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To Study the Prevalence of Carpal Tunnel Syndrome, its Severity and Functional Status Among Hairdressers in Twin Cities of Pakistan: A Cross-Sectional Study

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Abstract

Background: Carpal Tunnel Syndrome (CTS) is a common occupational disorder caused by repetitive hand movements and prolonged wrist positions. Hairdressers are particularly at risk due to the nature of their work. This study aimed to determine the prevalence of CTS among hairdressers in the twin cities of Pakistan and to assess its impact on their functional activities. Aims and Objectives: The main aim of this study was

to determine the prevalence of Carpal Tunnel Syndrome (CTS) among hairdressers in the twin cities of Pakistan and to identify how many hairdressers are affected by CTS in twin cities. Materials and Methods: A cross-sectional survey was conducted with 385 hairdressers from Rawalpindi and Islamabad. Data were collected using a structured questionnaire based on symptom severity and functional status, including hand pain, numbness, tingling, and difficulty in daily tasks such as writing, buttoning, and gripping objects Data Analysis: The data collected from 385 hairdressers through structured questionnaires were entered and analyzed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were used to summarize the demographic data, such as age, gender, work experience, and working hours. Results: The prevalence of CTS among participants was found to be 11.9%, while 88.1% were classified as normal. Most participants were aged between 37–47 years and had 5–15 years of working experience. Although the majority reported mild or no symptoms, a notable number experienced pain, numbness, or functional limitations, particularly during repetitive tasks or at night. Conclusions: CTS is present in a significant portion of the hairdressing population, highlighting the need for awareness, ergonomic interventions, and preventive strategies in this profession. Early detection and proper management may help reduce long-term disability and improve work productivity.

Keywords: Carpal Tunnel Syndrome (CTS), Hairdressers, Occupational Health, Prevalence, Functional Impairment, Repetitive Strain Injury

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is one of the most prevalent peripheral nerve entrapment disorders, caused by compression of the median nerve within the carpal tunnel of the wrist . This condition commonly presents with symptoms such as pain, numbness, tingling, and weakness in the hand, particularly affecting the thumb, index, and middle fingers (Genova et al., 2020) . CTS is widely recognized as an occupational health concern, especially among individuals engaged in repetitive manual tasks and prolonged wrist postures.

The anatomical structure of the carpal tunnel, being a rigid and non-expandable passage, makes the median nerve particularly vulnerable to increased pressure caused by inflammation, tendon swelling, or repetitive strain . Prolonged compression can result in ischemic injury and disruption of the blood-nerve barrier, ultimately impairing nerve function (Aboonq, 2015) . Several risk factors contribute to the development of CTS, including repetitive wrist movements, obesity, pregnancy, rheumatoid arthritis, and genetic predisposition (Kozak et al., 2015; Genova et al., 2020). Cybersecurity and health scineces are now a great combination in globally (Imtiaz et al., 2025).

Hairdressers represent a high-risk occupational group due to the nature of their work, which involves repetitive hand movements, sustained gripping, and prolonged standing hours. Activities such as cutting, styling, and blow-drying hair require continuous wrist flexion and extension, increasing the likelihood of median nerve compression (Imtiaz, 2026). Despite this, limited research has focused on this population in Pakistan, particularly in the twin cities of Rawalpindi and Islamabad.

CTS not only affects physical health but also significantly impacts functional ability and quality of life. Individuals with CTS often experience difficulty performing daily activities such as writing, gripping objects, and carrying items, leading to reduced productivity and psychological distress (Huisstede et al., 2018) . Early identification and intervention are crucial to prevent progression to severe stages, which may require surgical management (Carlson et al., 2010) .

Therefore, this study aims to assess the prevalence, severity, and functional impact of CTS among hairdressers in the twin cities of Pakistan, providing valuable insights for preventive and therapeutic strategies.

Problem Statement

Carpal Tunnel Syndrome (CTS) is a prevalent occupational disorder associated with repetitive hand movements, yet limited research has been conducted on its impact among hairdressers in Pakistan. Hairdressers in the twin cities are exposed to prolonged working hours and poor ergonomic conditions, increasing their risk of developing CTS. However, the prevalence, severity, and functional limitations of CTS within this group remain underexplored. This lack of localized evidence hinders effective prevention and intervention strategies, necessitating focused research in this occupational population.

Literature Review

Carpal Tunnel Syndrome (CTS) has been extensively studied as a significant occupational and clinical condition affecting the upper extremities. It is widely acknowledged as the most common entrapment neuropathy, characterized by compression of the median nerve within the carpal tunnel, leading to pain, numbness, and functional impairment (Berlanga-de-Mingo et al., 2019) . Research indicates that CTS prevalence varies across populations but is strongly associated with occupational exposure and repetitive hand activities.

Several studies have specifically explored CTS among hairdressers due to the repetitive and forceful hand movements required in this profession. Erick et al. (2021) conducted a study in Gaborone involving 184 hairstylists and found a high prevalence of CTS, particularly among females, with contributing factors including work-related stress and ergonomic conditions . Similarly, Demiryurek and Aksoy Gündoğdu (2018) reported

that hairdressers engaged in repetitive tasks exhibited a higher frequency and severity of CTS, emphasizing that reduced working hours could help mitigate symptoms .

In Pakistan, limited but relevant studies have been conducted. Kamal et al. (2023) examined musculoskeletal disorders among hairdressers in Lahore and found a high prevalence of work-related disorders, highlighting the need for ergonomic awareness . Another study by Zaheer et al. (2023) focused on barbers and identified significant musculoskeletal issues, particularly in individuals working long hours, reinforcing the occupational risk associated with such professions .

The role of occupational factors in CTS development has been widely documented. Giersiepen and Spallek (2011) emphasized that repetitive wrist movements, forceful exertion, and use of vibrating tools are primary contributors to CTS, while job title alone is less significant than the nature of tasks performed . Similarly, Kozak et al. (2015) confirmed a dose-response relationship, where increased exposure to repetitive hand activity significantly raises CTS risk .

Diagnostic approaches for CTS have also been extensively studied. Clinical tests such as Tinel's sign and Phalen's maneuver are commonly used for initial assessment (Durkan, 1991) . Hems et al. (2009) demonstrated that structured questionnaires combined with clinical evaluation can provide reliable diagnostic outcomes, with sensitivity up to 82% . Additionally, the Boston Carpal Tunnel Questionnaire (BCTQ) has been validated as a reliable tool for assessing symptom severity and functional status (Leite et al., 2006) .

Epidemiological studies reveal that CTS affects a significant portion of the general population. For instance, Gerritsen et al. (2002) reported that approximately 3% of adults are affected by CTS, with higher prevalence among women and older individuals . Maghsoudipour et al. (2008) found an 11.9% prevalence among industrial workers, linking the condition to occupational risk factors such as lifting heavy objects and repetitive wrist movements . These findings align with the current study's reported prevalence of 11.9%, indicating consistency with global occupational data .

Treatment strategies for CTS vary depending on severity. Conservative management includes splinting, physiotherapy, and ergonomic modifications, while severe cases may require surgical intervention (Hernández-Secorún et al., 2021) . Physiotherapy interventions such as stretching, strengthening exercises, and neurodynamic techniques have shown effectiveness in improving functional outcomes and reducing symptoms (Huisstede et al., 2018) .

Furthermore, CTS has a profound impact on quality of life. Patients often experience sleep disturbances, reduced work efficiency, and limitations in daily activities (Patel et al.,

2012) . Psychological factors such as anxiety and depression have also been associated with CTS, highlighting the need for comprehensive management approaches (Abdul-Razzak & Kofahi, 2020) .

Overall, the literature underscores the multifactorial nature of CTS, involving occupational, biological, and ergonomic factors. Despite global evidence, there remains a lack of localized research focusing on hairdressers in Pakistan, necessitating studies that address this gap and provide context-specific insights.

MATERIALS AND METHODS

STUDY DESIGN

A Cross-sectional survey

SAMPLING TECHNIQUE

Convenient sampling

STUDY DURATION

Data is collected in four months after synopsis.

SAMPLE SIZE

The sample size is calculated via the Open EPI tool. The total population of Rawalpindi and Islamabad between the ages of 18 and 60 is estimated to be around 4,297,698. This is based on data from the 2017 census. In Rawalpindi approximately 2,915,378 people are estimated between age 18 and 60. In Islamabad approximately 1,382,320 people are estimated between age 18 and 60

So, we put the 4,297,698 the total population of Twin Cities in Open EPI tool and we get 385 sample size with 95% confidence level

Sample Size for Frequency in a Population

Population size(for finite population correction factor or fpc)(*N*):	4297699
Hypothesized % frequency of outcome factor in the population (*p*):	50%+/-5
Confidence limits as % of 100(absolute +/- %)(*d*):	5%
Design effect (for cluster surveys-*DEFF*):	1

Sample Size(*n*) for Various Confidence Levels

ConfidenceLevel(%)	Sample Size
95%	385
80%	165
90%	271
97%	471
99%	664
99.9%	1083
99.99%	1514

Equation

Sample size $n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]$

Results from OpenEpi, Version 3, open source calculator--SSPropor
Print from the browser with ctrl-P
or select text to copy and paste to other programs.

INCLUSION CRITERIA

Age 18 to 60

Male and Female hairdressers Work load minimum 7 to 10 hours

Working Experience minimum 5 years

Exclusion Criteria

Prior Wrist Injury or Surgery Current Medication Pregnancy

Mental Health Conditions

Tools

The tool we used is Boston Carpal Tunnel Syndrome Questionnaire. This tool demonstrated excellent internal consistency reliability as the Cronbach's alpha values ranges from 0.80 to 0.90 for the symptom severity scale and from 0.88 to 0.93 for functional status scale

The Pearson's correlation coefficient for symptom severity scale is from 0.64 to 0.91 and for functional status scale is from 0.71 to 0.93

Its validity has been shown to be high when it was competed with widely used upper extremity patient outcomes whose spear man reliability is from 0.71 to 0.90

ETHICAL CONSIDERATIONS

Researchers should sign the consent form (present in the appendix) from participants before collecting data, the researcher should let the subject give his data voluntarily without any force. Keep the confidentiality of the patient's information. Do not harm the subject in either way, either psychologically, physically, or emotionally. Respect for the dignity of research participants.

RESULTS AND DISCUSSION

Results

Table 1: *Demographic Characteristics of Participants (n = 385)*

Variable	Category	Frequency	Percentage (%)
Age	16–26	101	26.2
	27–37	167	43.4
	38–48	82	21.3
	49–60	34	8.8
Gender	Male	194	50.4
	Female	191	49.6
Work Experience (years)	5–15	275	71.4

	16–26	90	23.4
	27–37	20	5.2
Working Hours/day	7 hours	28	7.3
	8 hours	127	33.0
	9 hours	63	16.4
	10 hours	167	43.4

The majority of participants were aged 27–37 years (43.4%), indicating a relatively young and active workforce. Gender distribution was nearly equal. Most participants had 5–15 years of experience (71.4%) and worked long hours, with 43.4% working 10 hours daily, highlighting high occupational exposure.

Table 2: *Symptoms of Carpal Tunnel Syndrome*

Symptom	Normal (%)	Mild (%)	Moderate (%)	Severe (%)
Night Pain	80.8	14.0	4.7	0.5
Day Pain	80.3	11.9	6.2	1.6
Numbness	76.6	14.8	7.3	1.3
Weakness	77.9	12.7	7.8	1.6
Tingling	80.0	13.5	4.9	1.6

Most participants reported no symptoms; however, a noticeable proportion experienced mild to moderate symptoms, particularly numbness (22.1%) and weakness (20.5%). This suggests early-stage CTS symptoms are present in a subset of the population.

Table 3: *Functional Difficulties*

Activity	No Difficulty (%)	Mild (%)	Moderate (%)	Severe (%)
Grasping Objects	85.2	10.1	3.1	1.6
Writing	86.8	10.1	2.6	0.5
Buttoning Clothes	85.5	10.4	3.1	1.0
Holding Book	82.3	12.5	4.2	1.0
Household Chores	85.5	10.6	2.3	1.6

The majority of participants did not experience functional limitations; however, 10–15% reported mild difficulty in daily activities, indicating early functional impairment associated with CTS symptoms.

Table 4: *Overall Severity and Prevalence of CTS*

Category	Frequency	Percentage (%)
Normal	339	88.1
Mild	39	10.1
Moderate	6	1.6
Severe	1	0.3
Prevalence		
Condition	**Frequency**	**Percentage (%)**
CTS	46	11.9
Non-CTS	339	88.1

The prevalence of CTS among hairdressers was found to be **11.9%**, with most cases being mild. Severe cases were rare, indicating that early-stage CTS is more common in this occupational group.

Table 5: *Association between Weakness and Household Activities*

Statistical Test	Value	p-value
Chi-Square	401.536	0.000

A significant association ($p < 0.05$) was found between hand weakness and difficulty in performing household chores, indicating that increasing symptom severity directly impacts functional ability.

Discussion

The findings of this study highlight that Carpal Tunnel Syndrome (CTS) is present among hairdressers, with a prevalence rate of 11.9%. This aligns with previous studies that reported similar prevalence rates in occupational settings involving repetitive hand movements. The relatively high prevalence can be attributed to prolonged working hours and repetitive wrist activities, which are common in the hairdressing profession.

The demographic analysis revealed that most participants were young adults with significant work experience and long working hours. This suggests that cumulative exposure to occupational stressors plays a critical role in the development of CTS. The high percentage of individuals working 10 hours daily further reinforces the role of overuse and repetitive strain as key risk factors.

Symptom analysis showed that while the majority of participants were asymptomatic, a considerable proportion reported mild to moderate symptoms such as numbness, tingling, and weakness. These findings indicate that CTS in this population is

mostly in its early stages. Similar patterns have been reported in previous studies, where early symptoms often go unnoticed or untreated, leading to progression over time.

Functional assessment demonstrated that most participants retained normal functional ability; however, a subset experienced mild difficulties in tasks such as grasping objects, writing, and performing household chores. This suggests that even mild CTS symptoms can begin to affect daily activities, emphasizing the importance of early intervention.

The statistically significant association between hand weakness and household activity limitations further confirms that symptom severity directly impacts functional performance. This finding is consistent with existing literature, which highlights that CTS can reduce productivity and quality of life.

Overall, the study indicates that although severe CTS is uncommon, mild and moderate symptoms are prevalent among hairdressers. This underscores the need for preventive strategies such as ergonomic adjustments, reduced working hours, and early screening to minimize the progression of the condition.

Limitations

This study has several limitations that should be acknowledged. Firstly, the use of a cross-sectional design restricts the ability to establish causal relationships between occupational exposure and the development of Carpal Tunnel Syndrome (CTS). Secondly, the study employed a convenient sampling technique, which may limit the generalizability of the findings to all hairdressers in Pakistan. Thirdly, data were collected using a self-reported questionnaire (Boston Carpal Tunnel Syndrome Questionnaire), which may introduce response bias or subjective interpretation of symptoms. Additionally, the absence of electrodiagnostic confirmation may affect diagnostic accuracy. Lastly, environmental and ergonomic factors at individual workplaces were not directly assessed, which could influence the occurrence of CTS.

Summary

This study aimed to assess the prevalence, severity, and functional impact of Carpal Tunnel Syndrome among hairdressers in the twin cities of Rawalpindi and Islamabad. A total of 385 participants were included using a cross-sectional survey design. The findings revealed that the majority of participants were young adults with substantial work experience and long working hours, indicating high occupational exposure.

The overall prevalence of CTS was found to be 11.9%, with most cases classified as mild. Although a large proportion of participants reported no symptoms, a notable percentage experienced mild to moderate symptoms such as numbness, tingling, pain, and weakness. Functional assessment indicated that most individuals retained normal

ability; however, some participants reported mild difficulties in performing daily activities such as grasping objects, writing, and household tasks.

Furthermore, statistical analysis demonstrated a significant association between symptom severity and functional limitations, particularly between hand weakness and difficulty in household activities. These findings suggest that early-stage CTS is present among hairdressers and may progress if preventive measures are not implemented.

CONCLUSION

In conclusion, this study highlights that Carpal Tunnel Syndrome is a relevant occupational health concern among hairdressers, with a prevalence of 11.9% in the studied population. Although the majority of cases were mild, the presence of early symptoms and their association with functional limitations indicate a potential risk for progression to more severe stages.

The results emphasize the impact of repetitive hand movements, prolonged working hours, and occupational strain in contributing to CTS. Early identification and intervention are essential to prevent further complications and to maintain functional independence and work productivity.

Therefore, it is recommended that awareness programs, ergonomic interventions, and routine screening be implemented for hairdressers to reduce the risk and burden of CTS. Future research should incorporate longitudinal designs and objective diagnostic tools to further validate and expand upon these findings.

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