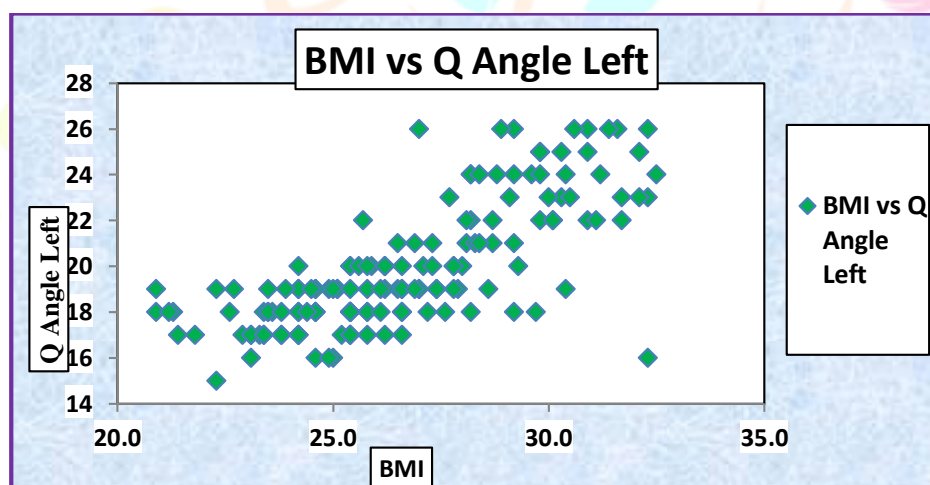


**TABLE 5 : CORRELEATION OF BMI WITH Q ANGLE OF LEFT SIDE**

r value	p value
0.76	0.00

- a) p-value and 'r'– correlation coefficient are obtained using karl pearsons correleation coefficient .
- b) p value <0.05 is considered to be statistically significant.

**GRAPH 4 : CORRELEATION OF BMI WITH Q ANGLE OF LEFT SIDE**



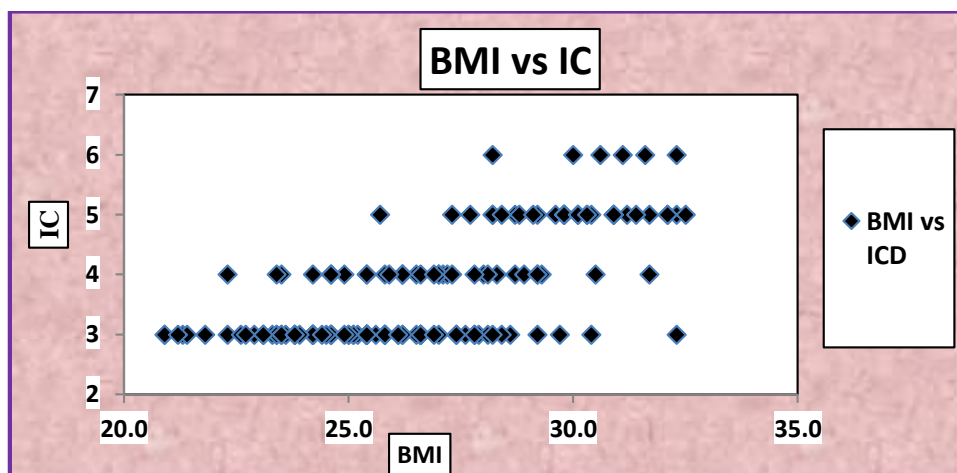
- a) There were fairly high degree of positive correlation (r= 0.76) found between BMI and Q angle of left side
- b) This means BMI increases Q angle also increases.

**TABLE 6 : CORELEATION OF BMI WITH ICD**

r value	p value
0.69	0.00

- a) p-value and 'r'– correlation coefficient are obtained using karl pearsons correleation coefficient .
- b) p value <0.05 is considered to be statistically significant.

**GRAPH 5 : CORELEATION OF BMI WITH ICD**

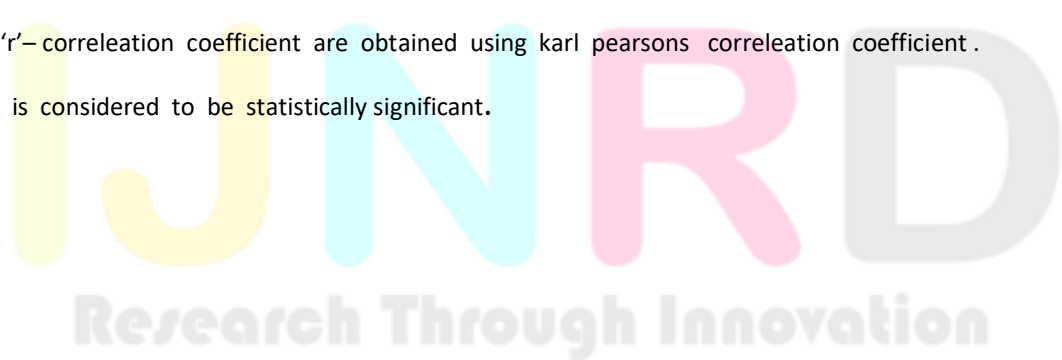


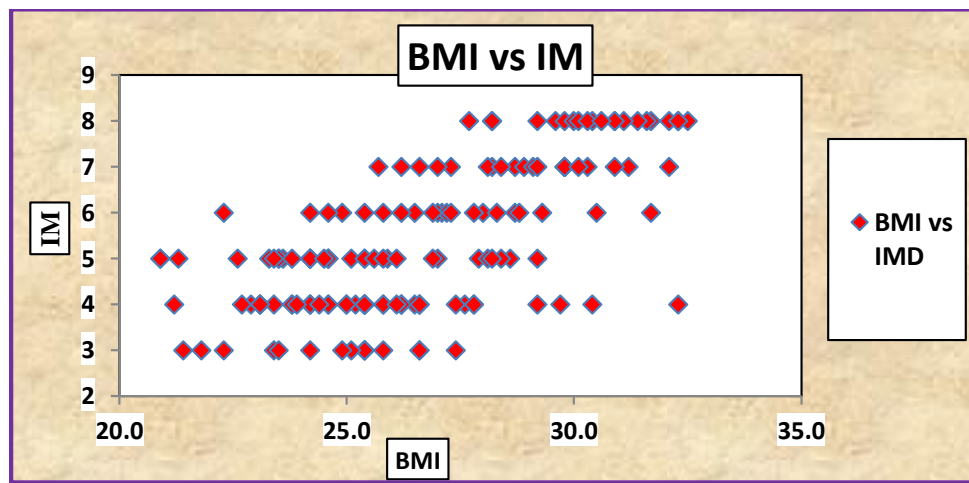
There were moderate positive correlation ( $r=0.69$ ) between BMI and ICD

**TABLE 7 : CORELEATION OF BMI WITH IMD**

r value	p value
0.66	0.00

- a) p-value and 'r'– correlation coefficient are obtained using karl pearsons correlation coefficient .
- b) p value <0.05 is considered to be statistically significant.



**GRAPH 6 : CORELEATION OF BMI WITH IMD**

There were moderate positive correlation ( $r=0.66$ ) between BMI and IMD

**TABLE 8 : COMPARISON OF MEAN DIFFERENCE BETWEEN AGE GROUP 21-35 YRS AND 36-50 YRS OF OVERWEIGHT & OBESE FEMALES**

Variable	Age 21-35	Age 36-50	t value	p value
	Mean $\pm$ SD	Mean $\pm$ SD		
BMI	26.02 $\pm$ 2.43	30.43 $\pm$ 1.55	11.4	0.00
Q Angle Right	19.76 $\pm$ 2.30	23.30 $\pm$ 2.70	5.92	0.00
Q Angle Left	19.38 $\pm$ 2.39	22.87 $\pm$ 2.69	5.83	0.00
IC	3.53 $\pm$ 0.77	4.78 $\pm$ 0.90	6.22	0.00
IM	5.03 $\pm$ 1.45	6.96 $\pm$ 1.30	6.45	0.00

p value less than 0.05, shows the significant difference in the average

**DISCUSSION :**

- The aim of the study was to find the lower limb postural changes in overweight and obese females . Obesity is affecting 300 million people in the world .it is also associated with postural changes .due to obesity musculoskeletal system is impril by many factors including daily habbits , occupation , culture and enviornment .the main purpose of study was to asses the relationship between BMI with knee postural changes in females with different age group. Infact our goal was to evaluate occurance of knee postural changes in overweight & obesity has significant coreleation with age group. In this study , total 153 females of age group 21-50yrs had participated .These participants were evaluated as per data collection sheet which include demographic data and measurement of Q angle by goniometer ICD & IMD by measuring tape . all the measurments were initially measured in standing position in knee extension . What we clearly found in this study was significant & strong correlation between postural changes in lower limb that is knee with BMI . In regards females with higher age group 36-50 yrs in our study has has higher incidence of knee angular changes as compare to females with age group of 21 -35 yrs .on the other hand obese females have significant changes in Q angle and ICD & IMD . Whereas as overweight females have minor changes in Q angle ,ICD and IMD . Therefore overweight females are prone to knee angular changes in future with increase in

age and BMI Interesting point in our study was that relationship between knee angular changes and BMI can be predicted even in adulthood and among higher age group .

- Offcourse it should be borne in mind that metabolic disorders ,especcially obesity are strongly influenced by growth process , base metabolism of individuals as well as hormonal changes . Therefore correleation between knee angular changes and BMI should be evaluated in different age groups older age , womens with or without fertility , sexual maturity , and other perplex factors such as hormonal medications underlying disorders releated to obesity .
- VARIABLE 1 -- Comparision of mean difference between age group 21-35yrs and 35-50 yrs of overweight and obese females
- mean BMI of age 21 to 35 yrs is  $26.02 \pm 2.43$  and age 36 to 50 yrs is  $30.43 \pm 1.55$  the test stastical value of unpaired t-test is 11.4 with p value 0.000.
- whereas Q angle of right side of age 21 to 35 yrs is  $19.76 \pm 2.30$  and age 36-50 yrs is  $23.30 \pm 2.70$  the test stastical value of unpaired t-test 5.92 with p value 0.000.
- Q angle of left side of age 21-35 yrs  $19.38 \pm 2.39$  and age 36-50 yrs  $22.87 \pm 2.69$  the test stastical value of unpaired t-test is 5.83 with p value 0.000 .
- ICD of age 21-35yrs  $3.53 \pm 0.77$  and age 36-50 yrs is  $4.78 \pm 0.90$  the test stastical value of unpaired t-test 6.22 with p value 0.000
- IMD of age 21-35yrs  $5.03 \pm 1.45$  and of age 36-50yrs  $6.96 \pm 1.30$  the test stastical value of unpaired t –test 6.45 with p value 0.000
- The p value less than 0.05, shows significant difference between age group 21-35 yrs & 35-50 yrs
- Our study result is in accordance with the study conducted by Bout tabaku ,Justin shelts (2015) in journal of rheumatology (2015) obesity is associated with greater valgus knee alignment in pubertal girls and higher BMI is associated with greater variability of knee alignment in girls . They found that there is significantly greater variability in knee alignment among females with higher BMI and greater valgus alignment in obese adolescents in late puberty.
- Our study result is in accordance with the study conducted by Noam Shohat, yossy machluf (2008) Conducted study clinical knee alignment among Adolescents an association with BMI a large prevalence study. 47,588 candidates for military service presenting to northern recruitment Centre during 11 year period was analysed between age group 16-18 years to identify clinical knee alignment based on standing skin surface ICD & IMD were measured with measuring Tape .The study Concluded that genu varum was prevalent among male subjects than females. and are also prevalent among under weight. And genu valgum was significantly more prevalent in Females than males and was also prevalent among obese and overweight subject.Int.J.Sports sci(2018).
- Obesity can occur at any age but as age increases hormonal changes and less active lifestyle increase risk to obesity .
- In females estrogen plays major role in fat distribution hence, gynoid pattern of obesity is mostly there . The pattern is mostly characterized by excess fat accumulation around hip ,thighs & buttock region owing to larger hips than abdomen and waist which transfer more weight on knee joint

## CONCLUSION :

our study concludes that there was significant difference between BMI with Q angle & IMD values which means there is high prevalence of getting knee deformalities in obese females specially in higher age group i.e. in our study is 36-50 yrs . also it was found that there was inverse correlation between BMI with knee deformalities (i.e.knock knees ) and no correlation with bow legs

### Limitations

1. The study is done only in females .
2. The study is done in small geographical area.

3. The study is done on asymptomatic subjects .

• **Suggestions**

1. study can be done on large sample size
2. radiographic images can also be used for measurements of Q angle ICD & IMD

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