ORIGINAL ARTICLE

# PREVALENCE OF CARPAL TUNNEL SYNDROME AMONG OFFICE WORKERS IN TWIN CITIES

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**ABSTRACT**

**Objective:** To determine the prevalence of carpal tunnel syndrome among office workers in twin cities.

**Material & Methods:** This was a cross-sectional study that used a non-probability purposive sampling technique to select 134 participants based on predefined inclusion criteria. The frequency of CTS was determined using the Phalen and Tinel test. The Boston Carpal Tunnel Questionnaire (BCTS) was used to evaluate the participants' functional status and severity, and the Numeric discomfort Rating Scale (NPRS) was used to measure their discomfort. SPSS 23 was employed for the purpose of data analysis.

**Results:** Out of the 134 participants, 80% identified as male and 20% as female. The participants' mean service time was 7.14 ± 8.9 years, and their mean age was 29.6 ± 7.7 years. Employees who work 8.6 ± 2.9 hours a day are more likely to have CTS. According to positive Tinel tests, the prevalence was 13.4%, and Phalen tests showed a prevalence of 25.4%. The Phalen and Tinel tests had positive frequency rates of 25.4% and 13.4%, respectively, with the right hand being the dominant hand (87.3%). The symptoms severity score (SSS) of 1.32 ± 0.48 and a functional status score (FSS) of 1.32 ± 0.55 on the Boston Carpal Tunnel Questionnaire.

**Conclusion:** This study found that office workers had a higher likelihood of having CTS, with a prevalence of 25.4% for positive Phalen tests and 13.4% for positive Tinel tests.

**Key Words:** Carpal tunnel syndrome, Hand, Movement, Workload.

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## INTRODUCTION

The carpal tunnel, a tiny aperture in the ventral portion of the forearm, serves as a conduit between the wrist and the palm. Its main function is to safeguard the nine flexor tendons, which are in charge of bending the fingers, as well as the median nerve. The floor of the carpal tunnel is bent in the deep part, while the ceiling is composed of the flexor retinaculum. Persistent constriction of the carpal tunnel (CTS) may lead to carpal tunnel syndrome.[1] There are a number of factors that can result in augmented compression in the carpal tunnel, even if the precise etiology of CTS is unknown.[2] About 3.8% of people worldwide suffer from carpal tunnel syndrome.[3] Individuals with CTS typically have more tissue pressure in the tunnel than those with normal wrists. These symptoms are indicative of CTS, the major cause of nocturnal paresthesia in patients of all ages. The condition is caused by pressure overload in the CT and damage to the median nerve. For normal wrists, the pressure in the CT varies from 2 to 31 mm Hg; however, for wrists with CTS, it can reach up to 32 to 110 mm Hg. Certain wrist motions have the potential to increase the pressure even further. A number of factors, including heredity, rheumatoid arthritis, obesity, pregnancy, and repetitive wrist motions, raise the risk of developing CTS.[4] The severity of CTS is divided into three categories: mild,

moderate, and severe. The symptoms of the illness might differ greatly. Common symptoms include pain, numbness, tingling in the hand, skin color changes, sensitivity to warmth, and a reduction in hand strength.[5,6]

When the patient is awakened from sleep at night and shakes their hand vigorously (the flick sign) to relieve the pain, the complaints typically worsen.[7] Depending on how severe CTS is, different physical examination results are obtained. The radial half of the fourth digit and the first three digits are affected by hypesthesia in more severe cases of CTS, and the thenar muscles atrophy.[8] Hand and wrist symptoms are intimately linked to physical factors such repetitive hand movements, poor posture when using computers, and prolonged usage of visual display terminals (VDTs) like mouse, keyboards, and computers. It's also believed that psychosocial factors, like high stress environments, insufficient rewards, and poor decision-making abilities, could be risk factors for musculoskeletal illnesses.[9] Tinel, Phalen, Durkan, and other tests are frequently used in conjunction with a systematic clinical investigation and the patient's complete medical history to diagnose CTS. However, more advanced techniques, including nerve conduction studies using electrodiagnostic testing, may occasionally be utilized for both therapy planning and diagnosis.[10]

Phalen's test, reverse Phalen's test, and other weight-bearing exercises used for clinical assessment in the carpal tunnel may exacerbate symptoms. Other clinical tests include a two-point discrimination, a median nerve compression test, and a Tinel's sign. In particular, abnormal Tinel's signals may be present in 45–60% of patients with CTS and around 30% of persons without the condition.[11,12] CTS is a common disorder that affects the median nerve in the wrist. It is a major concern worldwide, particularly for professionals in their field. With an annual incidence of 1-3 instances per 1,000 people and a prevalence of 50 cases per 1,000 in wealthy countries, it is the cause of 90% of all neuropathies globally.[13] Skilled persons employed in scientific or medical labs are known as lab technicians. To carry out complex mechanical or diagnostic operations, they make use of specialized instruments, technology, and gear. But there are other ergonomic hazards related to their profession that could cause wrist pain. Some of the tasks that include repetitive movements, excessive force, and awkward postures are pipetting, utilizing microtomes and microscopes, working with biological safety cabinets, and using video display terminals.[14] According to the study, there is a danger of carpal tunnel syndrome and musculoskeletal diseases with 4-5 hours of computer use every day. Carpal tunnel syndrome is more common among professionals who use computer-aided design (CAD) software.[15] There have been several research on the prevalence of CTS in various demographics, but not many on office workers. The purpose of this study is to determine how common carpal tunnel syndrome is amongst office workers in twin cities.

## MATERIAL AND METHODS

A cross-sectional study was directed in the different departments in Comsats University, Islamabad, Pakistan for six months from September 2022 to February 2023. Using the prevalence of CTS[16] and the Epitool website, the sample size of 134 was determined. In this study, a non-probability purposive sampling technique was used. The study included male and female participants, ages 18 to 30, as long as they were willing to participate. However, individuals with wrist fractures, arthritis, or any other hand deformity were not allowed to participate. A self-structured questionnaire was used to collect demographic data. The Numeric Pain Rating Scale (NPRS) was used to measure pain, and the Boston Carpal Tunnel Questionnaire (BCTQ), Tinel's test, and the carpal compression test were used to determine the diagnosis of carpal tunnel syndrome and evaluate symptom severity and functional status.

The Carpal Tunnel Questionnaire assesses the extent of functional capability and the intensity of symptoms in individuals. The Symptoms Severity Scale (SSS) is utilised to assess the kind, frequency, intensity, and duration of symptoms. The Functional Status Scale (FSS) assesses the impact of disease on daily functioning. The symptom severity scale comprises eleven questions addressing the following topics: nocturnal tingling, frequency of the tingling feeling, skill, dormancy, weakness, pain intensity

both diurnally and nocturnally, and the timing of pain throughout the day. Each question has five potential responses, numbered 1 to 5, organised in ascending order of symptom severity. Consequently, a rating of 1 signifies the absence of symptoms, 2 denotes mild symptoms, 3 represents moderate symptoms, 4 indicates acute symptoms, and 5 reflects severe symptoms. The participant's functional status is deduced from eight enquiries, each pertaining to a certain functional activity (writing, buttoning garments, reading while holding a book, hanging a phone, housekeeping, opening a glass vial cap, carrying market bags, bathing, and dressing). Each task is categorised into five levels of difficulty: 1 signifies no trouble, 2 denotes minor difficulty, 3 shows moderate difficulty, 4 represents significant difficulty, and 5 implies that the activity is entirely unfeasible due to hand and wrist pain.

The study has been approved by Ethical Committee of Institute of Health & Management Sciences, Islamabad, ref no: IHMS/DPT/SZABMU-2023/275, whereas informed consent was taken from all participants through a printed form in the English/local language. Every participant's privacy and sovereignty were respected and safeguarded.

The IBM SPSS version 23 was used for data analysis. Descriptive data were analyzed through mean, standard deviation, frequency and percentages while association among two variables were analyzed by Pearson's correlation.

## RESULTS

The study had 134 participants with the mean age was 29.6 ± 7.7 years, their mean height was 5.51 ± 0.45 feet, their average weight was 69.9 ± 18.4 kg, and body mass index was 24.6 ± 6.9 kg/m2. The participants' years of experience were 7.1 ± 6.9 years, their mean working hours were 8.6 ± 2.9 hours and the participant's pain level on the numeric pain rating scale (NPRS) was 1.20 ± 1.97. **(Table 1)**

Out of 134 participants, 107 (80%) were male and 27 (20%) were female. Majority of the participants were graduate 79.95% and doing job. 134 of the participants, 117 (87.3%) were primarily right-handed, 12 (9.0%) were left-handed, and 5 (3.7%) used both hands. To determine the prevalence of CTS, positive results for the Phalen and Tinel tests were found in 34 (25.4%) and 18 (13.4%) cases, respectively **(Table 2)**.

Findings showed that by applying the Boston carpal tunnel questionnaire, we found a symptoms severity score (SSS) of 1.32 ± 0.48 and a functional status score (FSS) of 1.32 ± 0.55.

**Table 1: Demographic Data of the Participants**

| Variable | Mean ± S. D |
|---|---|
| **Age (years)** | 29.6 ± 7.7 |
| **Height (ft)** | 5.5 ± 0.5 |
| **Weight (kg)** | 69.9 ± 18.4 |
| **BMI (kg/m2)** | 24.6 ± 6.9 |
| **Office working hours** | 8.6 ± 2.9 |
| **Duration of service (months)** | 7.14 ± 8.9 |
| **Numeric Pain Rating Scale** | 1.20 ± 1.9 |

**Table 2: Dominant Hand and Diagnostic Tests for Carpal Tunnel Syndrome**

| Variable | | Values n (%) |
|---|---|---|
| **Dominant Hand of Participants** | **Right hand** | 117 (87.3%) |
| | **Left hand** | 12 (9.0%) |
| | **Both hands** | 5 (3.7%) |
| **Phalen Test** | **Positive** | 34 (25.4%) |
| | **Negative** | 100 (74.6%) |
| **Tinel Test** | **Positive** | 18 (13.4%) |
| | **Negative** | 116 (86.6%) |

## DISCUSSION

The general public is prone to CTS, particularly among computer users and office workers. Extended wrist extension compresses the median nerve, causing paresthesia, edema, and a burning feeling in the fingers. Many studies on the prevalence of CTS in different populations have been conducted, but few of them concentrate on office workers in twin cities.[1] This study provides information on the functional state and prevalence of CTS among office workers. The purpose of this study is to evaluate the prevalence of carpal tunnel syndrome in office workers in twin cities.

A number of significant findings were initiate in the 2021 study by Feng et al., which involved 969 participants from 30 workplaces and ages 17 to 49. One of the main findings was that 9.6% of Chinese teenagers who work in offices had clinically proven CTS. The prevalence of clinical CTS was found in 8.4% of male workers and 10.3% of female workers, respectively. Thirty percent said they experienced tingling or numbness at night. Sixteen percent said that tingling or numbness had kept them awake at night during the preceding two weeks. The study highlights the need of addressing risk factors in the workplace, such as extended computer use and nonstop labor.[16]

The goal of the 2019 study by Abdullatif et al. was to find out how common carpal tunnel syndrome (CTS) is in people who use computers excessively. There were 138 patients in the study, and tests like the Phalen, Pinprick, Nerve Conduction, and Tourniquet tests were used to establish CTS clinically. The age range of 26 to 30 years old was shown to have the highest prevalence of CTS, and female employees were more likely than male employees to have CTS (18:1). Overusing a computer for longer than four hours was associated with a higher incidence of CTS, especially when using the mouse often. The study's conclusions indicated that there was insufficient information to determine that using a computer, particularly the mouse and keyboard, causes CT. The research did not identify CTS as a computer-related occupational ailment.[17] The purpose of current study was to demonstrate how common Carpal Tunnel Syndrome is among office workers, particularly those who use computers. Of the 134 individuals, the majority (i.e., 25.4%) had positive results on the Phalen and Tinel tests, indicating that the dominant hand was used correctly. Males are more likely than females to have CTS, particularly in professions where computer use is common.

Sulistika et al. did a second study in 2022 to examine the variables associated with the prevalence of CTS in computer users in the real estate finance sector. Thirty-two people who work in the real estate finance sector participated in the study. It was discovered that 32 respondents, or 68.8%, had CTS. Age or gender did not correlate with the occurrence of CTS. There was a correlation found between the frequency of CTS, awkward hand postures, and length of employment. Compared to females, males were shown to be less likely to experience CTS.[18]

The prevalence and risk factors of self-reported CTS among Kuwaiti office workers were investigated by Raman et al. The prevalence of self-reported CTS amongst Kuwaiti office workers is 18.7%. The population's risk factors for CTS included obesity, female gender, and a high number of connected comorbidities. The frequency of symptoms in the group that did not self-report CTS suggests that the condition may not be as well-known as it is, but more investigation is needed to determine the prevalence of CTS with a clinical diagnosis.[19] Andersen et al. carried out another investigation. The prevalence of CTS is rising among working people, particularly among computer users. The incidence of CTS in computer users, particularly those who use mouse devices, is ascertained by this study. Three outcome measures associated with CTS were examined in this study: the presence of pain, tingling, and numbness in the median nerve of the right hand throughout the night, as well as one or more episodes of tingling/numbness in the hand per week. Based on baseline tingling/numbness in the right hand, the data showed a prevalence of 10.9%, and it was concluded that there was minimal risk of developing possible CTS in that hand. The study demonstrated that there is no appreciable risk of developing CTS symptoms when using a computer at work. Nonetheless, it mentioned that extended usage of keyboard and mouse gadgets was connected to carpal tunnel syndrome.[20]

## CONCLUSION

Based on positive Tinel and Phalen test results, this study determined that the prevalence of CTS amongst office workers was 13.4% and 25.4%, respectively. The Phalen and Tinel tests had positive frequency rates of 25.4% and 13.4%, respectively, with the right hand being the dominant hand (87.3%). the SSS of 1.32 ± 0.48 and a FSS of 1.32 ± 0.55 on the Boston Carpal Tunnel Questionnaire. It was found that men were more likely than women to have CTS. Future research could look at the prevalence of CTS in office workers, both male and female, and the relationship between the condition and using a computer's mouse and keyboard.

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