



Original Research

Exploring Gender Disparities in Carpal Tunnel Syndrome: A Comparative Analysis of Male-Female Ratios

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ABSTRACT

Objective: To know about the gender disparities in carpal tunnel syndrome in the Neurosurgery and Orthopedics departments of Naseer Teaching Hospital and Maqsood Medical Complex.

Materials and Methods: This descriptive cross-sectional study was conducted in the Neurosurgery and Orthopedics department of NTH and MMC from 1st January 2017 to 20th March 2024. We included a total of 525 patients, both male and female from the age range of 16 years to 70 years presenting with complaints of pain and tingling sensation in their hands. All the included patients were diagnosed with cases of CTS based on clinical signs and symptoms and NCS. All the patients who had a joint pathology or any previous trauma to the wrist joint or pregnancy were excluded. The data was analyzed using SPSS (v 23.0).

Results: In our study; we observed that the mean age was 34.21 ± 7.685 and male-to-female frequency was 19.2% to 80.8% in a ratio that can be written as 1:4.2. The most common age group affected in females is 30-39 while in males the most common affected one was 40-49.

Conclusion: Our study concludes that the male-to-female ratio of median nerve entrapment was 1:4.2.

Keywords: Carpal Tunnel Syndrome. Gender disparities, nerve conduction study, Phalen's test.

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INTRODUCTION

Carpal tunnel syndrome (CTS) is defined as compression of the median nerve, at the level of the wrist joint, which causes numbness, pain, and tingling sensation in the affected hand and arm.^{1,2} According to the 2014 statistics database of the United Kingdom, women are more prone to have carpal tunnel syndrome as compared to males which is 193 per 1lac in women while in males its

prevalence is 88 per 1 lac.³ While according to current statistics, it ranges between 1-5%.^{4,5,6} Another study conducted in Swedish on a random sample of 3000 people suggested a prevalence of 4%.⁷

The prevalence of CTS is more common in females as compared to males due to the changes that take place during pregnancy. Obesity and diabetes are other factors that raise the risk of CTS.^{8,9} The prevalence in diabetic patients varies from 28 to 68.5% which mainly depends on the duration of diabetes. One of the reasons for the high occurrence rate in diabetic patients is that hyperglycemia leads to neurodegeneration.^{10,11,12} Apart from the main factors genetic, pathology of joints, thyroid disorder, advanced age, and fractures of the distal end of the forearm also play a vital role in developing CTS.^{13,14,15}

Due to the symptoms of CTS, the functional abilities are significantly limited, which affects a person in different ways, rendering him unable to do routine daily activities with ease. For diagnosis, two clinical tests that play a vital role in the diagnosis of CTS are the Tinel sign and Phalen test apart from that other diagnostic tests are Electromyography and Ultrasound wrist.^{16,17,18}

The treatment of CTS depends on severity and can be non-surgical in which reduction of edema is achieved via injecting steroids or by surgical exploration.¹⁹

In Pakistan, there have been no such studies conducted to report the gender disparities as per our report, to fill the gap in the literature we started conducting this study which will not only fill the gap but also it will aid the medical practitioner.⁴

MATERIALS AND METHODS

Study Design & Setting

This cross-sectional descriptive study was conducted in the Department of Neurosurgery and Orthopedics at Nasser Teaching Hospital and Maqsood Medical Complex, from 1st January 2017

to 20th March 2024. The data of the patients was included anonymously with the permission of the administration. Informed consents were taken from all patients.

Inclusion Criteria

We included a total of 525 patients, both male and female from the age range of 16 years to 70 years presenting to the Neurosurgery and Orthopedic Department for grievances regarding tingling in their hands. All the included patients were diagnosed with a case of carpal tunnel syndrome based on clinical signs and symptoms and nerve conduction studies.

Clinical Signs

1. Phalen's test: it is often known as the reverse prayer test. The procedure involves having the patient fully extend their wrist by applying pressure on both hands' dorsal surfaces for one minute. Reproduction of the symptoms indicates a positive test.
2. Reverse Phalen's Test: it is also known as the Prayer Test, involves having the patient extend both wrists and press their palmar surfaces together for one minute. Reproduction of symptoms indicates a positive test result.
3. Hoffman-Tinel sign: in this test, the carpal tunnel is tapped by the surgeon or physician to stimulate the median nerve. When the nerve is stimulated and the symptoms are reexamined, the test is considered positive.

Exclusion Criteria

All patients, both male and female, who had a joint pathology or any previous trauma to the wrist joint or pregnancy, were excluded.

Sample Size

Using the sample size calculator, we calculated the sample size, by assuming a prevalence of 50% of

diagnosed carpal tunnel syndrome since there are no former estimates available for the frequency of carpal tunnel syndrome in Pakistan. With a 95% confidence interval and a precision of $\pm 4.28\%$, the approximate minimum sample size was calculated to be 525.

Sampling Technique

Non-probability convenience sampling technique was used.

Data Collection

Data was collected from the hospital database after obtaining consent from the patient as well as the hospital. If consent is not given, that file will not be included in the study and a refusal will be noted without making a second attempt to obtain the consent.

All hospitals taking part in this study were assured of complete confidentiality and their responses will be kept anonymous, access to which will only be allowed to the principal research team. All Hospitals that were part of this project had the right to withdraw from participation at any point in time. No incentive was given to participants for participation in the study. This study was approved by the ethical committee of MTI Hayatabad Medical Complex Peshawar.

Data Analysis

SPSS (v 23.0) was used to analyze the data and it will manually be reviewed for disparities and missing data. After that, every variable will be coded for analysis. Qualitative data was presented as frequencies and percentages whereas quantitative data was presented with mean and standard deviation.

RESULTS

This study was a joint venture of the Department of Neurosurgery and Orthopedics conducted in

the respective departments at Naseer Teaching Hospital and Maqsood Medical Complex.

Gender Distribution

A total of 525 patients were taken as diagnosed cases of carpal tunnel syndrome based on clinical signs and symptoms and nerve conduction studies. Out of the total number of patients, females 424 (80.8%) and males were 101 (19.2%), out of these 290 (55.2%) were from the urban area while 235 (44.8%) were from rural areas which are mentioned in Table 1.

Table 1: Showing characteristics of patients.

Variable	Subcategory	Frequency	Percentage
Gender	Male	101	19.2%
	Female	424	80.8%
Place	Urban	235	44.8%
	Rural	290	55.2%

Affected Side

The most commonly affected side observed in 525 patients was the right side with 59% (310), followed by the left side with 41% (215) which are mentioned in Table no 2. Out of 310, who were diagnosed with CTS the frequency of females was 254/424 and males was 56/101. In left-sided patients, the frequency of females was 170 and males were 45 which are mentioned in Table 3.

Table 2: Showing the frequency of the most commonly affected side of patients.

Affected Side	Subcategory	Frequency	Percentage
Affected Side	Left	215	41%
	Right	310	59%

Table 3: Shows the frequency of common affected side in Gender.

Gender	Side		Total	Chi-square	P-value
	Left	Right			
Male	45	56	101	0.671	0.412
Female	170	254	424		

Table 4: Showing the most common age group affected by patients.

Categorical Age	Male	Female	Minimum	Maximum	S. D ± Mean
<20	2 (0.3%)	7 (1.33%)			
20-29	20 (3.80%)	108 (20.57%)			
30-39	23 (4.3%)	222 (42.28%)	18	61	32.21 ± 7.685
40-49	49 (9.3%)	69 (13.14%)			
50-59	7 (1.3%)	15 (2.8%)			
>60	0 (0%)	3 (0.57%)			

Age Distribution

The study showed that the mean age of patients was 34.21 ± 7.685 years. The most common age group affected by carpal tunnel syndrome in females was 30-39 years, which included 222 patients, followed by the age group 20-29 years which included 108 patients. In contrast, the age group most frequently impacted in males was 40-49 years, which included 49 patients followed by the age group 30-39 years, which included 23 patients, the age group distribution is mentioned in Table 4.

DISCUSSION

The main aim of the study was to find out the frequency difference of gender in carpal tunnel syndrome. In our study; we observed that the mean age was 34.21 ± 7.685 . In our study male to female frequency was 19.2% to 80.8% in a ratio that can be written as 1:4.2. The most common age group affected in females is 30-39 years while in males the most commonly affected one is also 40-49 years. A study was conducted in two areas of the United Kingdom from 1991 to 2001 according to that study the female-to-male ratio in the two areas was 2.0 and 1.8 but according to statistics, we got a ratio of 4.2 to 1 like that female are 4 times more likely to develop carpal tunnel syndrome.²⁰ Another study was conducted in 1999 in Argentina to find the gender disparities ratio between females to males according to their results the ratio is 10:1 while another study was held in Korea in late 2000 in that study, they mentioned the ratio of 23:1, which didn't match

our result that is 4.2:1 ratio.^{21,22} The main cause behind that can be attributed to the lifestyle.

According to the study conducted in 2019 to update the database of the National Insurance of Health Sciences according to that study the ratio of females to males in carpal tunnel syndrome is 1.5:1, while in our study the statistics show the ratio of 4.2:1, in that study the age group most frequently impacted was 40-49 in males and females it was 50-59 while in our study the commonly affected age group in females was 30-39 while in male it was 40-49.²³ Another study from India results shows a ratio of 3.28:1 in females to males while our study shows 4.2:1. This study has shown a slight matching with our results because of the same region and the same lifestyle our countries have.²⁴ Another study from Iran which was held in 2021 according to that study the ratio of females to males was 3:1.²⁵

In Pakistan, a study was conducted in 2020 on carpal tunnel syndrome according to that study the frequency of their data was 77.1% females and the male was 22.9%, in a ratio that can be 3.36:1, this study somehow slightly matches our study which is 4.2:1.²⁶ In 2013 a study was conducted in Saudi Arabia hospital between January 2007 to December 2010, sample size of 640 according to that study the most commonly affected side was reported as the right side which shows consistent findings with our results.²⁷

Since data from two teaching hospitals were used in our investigation, this became a study restriction that we had to solve. A multicenter survey across the entire district is necessary to determine the various frequencies across various

populations.

CONCLUSION

This study concludes that the male-to-female ratio of carpal tunnel syndrome was 1:4.2. The most commonly affected age group in females is 30-39 years while in males the age group most commonly affected was 40-49 years.

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Additional Information

Disclosures: Authors report no conflict of interest.

Institutional Ethical Review Board Approval: The study complies with the ethical review board requirements.

Human Subject: Consent was obtained by all patients/participants in this study.

Conflict of Interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationship at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that no other relationships or activities could appear to have influenced the submitted work.

Data Sharing Statement: For data sharing, interested researchers can contact the corresponding authors.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Ubaid Ullah	1. Study design and methodology.
2.	Ayaz Ahmad	2. Paper writing.
3.	Shehryar Shah	3. Data collection and calculations.
4.	Muhammad Mujtaba	4. Analysis of data and interpretation of results.
5.	Sadaf Ambreen	5. Literature review and referencing.
6.	Shahid Ayub	6. Editing and quality insurer.