Journal of Sport Medicine and Physiotherapy
1(1); 40-45 (2025) E-ISSN:

Journal of Sport Medicine and Physiotherapy (JSMP) Open Access

Relationship of Q-Angle With Walking Speed in Knee Osteoarthritis Patients

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Submitted : 28 June 2025
Accepted : 30 June 2025
Published : 30 June 2025

Abstract

Background: Knee Osteoarthritis is one of the biggest health problems in the world because knee Osteoarthritis is a degenerative disease whose condition severity usually increases with age. Patients with osteoarthritis of the knee often complain of various symptoms, especially pain, which can interfere with their functional activities, including walking. With age, the severity of the condition increases, potentially leading to alignment abnormalities in the knee. Alignment abnormalities occur due to changes in the Q-angle from the normal position. An increase in Q-angle occurs with malalignment, which will cause functional abnormalities and can result in subluxation of the patella and trigger various complaints in the knee.
Objectives: In patients with Knee Osteoarthritis patients often complain of a variety of complaints especially pain that disrupts the functional activity of patients including the ability of the patient to walk, as the age increases the severity of the condition that the possibility of Q-angle changes will occur malalignment that will cause abnormalities of function and trigger the emergence of various complaint on the knee.
Methods: The research method used in this study is a correlative descriptive method. The study was conducted over three days with respondents of 38 patients diagnosed with knee osteoarthritis between the ages of 40-70 years in the ambulatory care Husada Utama Hospital Surabaya. A large measurement of the Q-Angle angle and the speed of walking using 10mFPWT
Results: After measurement and statistical test using chi-square test has obtained P value of 0,000. which is value less than 0.05.
Conclusion: There's a relationship" between large Q-angle and speed walking in patients with knee osteoarthritis.

Keywords: Q-Angle, Alignment , Knee Osteoarthritis.

INTRODUCTION

Knee Osteoarthritis is one of the biggest health problems in the world because knee Osteoarthritis is a degenerative disease whose condition severity usually increases with age (Wang, 2020). Patients with osteoarthritis of the knee often complain of various symptoms, especially pain, which can interfere with their functional activities, including walking. With age, the severity of the condition increases, potentially leading to alignment abnormalities in the knee. Alignment abnormalities occur due to changes in the Q-angle from the normal position. An increase in Q-angle occurs with malalignment, which will cause functional abnormalities and can result in subluxation of the patella and trigger various complaints in the knee (Juriansari, 2020). Q Angle. When there is dynamic movement, there will be pathological changes in patients with instability in the patellofemoral joint than in healthy people, it can be concluded that dynamic Q-angle is positively correlated with higher femoral torque (Imhoff, 2020).

METHODS

Study Design and Participants

The research method used in this study is a descriptive correlational method. Researchers in this study measured the Q-Angle angle, which will then obtain the Q-Angle value in patients with knee osteoarthritis, and will be continued by measuring functional walking speed using the 10-meter fast-paced walk test (10mFPWT). Then analyze the relationship between the value of the Q-Angle and walking speed in the elderly with knee Osteoarthritis.

Respondents were patients with a history of knee Osteoarthritis at Husada Utama Surabaya Hospital, as many as 38 people aged 40-70 years. The sampling technique in this study was carried out using a purposive sampling technique. With the criteria of BMI value> 25, pain value with Visual Analogue Scale (VAS) between 1-3, with a record of respondents not wearing aids when walking, having no history of other injuries to the lower limbs, no sensory disturbances, and no history of cardiac and respiratory disorders.

Research Instruments

Q-Angle Measurement. The patient is in a supine sleeping position without any knee extension, and the physiotherapist draws a line from the Spina Iliac Anterior Superior (SIAS) towards the midline of the patella and continues by drawing a line from the midline of the patella towards the tuberosity of the tibia. Then the cut of the 2 lines is measured using a goniometer.

Measurement of walking speed using the 10 Meter Fast Paced Walk test (10mFPWT). Measurements are made by marking with cone points on a 10-meter-long walking path at the beginning and end of the path on a solid flat surface, then 2 cones are also placed at 2 meters and 8 meters. Then the patient is instructed to walk straight from one point to another quickly without running with the instruction "Walk quickly and safely, then stop at the finish line". The position of the examiner is behind the patient, but not to accelerate or obstruct the path. Time counting is done after the distance of the subject's feet reaches the 2-meter mark and ends when the distance of the subject's feet reaches the 8-meter mark. Scoring is obtained by dividing 6 meters by the total time required by the subject; the result is m/s. The subject may make 1 attempt to ensure the subject understands. The 10mFPWT itself is an alternative modification of the 40-meter fast-paced walk test (40mFPWT) recommended by OARSI. The 10mFPWT has a value of between rater reliability = 0.91 and within rater reliability = 0.88 (Dobson et al., 2017)

Data Analysis

The research is analytical research using inferential statistics. Interferential statistics is statistics that is used to collect parameters (population) based on statistics (samples) or better known as the process of generalization and inferential (Hidayat, 2009). In this study, researchers conducted measurements of the magnitude of the Q-angle and the assessment of the 10-meter fast-paced. The Walking Test and then the data analysis techniques will be carried out.

Data analysis of research variables, the distribution of age, gender, education, and occupation (Saryono & Anggraeni, 2013). A normality test is a test to see the distribution and distribution of the data. In this study, we will use the Shapiro-Wilk test because there are fewer than 50 data points, and the Kolmogorov-Smirnov test if there are more than 50 data

RESULTS

Respondents in this study totaled 38 people, with male respondents as many as 9 respondents (23.7%) and female respondents as many as 29 respondents (76.3%). The majority were in the young elderly age category (56 - 65 years), as many as 23 people (60.5%). Body Mass Index or BMI values in respondents were 3 people (7.9%) with underweight BMI values, 28 people (73.7%) with normal BMI values, and 7 people (18.4%) with overweight BMI values. The majority of Q angle is varus category as many as 36 people (94.7%).

Table 1. Respondent Characteristics Based on Research Variables

Characteristic	Frequency n = 38	Percentage
Age		
Pre Elderly (46 - 55 y.o.)	15	39.5%
Elderly (56 - 65 y.o.)	23	60.5%
Body Mass Index		
Underweight	3	7,9%
Normal	28	73,7%
Overweight	7	18,4%
Q-Angle		
Normal	2	5.3%
Varus	36	94.7%
Gait Speed		
Under Normal	33	86.8%
Normal	1	2.6%
Over Normal	4	10.5%

2 people with normal Q angle, all of them are with above normal walking speed and in a total of 36 people with Q angle varus, there are 33 people (91%) with below normal walking speed, 1 person (3%) with normal walking speed, and 2 people (6%). The results of statistical tests using chi-square obtained a p value of 0.000. which is smaller than 0.05, which means that there is a relationship between Q angle and walking speed.

Table 2. Relationship between Q-Angle Value and Walking Speed

Q-Angle	Kecepatan Berjalan						Total		*p value*
	Dibawah Normal		Normal		Diatas Normal				
	n	%	n	%	n	%	n	%	
Normal	0	0%	0	0%	2	100%	2	100%	0.000
Varus	33	91%	1	3%	2	6%	36	100%	
Total	33	87%	1	3%	4	11%	38	100%	

DISCUSSION

Limiting the BMI value of respondents is done to create homogeneity that will significantly affect the Q-Angle value. The higher the BMI, the higher the trunk mass and

abdominal fat. This causes an increase in lordosis in the lumbar spine so that the body's center of gravity shifts anteriorly. This condition causes an increase in anterior pelvic tilt which then causes a decrease in the angle of anteversion of the femur (Anwer et al, 2022)

Q-Angle measurements were carried out unilaterally because the respondents were patients with bilateral and unilateral knee osteoarthritis diagnoses. According to a Systematic Review study conducted by Rahul et al, 2023 stated that in some studies, researchers only recorded the value of a single Q-Angle angle, this was done with the assumption that there was no significant difference between the angles of the two legs or only measured the extremity that had problems. There is no adequate justification for this, regarding the Q-Angle data taken from a single limb or two limbs. Data is needed on the clarity and precision of the Q-Angle measurement itself as both ways would obscure the underlying variability of the data.

In the respondents taken the majority had a low Q-Angle which could be categorized as knee varus. Malalignment varus can be identified as a significant risk in cases of medial knee osteoarthritis. in the incidence of knee osteoarthritis, especially in the medial part, it often experiences greater internal compression of the joint, especially when walking (Marouane et al., 2020). The occurrence of varus or stretching of the lateral structures in the knee joint is due to an increase in external KAM and in line with the progressivity of Knee Osteoarthritis (Yuenyongviwat et al, 2020). So that no respondent's condition is worse than other respondents when assessed by the severity of the varus degree.

Knee Adduction Moment (KAM) which is the external torque of the knee in the frontal plane is considered a surrogate measure of loading in the medial plane. When the Knee Adduction Moment increases constantly, the passive resistance in the knee joint will also increase, and as a result during the stance phase will substantially reduce lateral hamstring work and increase medial hamstring work (Marouane.et al., 2020).

CONCLUSION

After taking and sorting data from the Q-Angle value and walking speed using 10mFPWT, it was found that there was a relationship between Q-Angle value and walking speed in knee osteoarthritis patients

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

AUTHOR'S CONTRIBUTION

Yahya contributed in preparing concept, supervising research and writing article, Maulana contributed in writing discussion and proofreading. Solikah contributed in statistical analysis.

FUNDING/SPONSORSHIP

This research does not receive external funding

References

Anwer, N., Manzoor, N., Kiran, *Q.*, Saleem, M., Fatima, S. A., & Rehan, A. (2022). *Quadriceps Femoral Angle (Q Angle) Variations in Knee Osteoarthritis Patients*. *16*(09), 627–629.

Imhoff, F. B., Cotic, M., Dyrna, F. G. E., Cote, M., Diermeier, T., Achtnich, A., Imhoff, A. B., & Beitzel, K. (2021). *Dynamic Q-angle is increased in patients with chronic patellofemoral instability and correlates positively with femoral torsion. Knee Surgery, Sports Traumatology, Arthroscopy, 29*(4), 1224–1231. https://doi.org/10.1007/s00167-020-06163-6

Juriansari, D., Naufal, A. F., & Widodo, A. (2020). Hubungan *Q-Angle* Terhadap Keluhan Osteoarthritis Pada Lansia. *FISIO MU: Physiotherapy Evidences*, *1*(2), 42–48. https://doi.org/10.23917/fisiomu.v1i2.10058

Kurniawan, H. M., Husni, A., & KSL, E. (2019). Hubungan Antara Body Mass Index dengan *Q Angle*: Studi pada Mahasiswa Fakultas Kedokteran Universitas Diponegoro. *Jurnal Kedokteran Diponegoro*, *8*(1), 222–232. http://ejournal3.undip.ac.id/index.php/medico ISSN

Marouane, H., & Shirazi-Adl, A. (2019). Sensitivity of medial-lateral load sharing to changes in adduction moments or *angle*s in an asymptomatic *knee* joint model during gait. *Gait and Posture*, *70*(February), 39–47. https://doi.org/10.1016/j.gaitpost.2019.02.006

Wang, C., Chan, P. P. K., Lam, B. M. F., Wang, S., Zhang, J. H., Chan, Z. Y. S., Chan, R. H. M., Ho, K. K. W., & Cheung, R. T. H. (2020). *Real-Time Estimation of Knee Adduction Moment for Gait Retraining in Patients with Knee Osteoarthritis. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 28*(4), 888–894. https://doi.org/10.1109/TNSRE.2020.2978537

Wang, Y., Zhang, K., Zeng, J., & Yan, S. (2020). 1 P re of. *Gait & Posture*. https://doi.org/10.1016/j.gaitpost.2020.10.024

Yamagata, M., Taniguchi, M., Tateuchi, H., Kobayashi, M., & Ichihashi, N. (2021). *The effects of knee pain on knee contact force and external knee adduction moment in patients with knee osteoarthritis. Journal of Biomechanics, 123*, 110538. https://doi.org/10.1016/j.jbiomech.2021.110538

Yuenyongviwat, V., Duangmanee, S., Iamthanaporn, K., Tuntarattanapong, P., & Hongnaparak, T. (2020). Effect of *hip* abductor strengthening exercises in *knee* osteoarthritis: A randomized controlled trial. *BMC Musculoskeletal Disorders*, *21*(1), 1–7. https://doi.org/10.1186/s12891-020-03316-z