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An analysis of Q angle with respect to various body parameters in athletes

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Abstract

The Q-angle is defined as the acute angle formed by the vectors for combined pull of the quadriceps femoris muscle and the patellar tendon. This angle helps indicating the force vector acting on the patella and patellofemoral joint and improve their individual performance by suitable workout. The present study aimed at analyze the Q angle with respect to various body parameters in athletes of Dakshina kannada district of Karnataka state. For the collection of required data 50 male and female athletes were selected respectively. Selected subjects were participated in State, National, Inter university competition since last 5 years. The Q angle was measured using a full circle universal manual goniometer made of clear plastic in the erect weight-bearing position with the subject standing. The collected data was analyzed by using mean, standard deviation z value and represented the data with the help of suitable graphs and tables.

Keywords: Q angle, athletes, Dakshina Kannda, body parameters etc.

Introduction

The Q-angle is defined as the acute angle formed by the vectors for combined pull of the quadriceps femoris muscle and the patellar tendon. It can also be stated as a composite measure of pelvic position, hip rotation, tibial rotation, patella position and foot position. When measured with the knee in extension in the frontal plane, it provides a reasonable estimate of the resultant force vector between the quadriceps muscle group and the patellar tendon. The knee joint is one of the major weight bearing joints. It is most commonly injured, contributing to 50% of all Muscular-skeletal injuries. Quadriceps femoris muscle angle (QFM) was first described by Brattstrom in 1964. Anh-Dung says, a change in any one of these alignment could change the position of one or more land marks used to measure the Angle. Contraction of QFM pulls the patella laterally. To assess the lateral line of pull of QFM relative to patella, Q- angle is a meaningful clinical measure. It also provides clear information about the alignment of knee joint. If Q- angle exceeds the normal, the force of the lateral pull will increase. Insall *et al.* suggested that an increased Q- angle is indicative of pathological lateral forces on the patella. Thus it is considered as an important index of patello-femoral function and dysfunction. It is a risk factor for patello-femoral pain, patellar subluxation and dislocation. Many researchers found that women do have a greater Q- angle than men, may be due to their broader pelvis and shorter femur. Therefore they can be considered to have greater risk for patello-femoraldys function (PFD). Conventional methods of finding Q- angle is by measuring the acute angle formed by the intersection of two lines, one drawn from anterior superior iliac spine (ASIS) to centre of patella (CP) and another from CP to tibial tuberosity (TT). Subject can be in supine or standing position with QFM relaxed. Many studies done worldwide expressed that normal value of Q- angle varies with given population.

Importance of Q angle

- This angle helps to athlete, improve their individual performance by suitable workout.
- Assessing the Q angle is cited by several studies involving biomechanics, clinics and knee surgery about the athletes.
- This angle helps indicating the force vector acting on the patella and patellofemoral joint.
- It is used as a criterion to identify candidates for surgery or as predictor of risk of injury.

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Delimitation of the study

1. The study is delimited to the athletes of Dakshina Kannada district only.
2. The study is delimited those who have practicing athletics since last 5 years.
3. This study delimited to subject age range between 18-25 years.
4. This study restricted to track event Athletes only.
5. This study is restricted to athletes who represented state, national and Inter university competition in track event.

Limitation of the study

1. Non - availability of some very sophisticated instruments was also considered as a limitation of this study
2. The training and coaching style of coaches of various specialties is different, that might have an influence on the athletes may be considered as another limitation of the study.

Methodology

Selection of subjects

For the collection of required data, 50 male and female athletes were selected respectively. Selected subjects were participated in State, National, Inter university competition since last 5 years.

Administration of test procedure

Measurement procedures were performed after securing

approval from the respected authority. Before embarking on the measurements an appropriate written consent report was distributed. Furthermore, a brief description of the procedure was shown to familiarize the subjects after recording their age, gender, weight, height and dominant side on a specific paper sheet of investigation. The Q angle was measured using a full circle universal manual goniometer made of clear plastic in the erect weight-bearing position with the subject standing. It replaced and determined the anterior superior iliac spine (ASIS), the patella midpoint, and tibial tuberosity. The goniometer's hinge was placed at the patella's midpoint, the goniometer arms were adjusted to align themselves to the line joining the ASIS and the line joining the tibia tuberosity, and then the small angle on the goniometer was read as the Q angle.

Statistical analysis

Suitable statistical tests will be used for testing the hypothesis set up. The obtained data was analyzed by z-test and calculating the mean and standard deviation. Then the attempt was presented in suitable tables and figures form. The data analyzed with the significance level of 0.05.

Analysis and interpretation of the data

This section will give the information of overall study. The collected data was analyzed by using mean, standard deviation and Z test. The data has been analysis and interpreted accordingly to the objective of the study.

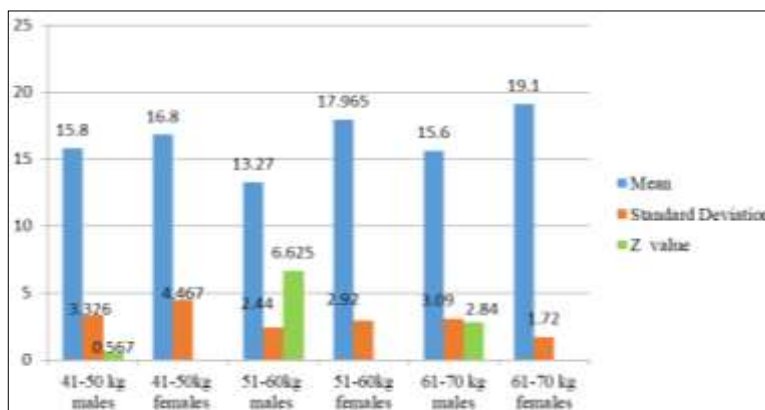


Fig 1: The below figure compare the Q angle of male and female athletes with respect to their body weight

The above figure no. 1 shows the Q angle according to subject's body weight. The body weight of the both male and female subjects categorized as 3 groups like 41-50 kg, 50-60 kg and 61-70 kg. The mean and standard deviation values male female is 15.8 and 3.32, 16.8 and 4.46, and 13.2, 2.44 and 17.96, 2.92 and 15.6, 3.09 and 19.1, 1.72 respectively.

The z value is 0.56 for 41-50 kg, 6.62 for 51-60kg and 2.84 for 61-70kg. It clear that there is significance deference in Q angle between male and female athletes. Female have greater Q angle than male when compared with respect of their body weight.

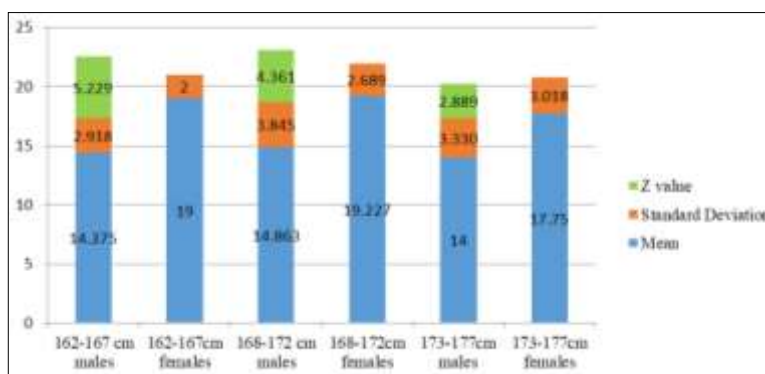


Fig 2: The below figure compare the Q angle of male and female athletes with respect to their height

In the above figure no 2 shows the Q angle according to subject's height. The height of the both male and female subjects categorized as 3 groups like 162-167 cm, 168-172 cm, and 173-177 cm. The mean value of male is 14.375,

14.8636, 14 and female mean value is 19, 19.2272, and 17.75. its indicates female have more Q angle and also the have notable correlation with their height.

Table 1: The comparison of mean, standard deviation and z value of Q angles between male and female athletes

	Mean	SD	Z test
Q angle of male athletes	14.22	3.339	5.017309584
Q angle of female athletes	17.58	3.356	

The above table shows the Q angle according to gender. Males are having 14.22 mean and 3.34 standard deviation and females are having 17.58 mean and 3.36 standard deviation. Z

value is 5.02.it clear that there are significant differences in Q angle between male and female.

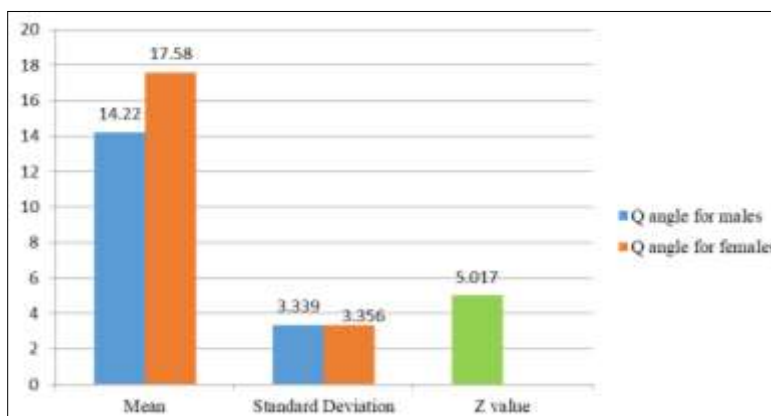


Fig 3: The below figure compare the Q angle between male and female athletes

The above figure represented comparison of Q angle between male and female. The Z value is 5.0173 it means female athletes have more Q angle than male athletes. The standard deviation indicates that the values tend to be close to the mean of the set.

Discussion hypothesis

According their gender both category showing different Q angles. There is significance deference between male and female athletes in all selected parameters. The Q angle have notable correlation with selected subject body weight and height.

After analysis the data with significance level of 0.05, the study conclude that there is significance difference in the Q angles in male and female Athletes, hence formulated null hypothesis (H_0) is rejected.

Summary and Conclusion

The present study provides new findings about the Q angle and its relation to several body parameters in athletes of Dakshina Kannada district. According to Swati Paranjape *et al.*, (2019) Measuring the Q angle is concerned with assessing the knee functions during daily activities and sports participation, therefore assessing this important measurement not only in supine but also in a weight-bearing functional position in clinical setups would be helpful.

Ramada Khasawneh *et al.*, (2019) ^[15] find that, Q angle was greater in young women than young men. Also, the analysis of the data revealed an insignificant increase in the dominant side of the Q angle. In addition, the Q angle was significantly higher in the taller people of both sexes.

Conclusion

After analysing the collect data following conclusions were drawn:

- According their gender both category showing different Q angles.
- There is significance deference between male and female athletes in all selected parameters. The Q angles have notable correlation with selected subject's body weight.
- The result of the study conclude that there is significance difference in the Q angles of male and female, hence formulated null hypothesis (H_0) is rejected.

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