

Evidence of Carpal Tunnel Syndrome Among Obese Patients

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ABSTRACT

Objective: To determine the evidence of carpal tunnel syndrome among obese patients at tertiary care hospital, Karachi.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Neurology Outpatient Dr. Ruth K.M. Pfau Civil Hospital and Al Tibri Medical College and Hospital in Karachi from October, 2022, to March, 2023.

Materials and Methods: It was a cross-sectional study done at the neurology department of Dr. Ruth K.M Pfau Civil Hospital and Al Tibri Medical College and Hospital Karachi within the duration of six months. The calculated sample size was 107 and non-probability, consecutive sampling was done. Data was analyzed on SPSS Version 23.0.

Results: In our study 107 patients with carpal tunnel syndrome were included. The mean age was 49.75 years. Mean body mass index was 27.5 kg/m². Majority, 68 (63.6%) were females. Out of 107 patients, 73 (68.2%) were residents of urban areas. Diabetes mellitus was documented in 41 (38.3%) patients. Hypertension was noted in 61 (57.0%) patients. Dyslipidemia was present in 33 (30.8%) patients. Most of the patients, 65 (60.7%) had right sided carpal tunnel syndrome. In this study 35 (32.7%) were obese while 72 (67.3%) were non-obese.

Conclusion: It is concluded that a significant proportion of obesity was present in patients with carpal tunnel syndrome. However other factors like diabetes mellitus, dyslipidemia and hypertension were also noted significantly with carpal tunnel syndrome. Since this was a small size study, results may not reflect the most population, and needs more studies with larger group of patients at multiple hospitals of the country in this regard to validate the current findings.

Key Words: Carpal tunnel syndrome, obesity, hypertension, dyslipidemia, diabetes mellitus.

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INTRODUCTION

Carpal Tunnel Syndrome (CTS) is the most common form of nerve compression in the upper extremity.¹ It is characterized by typical symptoms such as tingling and numbness in the first three fingers of the hand, which often worsen at night. Diagnostic signs include loss of sensation in the outer side of the hand, weakened hand muscles (particularly the Abductor Pollicis Brevis muscle), and the presence of Tinel's and Phalen's signs

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when testing the wrist. Nerve conduction studies (NCS) are a definitive diagnostic test for CTS.² Various factors contribute to the development of CTS, including high-stress work, injuries, hormonal disorders, joint abnormalities, fluid retention, and the presence of any growths or blockages in the carpal tunnel.³ The condition typically starts with damage to the protective covering of the nerve (demyelination) and progresses to nerve fiber degeneration. Initially, the sensory fibers are affected, followed by the motor fibers.⁴⁻⁵ Obesity has been identified as a contributing factor to several medical conditions such as heart disease, diabetes, thyroid disorders, and connective tissue disorders.⁶⁻⁷ A study by Komurcu et al. demonstrated a higher risk of developing CTS in individuals who are obese (BMI >30), likely due to increased fat accumulation in the carpal canal and elevated pressure on the median nerve.⁸ Obesity is a modifiable risk factor that can be addressed through lifestyle changes.⁹ Factors such as a sedentary lifestyle, eating habits, or untreated metabolic syndrome may contribute to the high prevalence of obesity in our country.¹⁰⁻¹¹ Body Mass Index (BMI) is a commonly used measure that relates weight to height and is highly correlated with body fat. It is considered a better indicator of body fat than other height and weight measures.¹² Another study suggested that individuals

with higher BMI may have increased blood volume in their arms when lying down, due to blood flow from the legs. This additional fluid volume can cause swelling in the veins of the wrist joint and increase pressure within the carpal tunnel¹³ This engorgement of synovial tissue explains the edema without inflammation and the elevated tissue pressures observed in the carpal tunnel above critical levels in patients requiring carpal tunnel surgery.^{14,15} The rationale for conducting studies to examine weight loss as a therapy for CTS would be strengthened by establishing evidence of a causal link between greater BMI and CTS.

MATERIALS AND METHODS

The Neurology Outpatient Department of Dr. Ruth K.M. Pfau Civil Hospital and Al Tibri Medical College and Hospital in Karachi were the sites of this cross-sectional investigation. The research was conducted from October 1, 2022, to March 31, 2023, spanning a six-month period. All patients gave their informed permission before being included in the trial, enabling the use of their information and participation in the study. In order to acquire demographic data, a brief history was taken. The height of each participant was measured in meters using a wall-mounted scale, and their weight was measured to the nearest kilogram using a weighing machine. Patient who has Body Mass Index (BMI) > 30kg/m² were classified as Obese. The collected data included quantitative variables such as age, height, weight, and BMI, as well as qualitative variables such as gender, residence status, hypertension, type II diabetes mellitus, dyslipidemia, smoking status, site of carpal tunnel syndrome, educational status, occupational status, and obesity. All these findings were recorded in a proforma.

Inclusion criteria:

- Patients between age group 20---60 years.
- Both genders.
- Newly diagnosed patients with carpal tunnel syndrome.

Exclusion criteria:

- Non-consenting.
- Patients with history of hypothyroidism and hyperthyroidism.
- Patients presenting with history of rheumatoid arthritis.
- Patients presenting with history of amyloidosis.
- Patients presenting with history of upper limb fracture.

Statistical analysis: 107 patients were chosen as the necessary sample size. This sample size was estimated using WHO software using a prevalence of 33.9% for obesity in carpal tunnel syndrome [16], a margin of error of 9%, and a confidence level of 95% (C.I.). SPSS 23.0 was used to analyze the data. Age, height, weight, and BMI are examples of continuous variables for

which mean and standard deviation were determined. For categorical variables including gender, residency status, hypertension, diabetes mellitus type II, dyslipidemia, smoking status, location of carpal tunnel syndrome, educational attainment, employment status, and obesity, frequencies and percentages were determined. Stratification was performed based on age, gender, residence status, hypertension, diabetes mellitus type II, dyslipidemia, smoking status, site of carpal tunnel syndrome, educational status, and occupational status to assess their impact on the outcome variable (obesity). After stratification, appropriate statistical tests such as Chi-square or Fisher's Exact test were applied, with a significance level set at $P \leq 0.05$.

Ethical Approval: Institutional Review Board of Al-Tibri approved this study and found no ethical concerns.

RESULTS

In this study 107 patients were included to assess the obesity in patients presenting with carpal tunnel syndrome at tertiary care hospital, Karachi and the results were analyzed as: Mean \pm SD of age was 49.7 ± 11.50 with C.I (47.5-51.94) years. Mean \pm SD of weight was 71.5 ± 12.2 with C.I (69.24-73.94) kg. Mean \pm SD of height was 1.62 ± 0.11 with C.I (1.60-1.65) meters. Mean \pm SD of body mass index was 27.5 ± 6.70 with C.I (26.22-28.79) kg/m². In distribution of gender, 39 (36.4%) were males while 68 (63.6%) were females. Among the 107 patients, 73 (68.2%) lived in an urban region, and 34 (31.8%) in a rural location. 41 individuals (38.3%) had diabetes mellitus recorded. Hypertension was found in 61 (57.0%) patients. Dyslipidemia was present in 33 (30.8%) patients. Out of 107 patients, 45 (42.1%) were smokers while 62 (57.9%) were non-smoker. In distribution of site of carpal tunnel syndrome, 65 (60.7%) patients had right sided carpal tunnel syndrome while 42 (39.3%) patients have findings on left side as shown in Figure 01. Out of 107 patients, 79 (73.8%) were employed while 28 (26.2%) were unemployed. Educational status showed that 11 (10.3%) patients were illiterate, 27 (25.2%) had primary education, 45 (42.1%) had secondary education while 24 (22.4%) had higher level education. Out of 107 patients, 35 (32.7%) were obese while 72 (67.3%) were non-obese as shown in Figure 02. Stratification of age, gender, residential status, hypertension, diabetes mellitus type II, dyslipidemia, smoking status and occupational status with respect to obesity showed age of 29 (27.1%) obese patients was above 40 years, while majority of obese 24 (22.4%) patients were females and resided in urban area 24 (22.4%). Hypertension was found in 30 (28.0%) obese patients, while diabetes mellitus type II was noted in 28 (26.2%) patients with obesity. Dyslipidemia was present in 17(15.9%) obese patients and 14 (13.1%) obese patients were smokers. Most obese patients, 26 (24.3%) were employed.

Stratification of site of carpal tunnel syndrome with respect to obesity was done as shown in Table No. 01.

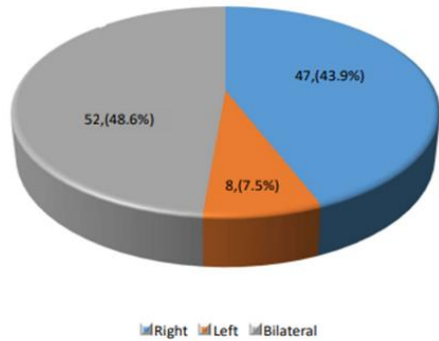


Figure No. 1: Frequency For Site of Carpal Tunnel Syndrome (n=107)

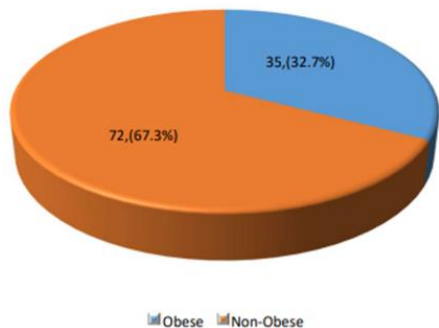


Figure No. 2: Frequency For Obesity (n=107)

Table No. 1: Stratification of site of carpal tunnel syndrome obesity

Site	Obesity		P-Value
	Obese	Non-Obese	
Right	16 (15.0%)	31 (29.0%)	0.900
Left	3 (2.8%)	5 (4.7%)	
Bilateral	16 (15.0%)	36 (36.6.0%)	

DISCUSSION

The median nerve in the carpal tunnel of the wrist can get compressed, causing the symptoms of numbness, tingling, and pain, which is known as carpal tunnel syndrome (CTS). In the United Kingdom, the prevalence of CTS ranges from 70 to 160 cases per 1,000 subjects.^{17,18} Various risk factors are associated with the development of CTS, and among them, body mass index (BMI) is recognized as a modifiable risk factor. Obesity contributes to CTS by causing fluid accumulation and fat buildup in the carpal tunnel.¹⁹ First hospital referral and Quetelet's obesity score were shown to be significantly related.²⁰ According to a research on CTS risk factors, those who take slimming classes have a statistically significant two-fold increased chance of developing the condition.²¹ In another research, thin people (BMI less than 20) had a lower incidence of CTS (16%) compared to obese patients, whose average BMI was above 29, who had a higher incidence of CTS (39%). Interestingly, obesity affects nerves differently, as no correlation was found

between obesity and ulnar sensory distal latencies.²² Studies have shown a significant relationship between obesity and CTS, with higher BMI values observed in CTS patients.²³

Physical variables linked to CTS include awkward hand postures, repetitive activities, especially with high power, and vibration exposure. Additionally, certain medical disorders, excessive alcohol and cigarette use, and other personal variables might lead to its development.

Participants in our research had an average age of 49.7 11.50 years and a mean weight of 71.5 12.2 kg/m². There were 68 (63.6%) females and 39 (36.4%) men in the study population. 47 (44%) individuals had CTS on the right side, 8 (7.5%) on the left, and 52 (48.6%) had bilateral involvement. In our investigation, there were 35 instances of obesity (32.7%). When examining the relationship between obesity and other factors, such as age, gender, residential status, smoking status, site of CTS, occupational status, and educational status, no significant differences were found. However, hypertension, diabetes mellitus, and dyslipidemia showed significant associations with obesity.

Waist circumference (WC), in addition to BMI, has been used in connection to CTS as a marker of illness risk. Regardless of BMI, studies have shown that having a big waist circumference and a high waist-to-hip ratio can double the risk of CTS. A shape body index (ASBI) and waist-to-stature ratio are two new markers of obesity that have also been researched in the literature.²⁴⁻²⁷

In summary, CTS is a common compressive neuropathy with various risk factors, including obesity. Our study found significant associations between obesity and certain medical conditions, highlighting the importance of considering weight management in CTS prevention and management.

CONCLUSION

Findings of this study demonstrate moderate proportion of obesity in patients presented with carpal tunnel syndrome. Since the study was done only on a small sample, results may not reflect the scenario countrywide, and needs more prospective and well-controlled trials with larger group of patients at different hospitals of the country to validate the current findings.

Author's Contribution:

Concept & Design of Study:	Sundus Mehtab Shafee
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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