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Variation of Q'Angle in Multiparous Pregnant Females: An Observational Cross-Sectional Study

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ABSTRACT

The growth and development of fetus in uterus of mother is called pregnancy. In gestational period the ligamentous, musculotendinous and postural changes occur **Objective:** To determine the variation of Q angle in multiparous pregnant females **Methods:** Multiparous pregnant females were included in this study that was not diagnosed with any knee joint complication like any fracture, OA, RA, genu valgum, recurvatum and arthroplasty of knee joint. A semi-structured proforma was used that consist of demographic data and Q angle values. Q angle was measured by using standard goniometer in standing position, BMI of females were calculated by taking height in cm and weight in kg. **Results:** The valid value of Q angle is 15º-20º (normal) and >20º (abnormal), 317 multiparous pregnant females were included in this study participants were divided into two age groups 1st (20-30Years),2nd (31-40Years) out of 26.5% having bilateral normal Q angle and 73.5% bilateral abnormal Q angle. By applying chi-square test positive association found between age group of participants with significant p-value<0.001 association found with bilateral abnormal Q angle value by BMI with significant p-value<0.001. **Conclusion:** According to this study we concluded that bilateral Q angle was significantly abnormal in multiparous pregnant females. By age group, participants in age group 2 having noteworthy abnormal Q angle as per BMI, participants in overweight category having abnormal Q angle value.

INTRODUCTION

The growth and development of fetus in uterus of mother is called pregnancy. In gestational period the ligamentous, musculotendinous and postural changes occur [1]. Multiparous pregnant females are those who have one or more children. Multiparous pregnant females are with greater risk of developing musculoskeletal complications [2]. Multiparous ladies were at greater risk to develop MSK issues other than nulliparous[3]. All these musculoskeletal changes are due to release of hormone relaxing, progesterone and estrogen. The adaptation and remodeling of collagen in knee and body joints is due to increment of relaxing and estrogen hormone. Physiological pressure increases on the muscular system of the body due to alteration in biomechanics of joint as well as joint laxity [3-4]. As per weight gain the contact pressure on hips and knee joint increases which are leading cause to develop hip and knee joint complications5. Multiparous pregnant females are at greater risk of fall due to changes in posture and gait as compared to nulliparous [4]. Danger of fall increases during walk because during gestational period the alteration occur in step length and also width these changes come due to increased pelvic width and anterior pelvic tilt [5]. The knee joint proprioception decreases especially in multiparous ladies. For maintaining normal posture, equilibrium and movements of limbs proprioception is important [1]. Q angle or quadricep's angle is the angle that is used to measure the tension of quadricep's muscles between two structures patellar ligament and quadricep's tendon. Q angle is widely used assessment protocol in clinical setups for the evaluation of patella femoral pain syndrome [6-7]. One study determined that the normal value of Q angle is in between 15º-20º [8]. Different researches have shown that, the changes in multiparous females that takes place during pregnancy

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these postural alterations and many other changes can lead to knee joint dysfunction. But there is no literature on specifically Q angle variation in multiparous females. By finding Q angle variation in multiparous females, it would be beneficial for gynecologist and physiotherapist to manage the females gait related issues and prevent them from further knee joint complications.

METHODS

Study was completed within 6 months from 22nd August 2020 to 22nd February 2021. It is an observational cross-sectional study. Data was collected by non-probability judgmental sampling technique from gynecological department of DHQ hospitals Mandi Baha-ud-Din, Aziz Bhati and Rehmat hospital Gujrat. After taking written consent from 317 multiparous pregnant females a semi-structure proforma was used that consist of demographic data as well as the altered value of Q angle. The participants selected those were not diagnosed with any knee joint complication like any fracture, genu valgum, recurvatum, external tibial torsion, OA, RA and arthroplasty of knee joint. Standard goniometer was used to find out the values of Q angle. The interrater reliability of goniometer for Q angle measurement is 0.91-0.92[9]. The test was conducted in standing position. The normal values of Q angle in females are 15-20º. For the assessment of Q angle, first maintain anatomical position of patient with the extension of both hip and knee, while quadriceps muscles are in relaxed state. Now start with placement of goniometer over the mid-point of patella. Palpate all the bony landmarks carefully. Now place the resting arm of goniometer along the patellar tendon to tibial tubercle. Place the moving arm of the goniometer toward the anterior superior iliac spine (ASIS). There is very small angle noted on the goniometer that is Q angle. The data was analyzed using statistical software Statistical Package for Social Sciences (SPSS) version 21.0. Numerical data was described in mean and standard deviation (SD). Frequencies and percentages were used to display the qualitative data. Chi square test was applied to access the relationship between variables-values ≤ 0.05 was considered as significant value. All results were calculated at 95% confidence level.

RESULTS

Our results show that the variation of Q angle in multiparous pregnant females, out of 317 participants 73.5% were bilateral abnormal Q angle value and 26.5% were bilateral normal Q angle value (Table 1, Figure 1).

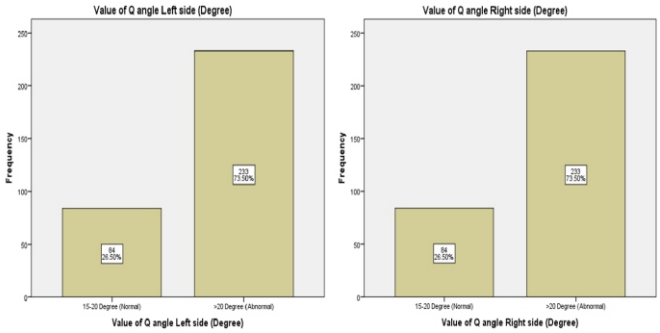

Figure 1: Frequency of right and left side Q angle values

Table 1: variables of participants and mean median

Variables		n%
BMI	<18.5 Underweight	9(2.8)
	18.5-24.9 Normal	114(36.0
	25-29.9 Overweight	137(43.2
	>30 Obese	57(18.0
Age Group	20-30 Years	149(47)
	31-40 Years	168(53)
Total		317(100

Table 2: Frequency distribution of participants by BMI, and Age group of participants

Variables		Chi-Square	Df	p-value	Correlation(R)
By BMI	Left side Q angle	60.3	3	<0.001	.32
	Right side Q angle	60.3	3	<0.001	.32
By Age group	Left side Q angle	32.9	1	<0.001	.33
	Right side Q angle	32.9	1	<0.001	.33

Table 3: Association with BMI and Age group of participants by Chi-Square Test

Percentages of right and left sided Q angle value by BMI of participants: According to results right side Q angle 17.67% (56) participants in normal BMI category having normal Q angle values and 58(18.30%) abnormal high Q angle value, as those where over weight categories 5.05% (16) having good normal Q angle and 38.17% (121) abnormally high Q angle, participant with obese BMI where 6 (1.89%) normal Q angle and 51(16.09%) abnormally high Q angle values (Table 2). Q angle value in left side participants with BMI normal were 17.67% normal Q angle and 18.30% abnormally high Q angle, those with BMI overweight 5.05% normal and 38.17% abnormal high Q angle value (Table 3). Percentages of right and left side Q angle by Age Group of participants: On right side 19.56% participants were in age group 1 having normal Q angle and 27.44% having abnormal high Q angle and participants in age group 2, 6.94% with normal Q angle and 46.06% abnormally high Q angle value. On left side the

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participants in age group 1 were 19.56% (62) with normal Q angle and 87(27.44%) with abnormal high Q angle values, participants in age group 2 were 6.94% (22) having normal Q angle and 148(48.08%) with abnormally high Q angle values (Table 3).

DISCUSSION

One study was carried out by Dr. Deepa Abichandani et al, in India on the title of knee joint proprioception during three trimesters of pregnancy. She concluded that there is decrease in knee joint position sense over three trimesters of pregnancy. Due to this reason the females with multiparous pregnancy and in third trimester the fall risk increases by 65% [1]. There is weight gain during pregnancy which can double the force across the hip and knee joint. Due to this weight gain many postural changes occur these changes include hyperextension of knee, anterior pelvic tilt, and flat foot these changes can alter the knee joint biomechanics [10]. Women continue to use their gait pattern which was acquired during pregnancy, Multiparous females may adopt the abnormal posture to prevent themselves from risk of fall, knee pain [11]. Previous literature does not give the clear picture about relationship of Q angle variations in those females with multiparous pregnancies. Current study will help to determine the variations of Q angle in females with multiparous pregnancies so there will be greater chance to manage the gait related issues, eliminate the risk of fall and also prevent them from patellofemoral joint complications. According to Sakshi Pradeep shah et al, and his colleagues in 2020 supervised this study. They concluded that 21 participants with multiparous pregnancies having altered Q angle (>20°) out of 66 participants. And knee joint dysfunction prevalence range about 29% in females with multiparous pregnancies [12]. Similar results were shown in our study age group 1, 149 (47%) and in age group 2, 68(53%) participants were included. As per the both age groups we found that in age group one 87(27.44%) participants having bilateral abnormal high Q angle (>20°) and only 62(19.56%) having normal Q angle (15-20°). In age group two after statistical analysis, we found that 146(46.06%) multiparous females have bilateral abnormal high Q angle (>20°) values and only 6.94% good normal Q angle values. As per the results we concluded that the participants in age group two (31-40Years) having more than 3 children were more prone to high abnormal Q angle values with mean range 50% having (> 22°) and 75% having (>24°). By BMI category 137 (43.22%) fall in overweight having abnormal Q angle. And those with obese BMI also have abnormal high Q angle with mean range 75% having (>24°). Association of right and left side Q angle by chi-square test is found to be 233(73%) having bilateral abnormalQ angle values (>20°). Sport Sciences, Selcuk University, Konya, Turkey administered this study on the title of sport and exercise among men and women in Q angle. While in standing position the overall change in Q angle in gents and ladies were 17.05° and in gents was 14.04° correspondingly. The overall change in both genders was (P<0.001). Author revealed that the angle value in right limb is more than 17° in gents and more than 20° in ladies [13]. Walking speed, hip angle, and pelvic tilt in gait altered during pregnancy and then returned to values similar to those before pregnancy by 12 to 16 weeks postpartum. Ankle dorsiflexion decreased in complete steps of gait during pregnancy and the decrease in ankle dorsiflexion persisted postpartum [14]. Male subject the Q-angles were 12.92 + 1.320 and 12.27 + 1.480 for the right and left lower limb, while the female Q-angle was 16.93 + 1.350 and 16.30 + 1.200 for the right and left limb respectively. Further analysis reveals that the right Q-angle is higher than the left (P < 0.05) for both gender with the female being slightly higher than the male (P < 0.05)[15].Around noteworthy changes in the standing place with abducted feet and equivalent to the left leg, and balance between the lower limbs autonomous of rotation of limbs in the supine posture[16]. the regular dimension of anterior tibial translation in pregnant female subjects presented a statistically noteworthy increase in slackness in the third trimester of pregnancy associated with the postpartum period. The upsurge in anterior cruciate ligament slackness seen in the third trimester of gestation as compared with that in the post-delivery period correlates with improved serum estradiol levels [17]. Soreness at rest necessity be given to better attention in pregnant females, and their growing lumbar kyphosis must be responded. Training the deep segmental muscles may assist as a preventive measure [18]. There was a important chief effect of group representative a larger knee flexion angle at toe off (p = 0.060), smaller knee extension moment at heel strike (p = 0.0006), smaller first peak knee flexion moment (p = 0.040), and smaller peak hip adduction moment for the parous group compared to the nulliparous group (p = 0.003).[19]There was no meaningful alteration between 6 ~ 8 weeks and 12 ~ 14 weeks after delivery groups (P0.05).There was significant difference between 6 ~ 8 weeks and 12 ~ 14 weeks after delivery group while compared the bladder neck angle [(88.11±13.36)° vs. (82.17±10.28)°] with the bladder neck rotation angle[(21.67±10.64)° vs.(16.79 ±8.57)°].Conclusions: Pregnancy and delivery can damage the function of pelvic floor, which has certain rehabilitation after delivery[20].Through our study suggestion initiate between bilateral abnormal Q angle values by age group of participants, chi square test it was found (32.98), degree of

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freedom[1] with significant p-value <0.001 and strength of this correlation. A positive association found between bilateral abnormal Q angle values according to BMI of participants, Chi-square square test value (60.3), degree of freedom (3), with significant p-value <0.001 and strength of this correlation.

CONCLUSION

Bilateral Q angle variation with abnormal high values found in multiparous pregnant females. Positive association with age group of participants with abnormal Q angle in age group 2, and by BMI significant abnormal Q angle was found in participants those in overweight and obese category.

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