



## Original Article

## Carpal Tunnel Syndrome in Motorbike Riders: Prevalence, Severity, and Implications for Occupational Health

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## ABSTRACT

The clinical diagnosis of Carpal Tunnel Syndrome (CTS) is based on a collection of symptoms and indicators that point to compression of the median nerve within the carpal tunnel. **Objective:** To find out the severity, functional status, and pain of carpal tunnel syndrome in motorbike riders using BCTQ and NPRS. **Methods:** A cross-sectional study was conducted in 4 months on 169 motorbike riders in Faisalabad based on inclusion and exclusion criteria after obtaining consent. Phalen test was used to see carpal tunnel syndrome. Pain identification was done by using BCTQ in the selected subjects. Data were evaluated by SPSS version 22. Pearson Chi-Square test was applied for BCTQ symptom severity and functional limitation. **Results:** Data showed that all 169 participants were men. It also demonstrated that 42% fall in the category of 20-24 years, 33.1% fall in the 25-29 years category, and 24.9% fall in the age category of 30-34 years. The distribution showed that the prevalence of carpal tunnel syndrome by the Phalen test was 13% (22) among motorbike riders (169). **Conclusions:** Bike riding is an occupational hazard for CTS. To lower the risk of CTS in occupations involving motorbike riders, programs utilizing ergonomic and industrial hygiene improvement must be developed and implemented. The study showed that the prevalence of CTS among motorbike riders was 13% and the mean  $\pm$  S.D was 1.869  $\pm$  .3375.

## INTRODUCTION

The carpal bones on the bottom of the wrist and the transverse carpal ligament across the top of the wrist combine to form the carpal tunnel, an aperture of the wrist [1]. The clinical diagnosis of Carpal Tunnel Syndrome (CTS) is based on a collection of symptoms and indicators (sensory pain, motor dysfunction) that point to compression of the median nerve within the carpal tunnel [1]. The non-extendable osteofibrous tunnel is bordered on the ulnar and radial edges and the carpal tunnel narrows at a 20mm point from its proximal margin [2]. The median nerve is surrounded by four tendons from the superficial flexors of the fingers, four tendons from the deep flexors of the fingers, and the long flexors of the thumb [2]. The sensations such as paresthesia, hypoesthesia, hyperesthesia, and discomfort that may extend proximally

into the forearm, upper arm, and shoulder are triggered by constriction of the median nerve at the carpal tunnel [3]. Patients who have pressure or repetitive motion applied to their wrist joint are more likely to develop CTS [4]. CTS can be caused by sewing, typing, driving, painting, writing, vibratory tools, and sports [4]. Anatomically, the median nerve is compressed at two different locations; first at the carpal tunnel's proximal end, and second at the narrowest portion [5]. A study proposed the following clinical anatomical classification; Early stage Initial, Intermediate stage, and Advanced stage [6]. In adults, Carpal Tunnel Syndrome affects 1 in 20 people, with females outnumbering males three to one [7]. A persisting median artery in the carpal tunnel is often diagnosed based on the patient's medical history and clinical symptoms [8].

Motorcycling is gaining popularity [9]. Published details about overuse syndromes caused by off-road motorcycle sports include carpal tunnel syndrome and Raynaud syndrome [10, 11]. The most prevalent of all nerve compression syndromes, CTS affects one to five percent of the normal population [12, 13]. The diagnosis of CTS is established clinically by the use of various tests such as the Tinel Test, the Phalen Test, and the Hand Elevation Test [14]. Fractures of adjacent bones are commonly associated with Peripheral Nerve Injuries which are frequently underestimated [15-17]. The Tinel test's sensitivity is between 26-79% and the specificity is between 40-100% [18]. Phalen test's sensitivity is between 67-83% and the specificity is between 47-100% [19]. The approach to managing CTS involves the use of splints, corticosteroids, physical therapy, therapeutic ultrasound, and yoga [20]. Physical therapy and nerve glide exercises are good treatment options [21]. High-frequency electromagnetic radiation is employed in targeted radiofrequency treatment to heat deep tissues, encouraging tissue regeneration [22]. Laser therapy is used to alleviate symptoms such as pain and paresthesia [23]. Magnetotherapy is utilized to counteract oxidative stress, improve oxidative processes, and encourage tissue trophic growth [24]. A regular light attentive massage affects muscle hypertrophy [25].

The study aims to assess the prevalence of carpal tunnel syndrome in motorbike riders in Faisalabad. However, the research question is, what is the prevalence of carpal tunnel syndrome in motorbike riders in Faisalabad?

## METHODS

A cross-sectional (observational) study was conducted on bike riders (Food delivery riders, courier riders) of Faisalabad over four months; January 2023 to April 2023. The sample size was 169, calculated by the formula with a 95% confidence interval and 5% margin of error by OpenEpi software via a convenient (non-probability) sampling technique. Male bike riders working for 2-10 hours a day, aged between 20-35 years were included in the study. However, males who had having history of fracture of the arm, surgery of the arm, diabetes mellitus, kidney diseases, rheumatoid arthritis, and computer users were excluded from the study. The data were collected through tools such as; the Numeric Pain Rating Scale (a segmented numeric variant in which a respondent chooses a number that best depicts the severity of discomfort), Phalen's Test (a provocative test used to diagnose CTS), and Boston Carpal Tunnel Syndrome Questionnaire (a validated questionnaire designed to measure CTS symptoms and functional limitations) [25, 26]. The data were analyzed by SPSS version 22. The Pearson Chi-square test was used for BCTQ

symptom severity and BCTQ functional limitation in bike riders. The study had no ethical issues as no medication was given to any individual during the study. Further, consent was obtained before the study from the participant. The ethics committee of Faisal Hospital (FIHS), Faisalabad, Pakistan, gave the ethical clearance numbered FIHS/2023/04 dated 02/01/2023.

## RESULTS

Table 1 shows the age distribution of 169 participants. The mean age was  $26.68 \pm 3.47$  years. 71 participants lay in the 20-24 years category, 56 participants lay in the 25-29 years category, and the rest 42 participants lay in the 30-34 years category.

**Table 1:** Age-group distribution of 169 participants

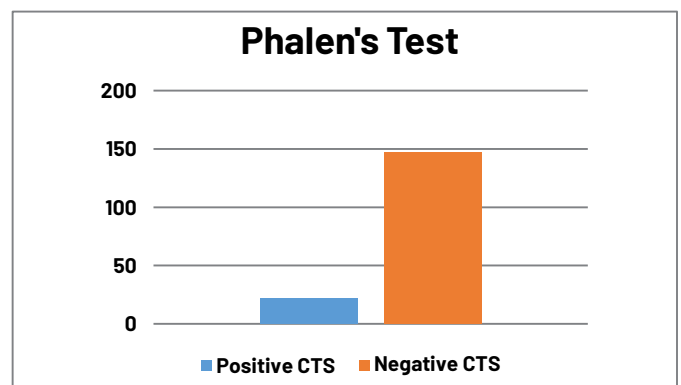
Age-Group	Frequency (%)
20-24 years	71 (42)
25-29 years	56 (33.1)
30-34 years	42 (24.9)
Total	169 (100)

Table 2 shows the distribution of pain levels in the participants. The mean  $\pm$  SD of pain was  $.3550 \pm .8263$ . Out of 169 participants, 139 participants had no pain, 8 participants had mild pain, 14 participants had moderate pain and the remaining 8 participants had severe pain.

**Table 2:** Level of Pain by NPRS

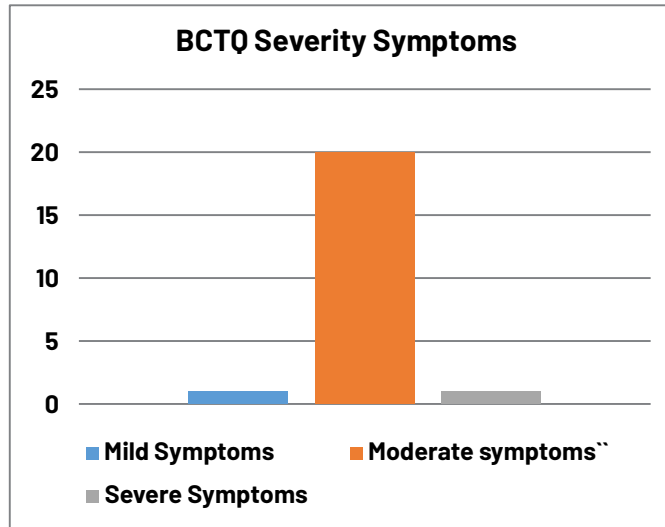
Pain Level	Frequency (%)
No Pain	139 (82.2)
Mild Pain	8 (4.7)
Moderate Pain	14 (8.3)
Severe Pain	8 (4.7)

Figure 1 shows the prevalence of CTS by Phalen's Test. The Mean  $\pm$  SD of the CTS was  $1.869 \pm .3375$ . The data showed that 22 participants (13%) had CTS while the remaining 147 (87%) participants did not have CTS.



**Figure 1:** Prevalence of CTS

Figure 2 shows the severity of symptoms of 22 positive CTS by the Boston Carpal Tunnel Syndrome Questionnaire. The Mean ± S.D was 3.000 ± .30861. The data showed that 1 participant had mild symptoms, 20 participants had moderate symptoms, and the remaining 1 participant had severe symptoms (wrist pain and tingling at day and night).



**Figure 2:** Symptoms Severity by BCTQ

Table 3 shows the description of the functional status of the participants by the Boston Carpal Tunnel Syndrome Questionnaire. The Mean ± S.D was 2.6364 ± .49237. The data showed that 8 (36%) participants had mild functional limitations and the remaining 14 (64%) participants had moderate functional limitations (writing, gripping, household chores, etc).

**Table 3:** Functional Status by BCTQ

Scale	Frequency (%)
Mild	8 (36)
Moderate	14 (64)
Total	22 (100)

The Pearson Chi-Square test revealed that the BCTQ symptom severity is significant with a value of  $p=0.02$  (less than 0.05) and BCTQ functional limitation is also significant with a value of  $p=0.03$  (less than 0.05) in Bike Riders in Faisalabad. However, the Linear-by-Linear association is less than 0.01 in both BCTQ symptom severity and functional limitation.

## DISCUSSION

169 individuals were recruited in the study out of which 22 showed positive CTS while the remaining showed negative CTS. The prevalence of CTS in dentists was reported to be 16.7% in an Iranian study by Haghghat et al., in 2012 that was done to estimate the disease's prevalence [27]. In an American study by Luckhaupt et al., in 2013 among adults, the

lifetime prevalence rate of self-reported, clinically diagnosed CTS was 8.0% (95% CI 7.6–8.4) [28]. A study carried out in Karachi by Khan et al., in 2014 discovered that dentists had a 10.13% prevalence of CTS [29]. In concordance with these studies, bike riders were found to have a 13% prevalence of CTS in the given study in comparison to the prevalence of CTS in the mentioned studies; 16.7% in Iranians, 8% in Americans, and 10% in the Karachi population. A study conducted by Dale et al., in 2013 revealed a mean age of  $38.5 \pm 11.8$  years [30]. In the current study, the mean age of the participants was  $26.68 \pm 3.47$  years, with most participants lying in the age group of 20-24 years. A study conducted by Sousa, in 2017 on a group of cyclists, (professionals/amateurs, mountain bikers) had 88% of male cyclists while 12% female cyclists [31]. However, the given study solely comprised male bike riders; 169 participants. According to a study carried out on dentists in Peshawar by Zubair et al., in 2022, at the time of data collection, 71.2% of dentists reported having no pain, 18.9% reported having light pain, and 9.8% reported having moderate pain [32]. The current study showed that 82.2% of participants had no pain, the remaining 4.7% participants had mild pain, 8.3% participants had moderate pain, and 4.7% participants had severe pain. According to a study by Ravisankar and Thenmozhi, in India in 2020. Utilizing the BCTQ on 100 dentists, 63% of the participants were asymptomatic, 18% had mild symptoms, 10% had severe symptoms, and 5% had extremely severe symptoms [33]. The results of the given study well correlate with the Indian study, 4.5% of participants had mild symptoms, 90.9% of participants had moderate symptoms, and the remaining 4.5% of participants had severe symptoms. An Indian study carried out by Inbasekaran et al., in 2018 found that 17.5% of dentists in Chennai city had CTS, with periodontists and endodontists having higher prevalence rates than dentists in other dental specialties. The repetitive motions made during scaling and root planning or the ultrasonic scaler's vibration may be the cause of the rising prevalence among periodontists [34]. Research done on nurses in Thailand by Ithnin, in 2012 revealed a 7.5% prevalence of carpal tunnel syndrome among the 80 nurses working in the medical ward [35]. The given study showed that 13% of bike riders in Faisalabad city had a positive Phalen test, supporting the diagnosis of carpal tunnel syndrome.

## CONCLUSIONS

Out of 169 participants, 22 participants showed Phalen Test positive but others showed negative. The prevalence of Carpel Tunnel Syndrome among bike riders in Faisalabad was 22 (13%). Out of 169 bike riders, 139 (82.2%) showed no pain, 8 (4.7%) had mild pain, 14 (8.3%) had moderate pain, and the remaining 8 (4.7%) had severe pain. Out of 22 positive CTS bike riders, 14 (64%) had functional limitations

(writing, gripping, household chores) by BCTQ while 20 participants had moderate-severity symptoms by BCTQ. The Phalen's Test proved to be the gold standard test to diagnose CTS in bike riders.

### Authors Contribution

Conceptualization: AMK

Methodology: AMK, MMA, MMR

Formal analysis: AMK, MMA

Writing-review and editing: AMK, MMA, MMR

All authors have read and agreed to the published version of the manuscript.

### Conflicts of Interest

The authors declare no conflict of interest.

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