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Research Article

Prevalence of Carpal Tunnel Syndrome Symptoms in Excavator Machine Drivers in District Swat, Pakistan

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Abstract

The objective of this study was to investigate the prevalence of carpal tunnel syndrome (CTS) symptoms among excavator machine drivers in the district of Swat, Pakistan. The duration of the study spanned six months, and data collection was done over two months by a CTS diagnostic questionnaire. The sample size calculated for the research study was 292, and a convenience sampling technique was employed. There were 3 categories of diagnostic CTS questionnaire, among which 10(3.4%) fell in unlikely CTS (1-2 score, category-1), 134(45%) fell in the suggested possibility of CTS (3-4 score, category-2), and 148(50.7%) fell in strongly suggestive of CTS (5 or more score, category-3). The mean and standard deviation (SD) of CTS symptoms among excavator driver participants was 2.4±0.5. The results demonstrate a high prevalence of CTS symptoms among excavator machine drivers in the district of Swat, Pakistan.

Keywords: Carpal tunnel syndrome, excavator machine, median nerve, pain, prevalence

1. Introduction

Carpal Tunnel Syndrome (CTS) is a disorder in which the median nerve is trapped in the carpal tunnel and as a result, a person feels tingling, weakness, and numbness in the wrist joint. It is mainly caused by excessive pressure on the wrist joint (Hayder et al. 2022). This condition represents the most common compressive mononeuropathy of the upper limb, which may lead to major disability (Zaralieva et al. 2020). It is characterized by motor and sensory symptoms and signs in the allocation area of the median nerve, generally distal to the wrist (Stjernbrandt et al. 2022). Early symptoms of the CTS include pain, paresthesia, numbness, and weakness. With some variation, these symptoms most frequently appear on the thumb, index finger, and radial half (thumb side) of the ring finger (Sevy and Varacallo 2022). CTS risk factors include repetitive and excessive hand and wrist use, awkward postures, vibration, and heavy lifting. Additionally, personal predictors such as female gender, obesity, advanced age, and smoking also predispose one to developing CTS (Feng et al. 2021).

Assessed by the ultrasound of the median nerve cross-sectional area, CTS symptoms are categorized into mild, moderate, and severe (Roomizadeh et al. 2019). Mild CTS is defined as slow orthotropic sensory conduction velocity (<44 m/s) and normal motor response time. Slow orthotropic sensory conduction velocity (<44 m/s) and an increase in motor distal delay, more than 4.4 m/s, are considered to be signs of moderate CTS. Prolonged or absent motor distal delay and lack of sensory nerve action potential

Table 1. CTS scores, their frequency, and the percentage of the participants.

CTS Score	Frequency	Percent	Mean	Std. Deviation
.00	2	.7	4.7226	1.93763
1.00	3	1.0		
2.00	5	1.7		
3.00	105	36.0		
4.00	30	10.3		
5.00	46	15.8		
6.00	56	19.2		
7.00	13	4.5		
8.00	14	4.8		
9.00	18	6.2		
Total	292	100.0		

are used to diagnose severe CTS (Shafaee-Khanghah, Akbari, and Bagheri 2020). Physical assessment of findings, such as the Phalen maneuver, flick sign, median nerve compression test, tinsel's test, and electrophysiological tests are also performed. Patients with usual symptoms and signs of CTS do not need other testing, like ultrasonography, and electrodiagnostic procedures (Wipperman and Goerl 2016). CTS Patients typically undergo manual treatment like stretching exercises, ultrasound therapy, and other forms of physical therapy twice a week for two weeks (Putri, Sudaryanto, and Ismadi 2022).

The worldwide prevalence rate of CTS in the general population is about 3.8%, and it is more common in females (up to a 9.2% prevalence rate) than in males (6%) (Bukhari et al. 2018). In a study, among 100 auto-rickshaw drivers, 23 subjects had pain, numbness, and tingling; 16 subjects had weakness; and 10 subjects had pain at night. The investigators of this study came to the conclusion that auto-rickshaw drivers have a 23% prevalence of CTS. In Pakistan, comprehensive data on CTS prevalence is not available. One study, conducted in Karachi, showed that the prevalence of CTS among dentists was 10.13% (Zubair et al. 2022).

An excavator is a hydraulic, heavy-duty, human-operated machine used in a variety of common tasks, including digging, ground leveling, carrying, and dumping loads. The excavator machine operators are at high risk of developing CTS (Khan, Islam, and Hossain 2016). If left untreated, it can lead to permanent median nerve damage (Mansoor et al. 2017). Mild CTS presents in the form of 'irritant' symptoms including dysesthesia, and sleep disturbance. However, severe CTS may extensively impair motor and sensory function (Newington, Harris, and Walker-Bone 2015). It also includes sensory instability from the palm of the hand to the fingertips, typically in the dominant hand in 80% of cases, which also radiates to the elbow (Saint-Lary et al. 2015). The thumb, index finger, middle finger, and the radial side of the ring finger may all experience these symptoms, leading to a reduction in grip strength and hand function. The incidence of CTS over a long time may also atrophy the muscles at the base of the thumb (Genova et al. 2020). Patients with CTS may also present with aches, changes in skin color, and temperature sensitivity. Some patients claim that the thenar muscles have atrophied and weakened interfering with normal hand function (Singjam, Charoentanyarak, and Saengsuwan 2021). In this investigation, we investigated the prevalence of CTS symptoms in excavator machine drivers in the district of Swat, Pakistan.

Table 2. CTS diagnostic categories and their corresponding score.

	Frequency	Percent	Mean CTS symptoms	Std. Deviation CTS symptoms	Df	Sig. (p-value)
Unlikely Carpal Tunnel Syndrome (1-2 score)	10	3.4				
Suggested possibility of Carpal Tunnel Syndrome (3-4 score)	134	45.9				
Strongly suggestive of Carpal Tunnel Syndrome (5 or more score)	148	50.7				
Total	292	100.0	2.4726	.56465	18	.001

2. Methodology

This cross-sectional study was conducted on 292 subjects, recruited through a non-probability convenient sampling technique, over the period of 6 months, in district Swat, Pakistan. Participants who were excavator drivers in the district Swat, aged between 24-46, working for 8 or more hours daily, with a work experience of six months or more, were included in the study. On the other hand, participants with ages below 24 and above 46 years, working experience of less than six months, or with a history of surgery, fracture, or trauma, and daily working hours of less than 8 hours, were excluded. The purpose of the study was explained, and informed consent was obtained from all participants, and the CTS diagnostic questionnaire was filled.

3. Results

The mean age of participants was 30.5±5.7 years. Among the participants, 2 (0.7%) scored 0 on CTS symptoms score test, 3 (1%) scored 1, 5 (1.7%) scored 2, 105 (36%) scored 3, 30 (10.3%) scored 4, 46 (15.5%) scored 5, 56 (19.2%) scored 6, 13 (4.5%) scored 7, 14 (4.8%) scored 8 and 18 participants scored 9 (Table 1). The mean and SD of the total score of participants were 4.7±1.9. There were 3 categories of diagnostic CTS questionnaire (Table 2) in which 10(3.4%) fell in the unlikely CTS category (1-2 score, category-1), 134 (45%) indicated the possibility of CTS (3-4 score, category-2), and 148 (50.7%) fell in the strongly suggestive category of CTS (5 or more, score category-3).

4. Discussion

CTS is a disease related to the wrist, involving nerve entrapment near the carpal tunnel due to repetitive wrist movement. In addition, excessive pressure on the wrist can lead to numbness, tingling, and weakness in the wrist (Hayder et al. 2022). Several studies have shown that whole-body vibration on the seats of combine harvesters, wheel tractors, and excavators exceeds exposure limits, impacting proficiency and comfort boundaries as compared with the ISO 2631-1 standard (Tint et al. 2012). Many studies have suggested that age also plays a significant role in CTS development. We investigated the symptoms of CTS in excavator drivers using a CTS diagnostic questionnaire, which categorized scores as follows: <3 (unlikely CTS), 3-4 (possible CTS), and 5 or more (strongly suggestive of CTS). In this study, the recruited sample showed CTS symptoms among excavator driver participants to be 2.4±0.5. Out of 292 excavator drivers, 10 (3.4%) were unlikely to have CTS, 134 (45%) were suggested to have a possible CTS, and 148 (50.7%) were strongly suggestive of having CTS. A previous study reported a prevalence rate of 14.4% in symptomatic patients with clinically and electrophysiologically confirmed CTS (Melhorn and Talmage 2013). Similarly, another study found that 23% of rickshaw drivers were

experiencing symptoms of CTS (Gopinath and Binoosh). Moreover, in the present study, we had 148 (50.7%) subjects with symptoms strongly suggestive of CTS, while previous research reported a prevalence rate of 14.4% (95% confidence interval [CI], 13.0%- 15.8%) in patients who had clinically and electrophysiological confirmed CTS (Melhorn and Talmage 2013).

5. Conclusions

Our study found a higher prevalence of CTS, possibly due to the heavy-duty nature of the drivers' work involving prolonged duty times, body vibration, and repetitive hand movements. The study concluded that there was a significant prevalence of CTS symptoms among excavator machine drivers in the district of Swat.

Conflict of Interest

All the authors declare no conflicts of interest.

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Study Approval

Approval was obtained from the head of the physical therapy department at Abasyn University Peshawar, Pakistan

Consent Forms

Each and every participant signed a consent form before participating in the research.

Authors Contributions

HUK conceptualized the study, AK, MM and SK did the experimental part and analysis of the results, HUK and SK supervised the whole project and wrote the final manuscript.

Data Availability

All the data relevant to this study is with the authors.

Acknowledgments

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