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RESEARCH ARTICLE

De Quervain's tendinopathy and its relationship with grip strength, hand length, hand width, and carrying angle among health professionals

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ABSTRACT

Background: De Quervain's Tendinopathy (DQT) is the thickening of tendon sheaths on the abductor pollicis longus and extensor pollicis brevis along the radial styloid wrist, which leads to pain and difficulty in daily activities involving the thumb.

Objective: To determine the relationship between De Quervain's tendinopathy and grip strength, hand length, hand width, and carrying angle among health professionals.

Methods: This cross-sectional study (Ref. No IRB/2022/077) was conducted on 150 participants selected at Arif Memorial Hospital, Lahore. The Finkelstein test was used to diagnose De Quervain's tendinopathy. The data was collected using non-probability convenience sampling. The outcomes, carrying angle, grip strength, hand length, and width, were assessed with a goniometer, handheld dynamometer, and measuring tape. SPSS version 22 was used for data analysis. The correlations between carrying angle, grip strength, hand width, and hand length were described using Point biserial correlations.

Results: The results show the frequency of DQT was 33.33% among health professionals. The likelihood ratio showed a significant relationship between occupation and DQT, with a p-value of <0.05. Point biserial correlation revealed a negative relationship between carrying angle, grip strength, and De Quervain's tenosynovitis, but a positive relationship between Hand length, hand width, and De Quervain's tenosynovitis.

Conclusion: The study's findings, which reveal significant correlations between DQT and various anthropometric factors such as grip strength, hand length, hand width, and carrying angle. These physical characteristics may predispose individuals to DQT or influence their severity. This provides important information for making preventive and management strategies for DQT and enlightens the audience about the importance of this research.

Keywords: De Quervain's tendinopathy, grip strength, hand, health professional, wrist.

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Introduction:

De Quervain's tendinopathy (DQT), also called De Quervain's tenosynovitis, is a common musculoskeletal condition that causes tenderness and pain on the radial side of the wrist that is usually aggravated with wrist and thumb movements. In this condition, the tendons of the abductor pollicis longus (APL) and the extensor pollicis brevis (EBP) are inflamed when passing through the first dorsal compartment of the wrist.(1)

As reported in previous studies, DQT is 3 to 10 times more common in women than men.(2) Grip strength, a key metric of hand function, is often reduced in individuals with De Quervain's tendinopathy, implying a potential relation between the condition and reduced grip strength.(3) Additionally, variations in the hand length and width can influence how the mechanical stress is distributed among the tendons, which could influence the development of tendinopathy.(4) Aside from possibly affecting tendon loading patterns and wrist mechanics, the carrying angle formed when the arm is extended between the upper arm and forearm also increases the risk of De Quervain's tendinopathy. (5)

De Quervain's tendinopathy is a common problem for people working in occupations requiring a lot of hand and wrist motion, like healthcare. Its etiology is

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often linked to repeated hand and wrist motions.(6) Due to their repetitious and strenuous work, healthcare professionals such as surgeons, dentists, physical therapists, and nurses are especially vulnerable to De Quervain's tendinopathy.(7) These professionals often perform work that involves repetitive grasping, pinching, and manipulation of tools, which has the potential to cause overuse injuries like De Quervain's tenosynovitis.(8)

The severity and risk of such musculoskeletal disorders can be shaped by different physical attributes. One of those factors is the carrying angle, which is the angle formed by the longitudinal axis of the humerus and the bent forearm when supinated and extended elbow.(9) The normal angle is usually 5–10 degrees in men and 10–15 degrees in women. The other important factor is grip strength, which has an important role in hand function and has a close correlation with hand length and width.(10)

These physical characteristics may predispose individuals to DQT or influence their severity. This provides important information for making preventive and management strategies. Hence, the identification of these relationships is crucial for planning preventive and management interventions in at-risk populations. Therefore, the purpose of the study was to determine the relationship between De Quervain's tendinopathy and grip strength, hand length, hand width, and carrying angle among health professionals.

Methods:

The study design is cross-sectional descriptive conducted at the physical therapy department of Arif Memorial Teaching Hospital from May 2022 to November 2022, after approval of the study from the Institutional Ethical Review Board of Rashid Latif Medical College (Ref. No IRB/2022/077). The calculated sample size (n) was estimated as 150 by using the below-mentioned formula, Considering a 5 % level of significance (Z), prevalence (P) of 63.3% (11), precision (d) of 0.05, and confidence interval of 95%.

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

The data was collected using non-probability convenience sampling. The participants included in this study were 20 to 45 years old. All Health professionals, i.e., general physicians, dentists, physiotherapists, pharmacists, nurses, histopathologists, and surgeons, were included. The participants with radial-side wrist pain due to carpometacarpal arthritis, fracture of the wrist, operation on the ipsilateral side, and wrist immobilization were excluded. The participants were given a brief introduction to the study and assured that the information provided would not be disclosed and that privacy would be maintained regarding their information. They signed a consent form showing that they were willing to participate. All human subjects' ethical and moral values were followed, as mentioned in the Helsinki Declaration.

Finkelstein test was used to diagnose de Quervain's tenosynovitis.(12) It has a sensitivity of 84% and a specificity of 96%. It demonstrated higher specificity, produced significantly fewer false-positive results, and caused significantly less discomfort to patients. (13) The test was performed while the patient is seated comfortably on a chair, lying in bed, or standing in a relaxed posture. The examiner positions himself before the patient and moves the thumb in ulnar deviation, applying longitudinal traction. The patient experiences pain in the radial styloid process and along the length of the extensor pollicis brevis and abductor pollicis longus tendons.(14) In that case, the test is for De Quervain's tenosynovitis.

The universal goniometer measured the range of motion. The goniometer's inter-rater reliability (intraclass correlation coefficient: 0.128–0.860) showed significant variation, ranging from poor to excellent.(15) The range of motions, including thumb flexion, extension, adduction, and abduction, were measured with a universal goniometer and the patient sitting, forearm fully supinated, wrist in a neutral position. For the Carpo-Metacarpal (CMC) of thumb in 0˚ of abduction and adduction, hand and forearm rest on a stable surface. The fulcrum was located at the first CMC joint palmar aspect, the moveable arm at the ventral midline of the first metacarpal, and the fixed arm at the ventral midline of the radius. The patient was sitting, forearm in 0˚ supination-pronation, wrist in neutral position. Hand and forearm rest on a stable surface. The fixed arm was at the laterally located midline of the second metacarpal, and the fulcrum was at the laterally located aspect of the radial styloid process. The lateral midline of the first metacarpal served as the reference point for both the moveable arm and the second metacarpophalangeal (MCP) joint, as the first MCP joint's reference center.(16)

The hand grip strength was measured using a handheld dynamometer. The Intra-rater reliability(ICC) was 0.95(95% CI) and test-retest reliability (ICC) was 0.80(95% CI).(17) The participants' backs were supported, and their feet were flat on the ground as they sat erect. Their right hand was bent to a right

angle (90°), and both elbows were positioned by their sides. Their hands were positioned straight, without flexion or extension, with their wrists in the neutral position relative to their forearms. Before testing, the dynamometer handle was adjusted so the handle rested in the middle of the four fingers, and the device's base rested on the first metacarpal. After completing this process three times, the recording's average was determined.(18) The measuring Inch tape was used to measure hand length and width. Hand length was defined as the distance from the distal wrist crease to the midpoint of the tip of the middle finger on the palmar side. Hand width was defined as the distance across the finger knuckles on the palmar side. Distal interphalangeal joint (DIPJ) width was defined as the distance across the DIPJ.(19)

SPSS version 22 was used for data analysis. Descriptive statistics were presented for participant demographics. Descriptive data is expressed as frequencies, percentages, means, and standard deviations for the variables' demographics, carrying angle, grip strength, hand width, and length. Chi-square and Likelihood Ratio tests were used to find the association of gender, occupation, and hand involved with De Quervain's tenosynovitis. The correlations between carrying angle, grip strength, hand width, and hand length were described using Point biserial correlations.

Results:

Out of 150 participants, 50 Participants were positive. Furthermore, using Chi-square showed a significant association between gender and DQT with a p-value < 0.05, and there is a significant association between Dominant Hand DQT with a p-value < 0.05. Using the Likelihood Ratio, results revealed a significant association between Occupation and DQT with a p-value < 0.05, as represented in Table 1.

Table 1: Association of Demographics and De Quervain's Tenosynovitis

Demographics	Categories	Finkelstein		P-value
		Negative	Positive	
Age (year)		32.530±5.73	32.360±5.69	
Gender	Male	23	20	0.036*
	Female	77	30	
Occupation	Physicians	30	0	<0.001*
	Dentist	6	8	
	Physiotherapists	7	20	
	Pharmacists	11	0	
	Nurses	10	11	
	Histopathologist	10	3	
	Phlebotomists	21	0	
	Surgeons	5	8	
Hand Involved	Right	0	40	<0.001
	Left	0	10	
	None	100	0	

p value <0.05 is taken as significant.

The point-biserial showed a negative, weak correlation between carrying angle, grip strength, and De Quervain's tenosynovitis. There was a positive, weak correlation between hand length and hand width and De Quervain's tenosynovitis, as shown in Table 2.

Table 2: Correlation between Carrying Angle, grip strength, Hand Length, and Hand width with De Quervain's tenosynovitis

Anthropometric measurements	Right				Left			
	Finkelstein Test		r**	p*	Finkelstein Test		r**	p*
	Negative	Positive			Negative	Positive		
Carrying Angle (Degree)	12.82±0.86	12.475±1.01	-0.17	0.03	11.827±1.00	11.444±1.16	-0.16	0.03
Grip Strength (Kg)	46.510±13.34	44.220±14.62	-0.07	0.03	46.510±13.34	49.760±14.65	-0.11	0.01
Hand Length (Inches)	6.417±0.60	6.621±0.73	0.14	0.07	6.417±0.60	6.616±0.73	0.14	0.07
Hand Width (inches)	2.781±0.34	2.942±0.39	0.20	0.01	2.781±0.34	2.934±0.38	0.19	0.01

***r= correlation coefficient measured using Point biserial*

**p-value <0.05 is taken as significant.*

Discussion:

This cross-sectional study was conducted at Arif Memorial Hospital in Lahore on a sample of 150 patients to determine the frequency of Quervain's tendinopathy and its relationship with grip strength: hand length, hand width, and carrying angle among health professionals. According to the current study, De Quervain's Tendinopathy was present in 33.33% of medical workers, and there was a significant association between the condition and gender. These findings are consistent with research that shows different occupations have different frequencies, such as 75% of tailors (20), 50.45% of carpenters (21), and 67% of medical students.(22) These results are supported by the prevalence rate seen in this study, which indicates that occupation and repeated activities are important factors in the development of DQT. The substantial correlation between gender and DQT demonstrated one of the study's key outcomes. This finding implies that gender, with a higher frequency seen in women, is a significant factor in one's vulnerability to DQT. This result is in line with previous research showing that women are more prone than men to develop DQT.

This result suggests that gender, with increased prevalence of DQT found in women, is an important determinant of one's vulnerability to DQT. This result concurs with earlier findings that indicate women are more susceptible than men to developing DQT.(1) These factors may include the effects of hormones, bodily differences, and differences in job roles. For instance, estrogen has been shown to affect tendon elasticity and could play a role in women's higher prevalence of tendinopathies.(23) Women are also more likely to engage in sports that involve repeated wrist movements, which increases their risk even more.

In addition, there is a strong correlation ($p<0.05$) of DQT with the dominant hand. This finding substantiates the theory that repetitive overuse injuries such as DQT may be due to repeated use of the dominant hand in tasks requiring fine motor skills. The dominant hand bears a larger mechanical load with everyday activities and is more susceptible to tendinopathies. It is particularly significant for typing, manual labour, and assembly line work involving much thumb and wrist movement. The correlation between occupation and DQT is a significant finding of this study. The major correlation ($p<0.05$) suggests that individuals in particular occupations are perhaps predisposed to DQT, most likely because of repeated stress on the tendons of the thumb and wrist. Activities involving extensive hand and wrist movement, including manual labour, office work and extensive use of tools equipped with hands, have been consistently related to an increased risk of DQT.(4,24)

This research also examined the relationship between DQT and biomechanical factors, such as carrying angle, grip strength, hand length and width. Grip strength, carrying angle and DQT were negatively correlated by the point-biserial correlation analysis, which means that the individuals with greater carrying angles or stronger grips are less likely to have DQT. Previous research that negatively correlated carrying angle and DQT incidence supports the above discovery. (25) The variation in carrying angles could be one possible factor contributing to it, as it might affect grip strength and mechanics of the hand and forearm. An increased carrying angle could decrease the load on the

tendons of the wrist and, hence, the risk of tendinopathy. (10) Improved tendon conditions could be related to greater grip strength and might prevent the onset of DQT, stating that tendon flexibility and strength are significant considerations in avoiding overuse injuries.

Conversely, a positive correlation was found between hand length, width, and DQT, indicating that individuals with larger hands may be more prone to developing this condition, which can be increased mechanical stress experienced by larger hands during repetitive tasks, leading to a higher risk of tendinopathy. On the other hand, there was a positive correlation between hand length, width, and DQT, which means that larger-handed people might be more likely to develop this condition. It might be explained by the higher mechanical stress faced by larger hands in repetitive tasks, which can result in greater susceptibility to tendinopathy.(26) These results imply that hand dimensions play a role in the risk of DQT development as a consequence of biomechanical differences under repetitive task demands. Previous studies have also pointed out the significance of anthropometric measurements in DQT development (27,28).

There are some of the limitations of this study. First, the inclusion of a relatively small sample size, which lowers the generalizability of results to the overall health professional's population. Second, the study used non-probability convenience sampling, that might involve selection bias and decrease the representativeness of the sample. Third, the data was gathered from single-center study that might reduce external validity and generalizability to other geographic areas.

The findings of this research have several important implications for DQT prevention and management. The strong correlation demonstrated between DQT and factors such as gender, use of dominant hand, occupation, and biomechanical characteristics suggests that targeted interventions could effectively reduce the prevalence of the condition. Nevertheless, numerous other variables can influence the results, including BMI, working hours, age considerations, and work intensity. Also, promoting grip strength exercises and improving overall tendon health can protect susceptible individuals from the onset of DQT.

Conclusion:

The study's findings reveal significant correlations between DQT and various anthropometric factors such as grip strength, hand length, hand width, and carrying angle. These physical characteristics may predispose individuals to DQT or influence their severity. This provides important information for making preventive and management strategies for DQT and enlightens the audience about this research importance.

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Niazi R: Analysis and interpretation of data, visualization of work
Jamil A: Revised submitted version of the publication
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