

STUDY OF THE ASSOCIATION OF MANUAL WORK WITH CARPAL TUNNEL
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ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is the most common compressive neuropathy of the upper limb, with a significant impact on hand function. Describing the characteristics of affected patients contributes to a better understanding of risk factors and helps guide early intervention and prevention strategies. **Materials and Methods:** A descriptive analytical study was conducted on 80 patients diagnosed with CTS at Damascus Hospital between 2022 and 2024. Data were collected from clinical records and analyzed using SPSS software. The study included demographic, clinical, and occupational variables, as well as nerve conduction study findings. Statistical significance was assessed to evaluate associations between occupation and symptoms, signs, and complications. **Results:** The 25–45-year age group was the most prevalent (75%), and females constituted the majority (62.5%). Smokers made up 30% of the sample, 40% were diabetic, and 30% of female patients were pregnant. The left hand was more frequently affected (60%). Housewives represented the largest occupational group (27.5%), followed by computer typists (21.3%). The most common symptoms were numbness (93.8%), tingling (85%), and pain (43.8%). Muscle weakness and atrophy were observed in 30% and 7.5% of patients, respectively. Phalen's test was positive in 71.3% and Tinel's sign in 62.5%. There was a significant association between occupation and several symptoms such as numbness ($P = 0.024$), pain ($P = 0.036$), and muscle weakness ($P = 0.007$), in addition to signs and complications, indicating a possible occupational influence on the syndrome's progression. **Conclusion:** CTS is more prevalent among working-age females and is significantly associated with certain manual occupations. These findings highlight the importance of occupational education, early diagnosis, and both clinical and electrophysiological assessments to prevent complications.

KEYWORDS: Carpal Tunnel Syndrome, Numbness, Manual Occupations.

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is one of the most common peripheral neuropathies worldwide. It results from compression of the median nerve as it passes through the carpal tunnel, which is formed by the carpal bones and surrounding ligaments.^[1] This compression leads to a series of neurological symptoms that negatively affect the daily functioning of affected individuals, including numbness, tingling, weakness, and pain that radiates from the wrist to the hand and fingers, particularly the thumb, index, middle fingers, and part of the ring finger.^[2]

The significance of studying this syndrome is heightened in both medical and occupational contexts due to the high prevalence among individuals engaged in repetitive manual labor or those exposed to repetitive wrist strain. This includes factory workers, office employees who spend prolonged hours on computers, and workers exposed to continuous mechanical vibrations.^[3,4] Recent

epidemiological studies confirm a clear increase in CTS incidence among these occupational groups, warranting greater scientific attention to understand the direct causal relationship between occupational conditions and the development of CTS.^[5]

Although numerous studies have addressed the mechanical and anatomical aspects of the syndrome, recent research has begun to suggest a potential genetic component influencing individual susceptibility.^[6] Genome analyses indicate that polymorphisms in certain genes related to nerve inflammation or connective tissue function may be associated with increased risk.^[7] This opens the door to more comprehensive studies aimed at determining the role of genetic factors (genotype) in the development of CTS.^[8]

Understanding the interaction between genetic and occupational factors is therefore crucial for developing effective prevention strategies, promoting early

diagnosis, and identifying appropriate treatment methods.^[9]

This research project aims to provide a comprehensive review of the relationship between manual work and CTS, while also discussing the potential role of genotype in increasing or decreasing the risk of developing the syndrome. The outcomes of this study are expected to raise awareness about the importance of implementing preventive health practices in work environments, and to encourage further medical research into the genetic dimensions of the condition. Ultimately, this would improve early diagnosis, optimize treatment outcomes, reduce the incidence of CTS, and enhance both qualities of life and occupational productivity.^[10]

Significance of the Study

Carpal Tunnel Syndrome (CTS) is one of the most common compressive neuropathies, often resulting from repetitive hand movements or chronic wrist strain, particularly in manual occupations.

This study highlights the relationship between the nature of manual work and the emergence of CTS symptoms, which can aid in prevention and early detection.

The findings may also be used to guide occupational and health recommendations that contribute to improving quality of life and reducing the occupational burden associated with CTS.

Objectives of the Study

The study aims to evaluate the association between performing manual work and the occurrence of Carpal Tunnel Syndrome.

It also seeks to identify the distribution of clinical and demographic factors associated with CTS among the studied sample.

Type of Study

This is a retrospective analytical cross-sectional study based on reviewing medical records of patients over a defined period.

Data Collection Method

The study was conducted retrospectively by reviewing both paper and electronic medical records at Al-Mujtahid Hospital in Damascus, during the period from January 1, 2023, to January 1, 2024.

The sample included patients who presented to the orthopedic, neurology, and outpatient departments with clinical symptoms suggestive of Carpal Tunnel Syndrome.

Clinical and demographic data were extracted from the records and documented in a standardized questionnaire specifically designed for the study.

The questionnaire included the following variables: affected side, sex, age group, smoking, diabetes, pregnancy, Tinel's sign, Phalen's maneuver, numbness, tingling, sensory loss, pain, muscle weakness, muscle atrophy, complex regional pain syndrome, and scar tenderness.

Each questionnaire was coded with a serial number to ensure data confidentiality, without using any direct identifying information. Data collection and verification were carried out by a trained medical team under the supervision of the research committee.

Inclusion Criteria

Patients aged 18 years and above.

Presence of clinical symptoms suggestive of Carpal Tunnel Syndrome documented in the medical record.

History of repetitive manual work, pregnancy, or diabetes as a risk factor.

Availability of sufficient clinical information in the record to complete the questionnaire.

Exclusion Criteria

Recent wrist injuries such as fractures or ligament tears.
Previous surgical history involving the carpal tunnel.

Generalized peripheral neuropathy (e.g., diabetic polyneuropathy or Guillain-Barré syndrome).

Other central or peripheral neurological diseases affecting the upper limb.

Incomplete or insufficient clinical data in the medical record.

Ethical Approval

Formal ethical approval was obtained from the administration of Al-Mujtahid Hospital and its affiliated ethics committee after submitting the research proposal and scientific rationale.

Patient confidentiality and privacy were strictly respected, with no direct identifiers used in data documentation or analysis. All data were used exclusively for research purposes.

Statistical Analysis

Data were entered into SPSS software. Descriptive statistical analysis was performed to summarize variables (frequencies and percentages).

Inferential analysis was conducted using the Chi-square test to investigate the relationship between the nature of manual work and the appearance of CTS symptoms.

A significance level of $P < 0.05$ was considered statistically significant.

RESULTS

Basic characteristics of patients with carpal tunnel syndrome

The study results showed that the most frequent age group among patients was 25–45 years, accounting for 75%, indicating that Carpal Tunnel Syndrome primarily affects individuals in their active working years.

Females represented a higher proportion than males, with 62.5% of the sample being female, which may reflect a

role for hormonal factors or the nature of tasks typically performed by women.

The findings also revealed that 40% of patients had diabetes, and 30% were smokers, highlighting the contribution of these conditions as potential risk factors for the syndrome.

Regarding the affected side, the right hand was more commonly involved (60%), which is likely related to its dominance in the majority of individuals.

Table 1: Basic characteristics of patients with carpal tunnel syndrome.

Age	%
18-25 years	8.8%
25-45 years	75%
Over 45 years	16.3%
Gender	
Male	37.5%
Female	62.5%
Smoking	
Yes	30%
No	70%
Presence of Diabetes	
Yes	40%
No	60%
Pregnancy	
Yes	30%
No	70%
Side of Injury	
Right	60%
Left	40%

Occupation of the patients

The distribution of patients' occupations reveals that the majority were housewives, comprising 27.5% of the sample. This was followed by individuals working in computer typing at 21.3%, and those involved in sewing and labor-intensive jobs, each accounting for 17.5%. School teachers represented 8.8% of the patients, while

5% were weight lifters. A smaller portion, 2.5%, included plumbers and health teachers. This occupational breakdown provides insights into the physical demands and repetitive tasks potentially associated with each profession, which may contribute to certain health outcomes.

Table 2: Occupation of the patients.

Occupation	%
Housewife	27.5%
Computer typing	21.3%
Sewing	17.5%
Laborer	17.5%
School teacher	8.8%
Weight lifter	5%
Plumber (health teacher)	2.5%

Symptoms and signs in study patients

The most common symptom among study patients was numbness, reported by 93.8%, followed by tingling in 85% and pain in 43.8%. Loss of sensation and muscle weakness were observed in 31.3% and 30% of cases, respectively, while muscle atrophy appeared in 7.5%. On

examination, the Phalen maneuver was positive in 71.3% of patients, and Tinel's sign was noted in 62.5%, indicating nerve irritation. Regarding complications, scar tenderness was reported in 8.8% and complex regional pain syndrome in 7.5%, reflecting the potential for post-treatment morbidity in a subset of patients.

Signs	%
Phalen maneuver	71.3%
Tinel's sign	62.5%
Symptoms	
Numbness	93.8%
Tingling	85%
Pain	43.8%
Loss of sensation	31.3%
Muscle weakness	30%
Muscle atrophy	7.5%
Complications	%
Scar tenderness	8.8%
Complex regional pain syndrome	7.5%

The relationship between signs and profession

The results show statistically significant differences in the positivity rates of Phalen's maneuver and Tinel's sign among different occupations, with the highest rates observed in housewives, computer typists, and sewing

workers. This suggests a possible association between these occupations and a higher risk of carpal tunnel syndrome. The p-values (0.041 and 0.035) indicate that the differences are statistically significant.

Table 3: The relationship between signs and profession.

signs	Housewife	Computer typing	Sewing	Laborer	School teacher	Weight lifter	Plumber (health teacher)	P- value
Phalen maneuver	17.5%	15.0%	10.0%	12.5%	2.5%	2.5%	2.5%	*0.041
Tinel's sign	20.0%	16.3%	12.5%	13.8%	3.8%	2.5%	2.5%	*0.035

The relationship between symptoms and occupation

The results indicate statistically significant differences in the prevalence of symptoms related to carpal tunnel syndrome across various occupations. Numbness, tingling, and pain were most commonly reported by

housewives, computer typists, and sewing workers, suggesting a potential occupational risk. All p-values are below 0.05, confirming the statistical significance of these associations.

Table 4: The relationship between symptoms and occupation.

signs	Housewife	Computer typing	Sewing	Laborer	School teacher	Weight lifter	Plumber (health teacher)	P- value
Numbness	27.5%	18.8%	15.0%	17.5%	7.5%	5.0%	2.5%	*0.024
Tingling	25.0%	16.3%	13.8%	16.3%	6.3%	5.0%	2.5%	*0.037
Pain	11.3%	6.3%	5.0%	3.8%	5.0%	0.0%	0.0%	*0.036
Loss of sensation	8.8%	11.3%	5.0%	10.0%	2.5%	3.8%	2.5%	*0.017
Muscle weakness	6.3%	3.8%	2.5%	7.5%	6.3%	2.5%	1.3%	*0.007
Muscle atrophy	1.3%	1.3%	1.3%	0.0%	2.5%	1.3%	0.0%	*0.024

The relationship between complication and occupation

The results show statistically significant differences in the occurrence of scar tenderness and complex regional pain syndrome (CRPS) among different occupations. Although the overall percentages are low, sewing workers and laborers showed slightly higher rates of these postoperative complications. The p-values (0.005 and 0.038) indicate that these differences are statistically significant.

ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is the most common compressive neuropathy of the upper limb, with a significant impact on hand function. Describing the characteristics of affected patients contributes to a better understanding of risk factors and helps guide early intervention and prevention strategies. **Materials and Methods:** A descriptive analytical study was conducted on 80 patients diagnosed with CTS at Damascus Hospital between 2022 and 2024. Data were

collected from clinical records and analyzed using SPSS software. The study included demographic, clinical, and occupational variables, as well as nerve conduction study findings. Statistical significance was assessed to evaluate associations between occupation and symptoms, signs, and complications. **Results:** The 25–45-year age group was the most prevalent (75%), and females constituted the majority (62.5%). Smokers made up 30% of the sample, 40% were diabetic, and 30% of female patients were pregnant. The left hand was more frequently affected (60%). Housewives represented the largest occupational group (27.5%), followed by computer typists (21.3%). The most common symptoms were numbness (93.8%), tingling (85%), and pain (43.8%). Muscle weakness and atrophy were observed in 30% and 7.5% of patients, respectively. Phalen's test was positive

in 71.3% and Tinel's sign in 62.5%. There was a significant association between occupation and several symptoms such as numbness ($P = 0.024$), pain ($P = 0.036$), and muscle weakness ($P = 0.007$), in addition to signs and complications, indicating a possible occupational influence on the syndrome's progression. **Conclusion:** CTS is more prevalent among working-age females and is significantly associated with certain manual occupations. These findings highlight the importance of occupational education, early diagnosis, and both clinical and electrophysiological assessments to prevent complications.

KEYWORDS: Carpal Tunnel Syndrome, Numbness, Manual Occupations.

signs	Housewife	Computer typing	Sewing	Laborer	School teacher	Weight lifter	Plumber (health teacher)	P- value
Scar tenderness	1.3%	1.3%	1.3%	2.5%	1.3%	1.3%	0.0%	*0.005
Complex regional pain syndrome	1.3%	1.3%	3.8%	0.0%	1.3%	0.0%	0.0%	*0.038

DISCUSSION

The study results showed that the majority of patients with carpal tunnel syndrome (CTS) were in the 25–45 age group (75%), which is consistent with the findings of Atroshi *et al.*, who reported the highest prevalence of CTS in the middle-aged population, with a peak in the fourth and fifth decades of life.^[11]

In addition, the current study found that females accounted for 62.5% of the sample, a result commonly reported in the literature. Several studies, such as that of de Krom, documented a female predominance ranging from 60% to 70%, attributed to hormonal factors and the narrower anatomical structure of the carpal tunnel in women.^[12]

Regarding diabetes as an associated factor, it was present in 40% of patients—a relatively high rate that aligns with the findings of Foley *et al.*, who reported that diabetes increases the risk of developing CTS by 1.5 to 2.5 times compared to non-diabetics.^[13] Additionally, the percentage of pregnant women in the sample (30%) supports previous findings, such as those in the study by Padua *et al.*, which confirmed that CTS is common during the third trimester of pregnancy due to fluid retention and increased tissue pressure.^[14]

In terms of clinical symptoms, numbness and tingling were the most frequently reported (93.8% and 85%, respectively), consistent with the results of Bland, who found that sensory symptoms are the most prominent at diagnosis, followed by motor symptoms.^[15] The positivity of Phalen's maneuver (71.3%) and Tinel's sign

(62.5%) also aligns with the findings of Ghasemi-Rad *et al.*, who demonstrated that Phalen's test is more sensitive than Tinel's (sensitivity of 74% vs. 59%).^[16]

With regard to occupation, there was a statistically significant association between manual jobs such as sewing and typing and the presence of more severe symptoms. This supports the findings of Werner *et al.*, who emphasized that repetitive and manual tasks are among the most important occupational risk factors.^[17] The study also found that housewives had the highest rate of CTS (27.5%), which is in line with Mondelli *et al.*, who reported a higher incidence in domestic work due to frequent hand movements and carrying loads.^[18]

As for complications, complex regional pain syndrome (CRPS) was observed in 7.5% of patients, a rate that falls within the globally reported range of 5–10% following surgery or conservative interventions, as noted in a systematic review by Bialocerkowski *et al.*^[19]

CONCLUSION

The study results indicate that carpal tunnel syndrome affects the majority of patients between the ages of 25 and 45, with a relative female predominance. Neurological symptoms such as numbness and tingling are prominent among patients, and Phalen and Tinel's sign is an important positive test. A clear association was found between occupations requiring repetitive manual movements, such as sewing and typing, and the onset of symptoms. Diabetes and pregnancy are also contributing factors in the development of the syndrome. Complex regional pain syndrome is a relatively rare complication.

These findings reflect global trends, with some variations that may be due to environmental and genetic factors.

Funding Statement

This work was carried out without any financial support from governmental bodies, private industry, or non-profit institutions.

Conflict of Interest

The authors declare that there are no actual or potential conflicts of interest related to this research.

Data Availability

The datasets generated and analyzed during this study are not publicly available due to institutional confidentiality policies but may be obtained from the corresponding author upon reasonable and approved request.

Ethical Approval

This study was conducted in accordance with the ethical standards of the Al-Mujtahid Hospital Research Ethics Committee. Formal approval was granted under protocol number 2337/MJH/2025. Given the retrospective design and the anonymized nature of the data, individual patient consent was not required.

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