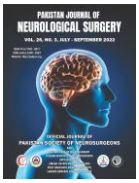

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Original Article

Frequency of Risk Factors in Patients with Carpal Tunnel Syndrome

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ABSTRACT

Objective: This study aimed to ascertain the frequency of carpal tunnel syndrome risk factors.

Materials and Methods: A cross-sectional study was conducted at the Department of Neurology, Nishtar Hospital Multan, Pakistan. One hundred and twenty patients with Carpal Tunnel Syndrome (CTS) who attended the study site were enrolled. Baseline data, including age, gender, residential area, Duration of CTS, smoking, hypertension, diabetes mellitus, and obesity, were obtained. The blood samples were obtained for screening for hypothyroidism.

Results: It was observed that most of the CTS patients were males (63.3%). The observed mean age was 44.3 ± 12.1 years, and 65.8% of cases belonged to urban areas. The most common risk factor observed among the currently enrolled CTS patients was obesity (70.8%), followed by smoking (50.8%), diabetes mellitus (45%), hypertension (34.2%), and hypothyroidism (22.5%).

Conclusion: Our study shows that the most common risk factor for CTS was obesity, followed by smoking, diabetes mellitus, hypertension, and hypothyroidism.

Keywords: Carpal Tunnel Syndrome, Risk Factors, Obesity.

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INTRODUCTION

Carpal tunnel syndrome also known as neuropathy of the median wrist is a disorder wherein the median nerve in the wrist is pinched, causing numbness and tingling, and muscle fatigue around the tissue.[1] It is the most frequently occurring neuro-compression. The prevalence of CTS has developed in tandem with the expansion of modern living.[2] CTS has a complex cause that encompasses both professional and personal aspects. Workplace ergonomics are essential in the onset of CTS. However, the impact of certain subjective characteristics is unclear.[3] The significant risk factors are older age, gender, diabetes mellitus, hypothyroidism, obesity, smoking, and occupational factors.[4-6]

Furthermore, the link between osteoarthritis

and CTS is based on a small number of studies involving a variety of osteoarthritis-affected joints. It is quite uncertain whether exposure to occupational factors changes how fat affects CTS.[7] Besides, the impact of smoking on CTS remains unknown.[6] Patients frequently complain that their hands lose their grip or that objects slip from their fingers unintentionally; sensation loss is another frequent complaint. The first to fourth fingers' palmar sides and the distal palm must be affected (i.e., the median nerve's sensory distribution at the wrist).[5,8,9] Even though CTS is an ambiguous illness, there are established risk factors associated with the occurrence of this health problem. The main environmental potential causes include prolonged postures with excessive dynamic stretching or extensions, flexor muscles repetitive use, and vibration exposure.[10] Numerous inherited traits are almost certainly related to a strong familial propensity.[11]

CTS has been associated with multiple hereditary health issues like diabetes, thyroid disease, and hereditary neuropathy with liability to pressure palsies.[12,13] CTS is not a life-threatening condition. Still, if it is not adequately treated, it can cause extreme, irreparable damage to the median nerve, resulting in significant impairment of the upper limbs.[14-16] This study assessed the frequency of risk variables in patients with CTS attending Nishtar Hospital Multan. The study's findings would aid the physician in identifying the modifiable reasons that should be treated sooner rather than later to avoid surgical intervention. In those with CTS, this would reduce morbidity and expense and increase the quality of life.

MATERIALS AND METHODS

Study Design & Setting

This cross-sectional study was conducted at the Neurology Department of Nishtar Hospital Multan from 5th May to 5th November 2021 after obtaining institutional ethical approval.

Sample Size Calculations

The sample size of 120 was calculated using the WHO sample size calculator, where the frequency of hypothyroidism in CTS patients was kept at 8.47%, 95% confidence level, and 5% absolute precision.

Inclusion

All patients aged 20 to 65 years, either gender and with diagnosed carpal tunnel syndrome (≤ 3 months duration), were recruited via the non-probability consecutive sampling technique.

Exclusion Criteria

While patients with traumatic injury to the affected hand and those with a history of stroke were excluded from the study. The enrolled patients were well-uninformed regarding the study objectives, and their consent was obtained.

Data Collection Procedures

The patient's baseline data, including age, gender, residential area, CTS duration, smoking status, hypertension, diabetes mellitus, and obesity, were recorded using a structured questionnaire. 3 ml of venous blood was drawn from each patient to examine the thyroid functions and evaluate the risk of hypothyroidism (per the operational definition).

Data Analysis

The quantitative data, such as age and CTS duration, were presented as mean and standard deviation. The frequency and percentages of the qualitative data, such as gender, residential area, diabetes, smoking, hypertension, obesity, and hypothyroidism, were shown. Age, gender, place of residence, and length of symptomatology were stratified. The impact of these traits on the frequency of CTS risk factors was examined using the post-stratification Chi-square test; a p-value

of 0.05 or lower was deemed statistically significant. Analysis was performed using SPSS version 23.0.

RESULTS

Age & Gender Distributions

The mean age of the enrolled participants was 44.3 ± 12.1 years. Of 120 patients, 63.3% were males, and 65.8% came from rural areas. The mean duration of symptoms was 2.0 ± 0.7 months (Table 1).

Table 1: Patient's baseline characteristics (N = 120).

Variables		n(%)
Age; Mean ± SD (years)		44.3 ± 12.1
Gender	Male	76 (63.3)
	Female	44 (36.7)
Residence	Urban	79 (65.8)
	Rural	41 (34.2)
Duration of symptoms; Mean ± SD (month)		2.0 ± 0.7

Frequency of Risk Factors

The most common risk factor observed was obesity (70.8%) patients, followed by smoking, diabetes mellitus, hypertension, and hypothyroidism, as shown in figure 1.

Factors Associated with CTS Risk Factors

Among all patient characteristics, the patient's age was significantly associated with the frequency of obesity (p = 0.046). While none of them were found to affect the frequency of diabetes mellitus (DM) and hypothyroidism. Age and gender were observed as the significant modifiers for smoking frequency (Table 2).

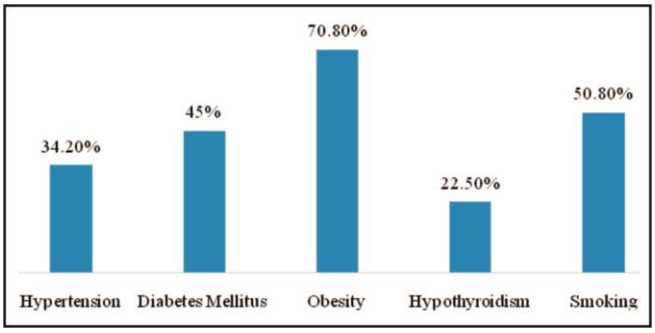

Figure 1: Risk factors' frequency among patients with carpal tunnel syndrome.

DISCUSSION

We designed this study to evaluate the frequency of risk factors among CTS patients. It was observed that most patients were in their '40s, i.e., the mean age was 44.3 ± 12.1 years. Moreover, there was a male majority (63.3%). The peak age was established in a study on clinical surveillance of carpal tunnel syndrome by Bland et al. They

Table 2: Frequency of CTS risk factors in association with patient's baseline characteristics.

Variables		Risk Factors				
		Obesity	Diabetes Mellitus	Smoking	Hypothyroidism	Hypertension
Age groups (years)	≤ 45	51 (78.5)	30 (46.2)	23 (35.4)	15 (23.1)	23 (35.4)
	> 45	34 (61.8)	24 (43.6)	38 (69.1)	12 (21.8)	18 (32.7)
Gender	Male	52 (68.4)	35 (46.1)	58 (76.3)	19 (28.8)	26 (34.2)
	Female	33 (75)	19 (43.2)	3 (6.8)	8 (18.8)	15 (34.1)
Residence	Rural	28 (68.3)	20 (48.8)	16 (23.5)	12 (29.3)	16 (39)
	Urban	57 (72.2)	34 (43.0)	45 (57.0)	15 (19.0)	25 (31.6)
Symptom duration (months)	1 – 2	46 (64.8)	33 (46.5)	34 (47.9)	17 (23.9)	22 (31)
	> 2	39 (79.6)	21 (42.9)	27 (55.1)	10 (20.4)	19 (38.8)

noted two peaks, one between 75 and 84 years old and the other between 50 and 54 years old.[17] Werner et al. observed that out of the 949 subjects, the average age was 46.1 years, but they found high CTS prevalence in females (56%) compared to males.[18] Contrastingly another study reported that CTS was three times more frequent in females than in males.[19] Similar to our findings, Giersiepen et al, concluded that CTS is a work-associated disease in both males and females. In the Bremen population under 65, the proportion attributable to work is roughly 33% for men and 15% for women.[20] The likely explanation for more involvement of males might be that men work more hours per week than women, and manual exposure remains more relevant in males in our local setting.

Moreover, we found that 65.8% of patients were from urban areas. In contrast, Mondelli et al, found that rural and industrial regions had higher age and sex-specific CTS incidences than the urban areas.[21] The reason may be increased awareness and education to seek medical attention for the complaints and easy access to the health facility.

In the present study, the most frequently observed risk factor was obesity, which is consistent with the findings of Karpitskaya and colleagues.[22] According to a study by Becker et al, diabetes mellitus, BMI greater than 30 $kg/m^{2,}$ and female gender were all significantly more prevalent in cases (CTS) than in controls.[23] Moreover, Lam et al. also reported that CTS patients were twice as likely to be overweight compared to healthy individuals.[24]

Considering the microcirculation ischemia theory of CTS, the CTS occurrence could be significantly altered by smoking status.[25] Existing literature confirms the effect of tobacco on microcirculation that leads to hypoxia, vascular endothelium injury, and micro-thrombus.[26] We observed that 61 out of 120 patients were smokers making it the second most frequent risk factor among CTS patients. In agreement, a study reported a high frequency of CTS among smokers; it is determined as a significant risk factor for CTS.[25] While opposing outcomes have also been documented, Karpitskaya et al. suggested a significantly low frequency of CTS patients who smoked than those without CTS ($p < 0.001$; odds ratio, 0.17).[22] A few studies have also evaluated alcohol consumption as a risk factor for CTS,[25,26] but the present study does not include the parameter.

Besides lifestyle factors, systemic conditions, including diabetes and hypothyroidism, were observed in 45% and 22.5% of patients. Ferry et al reported a significantly higher frequency of diabetes among CTS patients than counterparts.[27] Karpitskaya et al, observed a markedly high number of CTS cases who were diabetics or had hypothyroidism.[22] Perkins and colleagues observed a 2% prevalence of clinical CTS in the reference population, 30% in diabetics with diabetic polyneuropathy, and 14% without it.[28] In a case-control study by Guan et al. to determine the risk factors, the odds ratio of diabetes mellitus was 1.837, and hypothyroidism was 1.385.[5] Karne et al, studied 36 adult patients with primary hypothyroidism, where CTS was found in 16.7% of patients,[29] which is low compared to that observed in the present study.

Although the present study is the first attempt from Multan to assess the CTS risk factors, several limitations need consideration. The major limitation was the small sample size. Moreover, the driven outcomes were specific to a single-center experience, requiring further confirmation even for this geographic setting.

CONCLUSION

In this study, obesity was the most frequently observed risk factor among the enrolled CTS patients, followed by smoking, diabetes mellitus, hypertension, and hypothyroidism. Moreover, most of the enrolled CTS patients were in their 40's, males, and residing in urban areas.

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Additional Information

Disclosures: Authors report no conflict of interest.
Ethical Review Board Approval: The study was conformed to the ethical review board requirements.
Human Subjects: Consent was obtained by all patients/participants in this study.
Conflicts 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 relationships 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 there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Sohaib Hassan	1. Study design and methodology.
2.	Usman Ali	2. Paper writing.
3.	Shahtaj Malik	3. Data collection and calculations.
4.	M. Ali Qureshi	4. Analysis of data and interpretation of results.
5.	Maria Jabeen	5. Literature review and referencing.