Original Article

Relationship Between Overuse of Smartphones and De Quervain's Tenosynovitis in Young Adults

DOI: dx.doi.org

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Received: 18 January 2024
Accepted: 27 January 2024
Published: 10 February 2024

Published by:
Sher-E-Bangla Medical College,
Barishal, Bangladesh

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Editor: Prof. Dr. HN Sarker

Available Online:
https://bdjournals.org/index.php/planet/article/view/431

ABSTRACT

Introduction: *The widespread use of smartphones has led to increased health concerns, including conditions like de Quervain's tenosynovitis, also known as texting thumb or gamer's thumb. This condition affects the tendons on the thumb side of the wrist and is associated with the overuse of handheld devices for communication, entertainment, and information retrieval.* ***Aim of the study:*** *This study aimed to assess the relationship between the overuse of smartphones and de Quervain's tenosynovitis.* ***Methods and materials:*** *This cross-sectional study was conducted at Department of Orthopedic Surgery, United Hospital Limited Gulshan, Dhaka, Bangladesh from January, 2021 to December, 2023. The study included 220 young adults identified as excessive smartphone users through convenient sampling. An online questionnaire assessed smartphone usage behaviors and their association with de Quervain's tenosynovitis (DQT). The Finkelstein test diagnosed DQT, and data analysis utilized SPSS version 23.0.* ***Results:*** *In comparing the ages, duration of smartphone use, and smartphone screen sizes, we found significant correlations between de Quervain's tenosynovitis cases and non-de Quervain's tenosynovitis cases where the P values were 0.006, 0.032, 0.009 respectively. On the other hand, in comparing the causes of using smartphones, we did not find any correlation (P>0.05).* ***Conclusion:*** *Extended daily use of smartphones within a certain age range,*

(The Planet 2023; 7(1): 289-295)

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particularly with smaller screens, may pose potential risks for de Quervain's tenosynovitis in young adults.

Keywords: *Smartphone, de Quervain's tenosynovitis, DQT, Young adults, Gesture, Phone game*

INTRODUCTION

De Quervain's tenosynovitis is a common cause of wrist pain, often disabling [1]. Fritz De Quervain defined it in 1895 as wrist pain caused by stenosing tenosynovitis of thumb abductors around the radiostyloid process [2]. The etiology includes acute trauma and overuse due to repetitive hand and wrist movements, known as Blackberry thumb, Gamer's thumb, washer woman's sprain, or texting thumb [3]. In the past decade, the proliferation of smartphones has transformed communication and entertainment, particularly among young adults [4]. China, the world's largest smartphone market, has witnessed a significant surge in smartphone users, with nearly every college student owning one by 2022 [5,6]. While smartphones have undoubtedly improved users' lives with their diverse applications, this increased reliance has raised concerns about addiction, mental health issues, and physical health problems such as de Quervain's tenosynovitis (DQT) [7-9]. de Quervain's tenosynovitis, identified by Fritz de Quervain in 1895, is a prevalent tendinopathy affecting the upper extremities [10]. This condition involves thickening and myxoid degeneration of the tendon sheath in the first dorsal compartment of the wrist. Among young, active populations, the incidence rate of de Quervain's tenosynovitis is 1.0 cases per 1,000 person-years for women and 0.6 cases per 1,000 person-years for men. In the general adult working population, its prevalence is 0.5% for men and 1.3% for women [11,12]. Numerous studies have explored the relationship between smartphone usage, including messaging, various applications, and mobile gaming, and the development of DQT. However, some studies overlook crucial factors such as phone usage posture, screen size, and the influence of daily thumb/wrist activities or physical fitness [9,13]. Furthermore, the rapid evolution of smartphones and their applications necessitates considering both temporal and cultural differences when analyzing this relationship. The objective of this study was to assess the relationship between the overuse of smartphones and de Quervain's tenosynovitis.

METHODS & MATERIALS

This was a cross-sectional study that was conducted at Department of Orthopedic Surgery, United Hospital Limited, Gulshan, Dhaka, Bangladesh January, 2021 to December, 2023. The study involved 220 young adults identified as excessive smartphone users through convenient sampling. An online questionnaire was used to assess smartphone usage behaviors and their potential association with de Quervain's tenosynovitis (DQT). The Finkelstein test [13] was utilized for diagnosing de Quervain's tenosynovitis (DQT) in the study. Properly written consent was obtained from all participants before data collection. Inclusion criteria encompassed individuals aged 10-40 years, of both

genders, who were mobile phone users. Conversely, exclusion criteria involved individuals with musculoskeletal or neurological disorders in the upper limb and those with any kind of deformity in the upper limb. Demographic and clinical information of participants was recorded, and all data were processed, analyzed, and disseminated using SPSS version 23.0 program. A significance level of $P < 0.05$ was considered in statistical analysis.

RESULT

As per the Finkelstein test results, the frequency of de Quervain's tenosynovitis among participants was found 29% **[Figure 1]**.

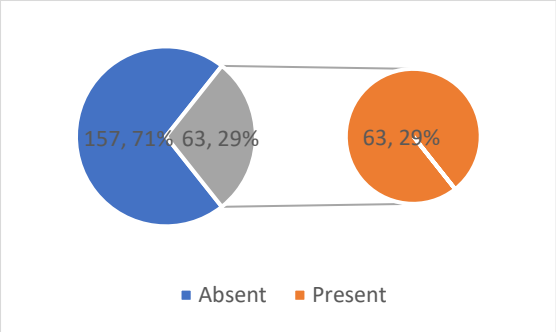

Figure 1: Frequency of DQT

The majority of participants (>70%) in both groups were aged 21-30 years, and a significant correlation between the ages of the groups with and without de Quervain's tenosynovitis (DQT) was observed (P=0.006) **[Table-I]**.

Table I: Age distribution

Age (Years)	DQT status				P-value
	Present (n-63)		Absent (n-157)		
	n	%	n	%	
10-20	8	12.7	20	12.7	0 0
21-30	45	71.4	113	72.0	
≥31	10	15.9	24	15.3	

In both the de Quervain's tenosynovitis (DQT) and non-DQT groups, more than 70% of participants were female based on gender distribution **[Figure 2]**.

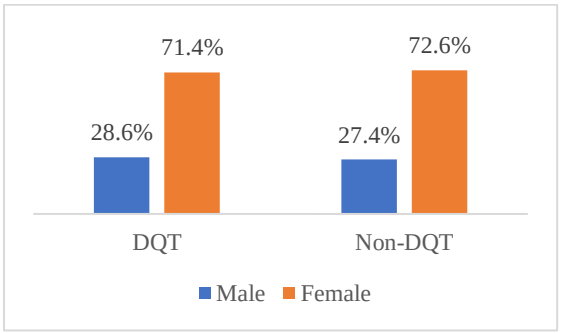

Figure 2: Gender distribution

In the DQT group (n=63), 12.7% reported using smartphones for less than 2 hours per day, 17.9% for 2-4 hours, 26.1% for 4-6 hours, 23.9% for 6-8 hours, and 19.4% for more than 8 hours per day. In the non-DQT group (n=157), 7.6% reported using smartphones for less than 2 hours per day, 20.4% for 2-4 hours, 35.7% for 4-6 hours, 24.8% for 6-8 hours, and 11.5% for more than 8 hours. The comparison revealed a statistically significant difference (p=0.032), suggesting variations in smartphone usage patterns between the two groups **[Table II]**.

Table II: Smartphone using times

Times	DQT (n-63)		Non-DQT (n-157)		P-value
	n	%	n	%	
< 2 h/day	8	12.7	12	7.6	0.032
2-4 h/day	11	17.9	32	20.4	
4-6 h/day	17	26.1	56	35.7	
6-8 h/day	15	23.9	39	24.8	

>8 h/day	12	19.4	18	11.5	

In the DQT group (n=63), 14.3% reported using smartphones for playing games, 42.9% for social media, 30.2% for leisure, and 12.7% for study. In the non-DQT group (n=157), 7.6% reported using smartphones for playing games, 35.0% for social media, 37.6% for leisure, and 19.7% for study. While there were some differences in usage patterns, the p-values indicated that these differences were not statistically significant (p>0.05) **[Table-III]**.

Table III: Distribution of uses functions

Uses	DQT (n=63)		Non-DQT (n=157)		P-value
	n	%	n	%	
Phone games	9	14.3	12	7.6	0.175
Social media	27	42.9	55	35.0	
Leisure	19	30.2	59	37.6	
Study	8	12.7	31	19.7	

In the de Quervain's tenosynovitis (DQT) group (n=63), 4.8% used devices with a screen size less than 5.0 inches, 36.5% used devices sized between 5.0 and 5.5 inches, 20.6% used devices sized between 5.5 and 6.0 inches, 25.4% used devices sized between 6.0 and 6.5 inches, 11.1% used devices sized between 6.5 and 7.0 inches, and 1.6% used devices with a screen size greater than 7.0 inches. In the non-DQT group (n=157), 11.5% used devices with a screen size less than 5.0 inches, 29.9% used devices sized between 5.0 and 5.5 inches, 25.5% used devices sized between 5.5 and 6.0 inches, 19.1% used devices sized between 6.0 and 6.5 inches, 12.1% used devices sized between 6.5 and 7.0 inches, and 1.9% used devices with a screen size greater than 7.0 inches. The differences in screen size distribution between the two groups were statistically significant (p=0.009) **[Table-IV]**.

Table IV: Screen size of devices

Size (Inch)	DQT (n-63)		Non-DQT (n-157)		P-value
	n	%	n	%	
<5.0	3	4.8	18	11.5	0.009
5.0-5.5	23	36.5	47	29.9	
5.5-6.0	13	20.6	40	25.5	
6.0-6.5	16	25.4	30	19.1	
6.5-7.0	7	11.1	19	12.1	
>7.0	1	1.6	3	1.9	

DISCUSSION

Overuse of smartphones refers to individuals who excessively use their smartphones, impacting their physical and mental well-being, productivity, and social relationships. The definition of 'excessive' varies, depending on responsibilities and lifestyle. Spending several hours, a day on a smartphone, especially if it interferes with important activities or relationships, might be considered overuse. In this study, participants' smartphone usage was classified as excessive based on their self-reported opinions. In this study, the frequency of de Quervain's tenosynovitis among participants was found to be 29% based on Finkelstein test results [14]. Another study reported that among

participants with positive Finkelstein test results, 42.21% exhibited bilateral DQT [15]. The majority of participants (>70%) in both groups were aged 21-30 years, and a significant correlation between the ages of the groups with and without de Quervain's tenosynovitis (DQT) was observed (P=0.006) [16]. A similar study presented an age range from 10-35 years [17]. In both the de Quervain's tenosynovitis (DQT) and non-DQT groups of our participants, more than 70% of participants were female based on gender distribution. Another study demonstrated that out of the total 300 students who participated in the study, 240 (80%) were females and the remaining 60 (20%) were males [18]. In this study, in the DQT group (n=63), 12.7% reported using smartphones for less than 2 hours per day, 17.9% for 2-4 hours, 26.1% for 4-6 hours, 23.9% for 6-8 hours, and 19.4% for more than 8 hours. In the non-DQT group (n=157), 7.6% reported using smartphones for less than 2 hours per day, 20.4% for 2-4 hours, 35.7% for 4-6 hours, 24.8% for 6-8 hours, and 11.5% for more than 8 hours. The comparison revealed a statistically significant difference (p=0.032), suggesting variations in smartphone usage patterns between the two groups. A previous study observed a statistical difference in Finkelstein's test results based on usage time, indicating a higher risk of DQT with increased smartphone usage time [15]. In these settings, in the DQT group, 14.3% reported using smartphones for playing games, 42.9% for social media, 30.2% for leisure, and 12.7% for study. In the non-DQT group, 7.6% reported using smartphones for playing games, 35.0% for social media, 37.6% for leisure, and 19.7% for study. Although there were some differences in usage patterns, the p-values indicated that these differences were not statistically significant (p>0.05). The dramatic shift in smartphone usage necessitates a more comprehensive approach to examining the links between social or gaming activities and disease, as single associations are no longer sufficient to prompt a re-evaluation of the extent of smartphone use [19]. In our current study, we observed that the risk of developing DQT varies based on the type of device used. In this study, in the de Quervain's tenosynovitis (DQT) group, 4.8% used devices with a screen size less than 5.0 inches, 36.5% used devices sized between 5.0 and 5.5 inches, 20.6% used devices sized between 5.5 and 6.0 inches, 25.4% used devices sized between 6.0 and 6.5 inches, 11.1% used devices sized between 6.5 and 7.0 inches, and 1.6% used devices with a screen size greater than 7.0 inches. In the non-DQT group, 11.5% used devices with a screen size less than 5.0 inches, 29.9% used devices sized between 5.0 and 5.5 inches, 25.5% used devices sized between 5.5 and 6.0 inches, 19.1% used devices sized between 6.0 and 6.5 inches, 12.1% used devices sized between 6.5 and 7.0 inches, and 1.9% used devices with a screen size greater than 7.0 inches. The differences in screen size distribution between the two groups were statistically significant (p=0.009). In previous studies, researchers have found that screen size has not been an influential factor in studies on the relationship between mobile gaming and DQT [20].

LIMITATION OF THE STUDY

The study had some limitations, including being single-centered with a small sample size. Additionally, it was conducted over a short period, and as such, the findings may not accurately represent the overall

scenario of the entire country. Interpretation of the results should consider these limitations, and further research with larger and more diverse samples and a more extended study duration may provide a more comprehensive understanding of the subject.

CONCLUSION

The study suggests that prolonged daily smartphone use, especially during specific age periods, and the use of smaller-screen smartphones may be potential risk factors for de Quervain's tenosynovitis in young adults. These findings highlight the importance of considering both the duration of smartphone use and the characteristics of the device itself when assessing the risk of musculoskeletal issues in this population. It's essential for individuals, particularly those in the identified risk categories, to be aware of ergonomic practices and take breaks to mitigate the potential impact on hand and wrist health.

FUNDING

No funding sources

CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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