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Research Article

## PREVALENCE OF CARPAL TUNNEL SYNDROME AMONG TECHNICIANS AND LABORATORY STAFF

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**Abstract:**

*Carpal tunnel syndrome is a condition that causes pain, numbness, tingling in the hand and arm. When the major Median nerve passing underneath the transverse carpal ligament gets squeezed or compressed it causes the symptoms. This continuous compression ultimately leads to the functional impairment and local ischemia of the nerve.*

***Objective:** The objective of this study is to determine the prevalence of carpal tunnel syndrome and commonly reported symptoms in laboratory workers and its associated factors*

***Methods:** It was a cross-sectional study in which 225 participants met the inclusion criteria by using "Boston Carpal tunnel Questionnaire. Data was analyzed through IBM SPSS version 21.0.*

***Results:** Out of 225 participants, 57 were had severe symptoms with the prevalence of 25.3%. Females were more affected than males (58% > 42%) in severely affected group. Technicians were more affected than the attendants (91.2% and 8.8% respectively).*

***Conclusion:** Current study concluded that laboratory workers have more risk to develop CTS especially women with dominant hand.*

**Key Words:** *Carpal tunnel syndrome, laboratory workers, risk factors.*

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## INTRODUCTION:

Carpal tunnel syndrome is a complex of sign and symptoms that occur due to the compression of median nerve as it runs through carpal tunnel. Median nerve compression causes pain, numbness and tingling in upper extremity which is one of the leading disabilities known as occupational upper-extremity disorders<sup>[1]</sup>. The carpal tunnel is a narrow passageway that is located on the palmar or anterior aspect of the wrist bounded by bones and ligaments. Compression of the nerve results in symptoms that characterize the syndrome, including numbness, pain and, eventually, hand weakness. Although CTS has been described as the most common peripheral mono-neuropathy<sup>[2]</sup>.

In 1985, a prospective population-based study was conducted, in Netherland in order to find out the occurrence of CTS, they found 0.6 % CTS in men and 5.8% in women. And increased rates of CTS were found in different occupations. Einhorn and Leddy conducted a study which concluded that prevalence of CTS in general population is 1% and in workers with repetitive movement of wrists and hands is 5%. Additionally, National Institute for occupational safety and health (NIOSH) stated that about 15% to 20% of Americans are under risk of developing cumulative trauma disorders (CTDs)<sup>[3][4]</sup>

Laboratory occupation has a risk of developing carpal tunnel syndrome due to the performance and repetitive and accurate movement. Some tasks involve both hands for 4-6 hours. Literature has reported that laboratory workers are more prone to have carpal tunnel syndrome and precautionary measure can prevent it<sup>[5]</sup>.

## METHODS:

**Study Design:** Quantitative observational cross-sectional study.

**Population:** Phlebotomy, Clinical Biochemistry, Histology and Cytology, Immunology, Hematology, Bacteriology and Virology were included.

**Sample size:** 252 participants were recruited into this study.

**Questionnaire:** Demographic data include age, gender, years of occupation and BMI. For the assessment of symptoms severity and functional status two forms "The Boston Questionnaire" developed by Levine Katz for the assessment of symptoms severity and functional status in carpal tunnel syndrome<sup>8</sup> was used to collect the data. It is a self-administered

questionnaire that consists of two sections, with a total of 19 questions.

There are five stems for each question, adopting a 'stem score' from 1(mild) to 5(severe). Questions concerning the first section, entitled as symptoms severity scale, are 11 questions checking for: pain severity during day and night times, time of pain during the day, weakness, tingling sensation felt at night, how frequently did that tingling occur and whether there is numbness or not. For each question, five possible answers are there numbered from 1 to 5, arranged in an ascending order of symptoms severity.

Therefore, 1 correlate to asymptomatic, 2 to mild symptoms, 3 to moderate symptoms, 4 to intense symptoms and 5 correlates to severe symptoms, for the second section - entitled as functional status scale-eight questions are there, where each one refers to a functional activity. The listed activities are "writing, buttoning clothes, ability to hold a book while reading, holding a telephone hangs, housekeeping, opening a glass vial cap, carrying market bags, bathing and dressing."

A written consent form was signed after explaining the purpose of the study. Ethical approval was obtained from the Institutional review board.

## DATA ANALYSIS:

Data were entered and analyzed using the IBM SPSS Statistics software (version 21). The study subjects were grouped according to their age, gender, and years of occupation, occupation, BMI, and symptomatic hand. Age groups were as follows;  $\leq 30$  years, 31-45 years, and  $> 45$  years. Years of occupation were grouped as follows;  $< 5$  years, 5-10 years, and  $> 10$  years. Occupation was categorized into technician and assistant. Body Mass Index (BMI) was categorized into normal (18-24), overweight (25-30), and obese ( $>30$ ). Symptomatic hand was grouped to right, left, both, and asymptomatic.

The outcome variable was categorized using percentiles to Mild, Moderate, Pak J Med Sci 2015 Vol. 31 No. 2 www.pjms.com.pk 333 and Severe in the Symptom Severity Scale (SSS) and to Mild-moderate and Severe in the Functional Status Scale (FSS). The three categories (mild, moderate, and severe) of susceptibility to having CTS symptoms were based on the SSS. Individuals suspected of having mild CTS symptoms are within the 50th percentile. Individuals suspected of having moderate CTS symptoms are within the 50th-75th percentile.

Individuals suspected of having severe CTS symptoms are above the 75th percentile.

The two categories (mild-moderate and severe) of susceptibility to having CTS symptoms will be based on the FSS. Individuals suspected of having Mild-moderate CTS symptoms will be within the 75th percentile. Individuals suspected of having severe will be within the 4th quartile (above 75th percentile). Karl Pearson's Chi-square test was used to observe the association between categorical study and outcome variables. Student's t-test for independent samples and one-way analysis of variance was used to compare the mean values of the total scores of both SSS and FSS in relation to each of the associated categorical variables.

### RESULTS:

Out of 225 subjects 122 male was age of more than 30 years. About 104(46.2%) were with < 5 years of occupation and 191(84.9%) of them were technicians. Normal BMI was observed in 101(44.9%) subjects.

Symptomatic hand as right hand was reported by 76(33.8%) of study subjects. By using symptom severity scale, it was found that about 108(48%) study subjects had mild symptoms, 60(26.7%) were with moderate symptoms and 57(25.3%) were with severe symptoms. Among those 57 subjects, the order of the most frequently reported symptoms was as follows: pain (82.5%), weakness (73.7%), tingling (70.2%), nocturnal exacerbations (66.7%), numbness (61.4%) and difficulty grasping (31.6%).

By using Functional severity scale, it was observed that 155 (68.9%) were with moderate symptoms and 70(31.1) with severe symptoms. The comparison of mean values of the SSS and FSS scores shows statistically significant difference in the mean values of SSS in relation to gender and occupation.

That is the mean SSS score is significantly higher in female study subjects when compared with male subjects ( $t=-2.60$ ;  $p=0.01$ ) and the mean SSS score is significantly higher in technicians when compared with assistants in laboratory ( $t=2.08$ ;  $p=0.04$ ).

Similarly, the mean FSS score was statistically significantly higher in technicians when compared with assistants working in laboratory ( $t=4.25$ ;  $p<0.001$ ), 31-45, & >45 years), three categories of years of occupation (10 years) and three categories of BMI (normal, overweight & obese).

There is a highly statistically significant association between the study subject dominant hands and their symptomatic hand in which, out of 94 right-handed participants with symptoms, 75 (79.8%) reported their right hands as being the symptomatic one and among the 11 participants who were left-handed with symptoms, 10 (90.9%) of them reported their left hand as the one being symptomatic ( $\chi^2 = 30.96$ ;  $p<0.0001$ ).

### DISCUSSION:

This study with 225 study subjects, had identified 57 were having severe symptoms of CTS on Symptom Severity Scale and they were also found to be having deterioration in their Functional Status Scale as well. Thirteen participants have shown deterioration in their Functional Status Scale, but without expressing severe symptoms on the Symptom Severity Scale. Our interpretation of such finding gave two possibilities.

Either they were having other unidentified musculoskeletal or neurological problem- not related to CTS- that affected their daily functions, or they were biased when answering the functional status scale section of the questionnaire. In the study that was conducted to determine the prevalence of CTS in the medical college of Belgaum, India by Kamaraddi SV et al. 7 21.5% was the prevalence they got.

In comparison with other publications that studied the prevalence of CTS in other vocational groups at risk, variations in the prevalence rates were present. Among fish processing workers, CTS prevalence was reported at 15%, dental hygienists at 8.4%, dentists at 4.8%, construction workers at 8.2% and ski manufacturing workers at 15.4.9 CTS is well known to result in a group of symptoms frequently reported by patients. Those include: pain, numbness, tingling, thenar muscle wasting, weakness, nocturnal exacerbations and difficulty grasping items. We identified the most frequently reported symptoms in those being severely symptomatic<sup>[6][7]</sup>

Upon analysis, the symptoms were in the following order: hand/wrist pain in 47 (82.5%), hand weakness in 42 (73.7%) tingling in 40 (70.2%), nocturnal exacerbations in 38 (66.7%), numbness in 35 (61.4%) and difficulty grasping in 18 (31.6%). When we compare these findings to those presented by Kamaraddi SV et al.7, we find that they reported the same symptoms but with lesser percentages. Numbness was reported in 6 (30%), hand/wrist pain in 18 (90%), tingling in 2 (10%), nocturnal exacerbations in 2 (10%), hand weakness in 4 (20%), difficulty in grasping of items in 1 (10%), plus two extra symptoms; thenar muscle wasting and motor

weakness in 1 (5%). We found out that among 57 participants with severe symptoms of CTS, 30 (52.6%) had symptoms of CTS only in the right hand, 16 (28.1%) had symptoms in the left hand, and 11 (19.3%) had symptoms in their both hands<sup>[8] [9]</sup>.

There are certain conditions and occupations that predispose to CTS. Many and countless risk factors had been reported regarding this condition.<sup>10-12</sup> The risk factors that were studied in the present study included age, gender, occupation, years of occupation, BMI and dominant hand. Of these, the statistically significant associated variables were gender, occupation, and dominant hand. Females were more than males in terms of severity of symptoms with a count of 33 compared to 24 males. Technicians outnumbered assistants in terms of severity of symptoms with a number of 52 in comparison with assistants who counted 5.

Coming to hand dominance, 36.4% of right-handed study subjects reported symptoms in their right hands and 52% of left-handed study subjects reported symptoms in their left hands. This variation (percentage being higher in left handed lab workers) is due to the scarcity of left-handed individuals. This suggests that there is an association between hand dominance and susceptibility of CTS development in that hand. Kamaraddi SV et al.<sup>7</sup>, found that age, years of occupation, and work pattern are statistically significant risk factors<sup>[10]</sup>.

Therefore, only occupation (work pattern) was a shared significant risk in both studies. So, from the list of factors we suggested it would have a great influence on the severity of symptoms, age, years of occupation, and BMI had no statistically significant evidence relating them to the development of CTS. This is a questionnaire-based study and cases of CTS could not objectively be identified with the gold standard diagnostic tool. We were only able to refer to those severely symptomatic and highly suggestive of having or developing the syndrome, by using the total scores of SSS and FSS, which were calculated based on the responses of study subjects. Hence the prevalence of CTS we are reporting may be under or over estimated.

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