

Comparative prevalence of Carpal Tunnel syndrome among private & public preschool Teachers in Lahore.

Amna AD^{*}, Hamna Afzal^{}, Shahwaiz Moeen^{***}, Eesha Zahid^{****}**

^{*} College of Physical Therapy, Government College University Faisalabad, Pakistan

^{**} Department of Physiotherapy, Services Hospital Lahore, Pakistan

^{***} Department of Physical Therapy, King Edward Medical University Lahore, Pakistan

^{****} Department of Physical Therapy, University of Health Sciences, Lahore, Pakistan

Abstract

Carpal Tunnel Syndrome (CTS) is the most common entrapment neuropathy and is frequently associated with occupations involving repetitive hand and wrist activities. Preschool teachers are particularly vulnerable due to prolonged fine motor tasks, sustained writing, and awkward wrist postures. However, limited local evidence exists comparing CTS prevalence between public and private preschool teachers. To compare the prevalence of Carpal Tunnel Syndrome among public and private preschool teachers in Lahore. A comparative cross-sectional study was conducted among 310 preschool teachers (109 public and 201 private) aged 22–40 years using non-probability convenience sampling. CTS was assessed using the Boston Carpal Tunnel Questionnaire (BCTQ) for symptom severity and functional status, along with Phalen's test for clinical evaluation. Demographic data were collected, and statistical analysis was performed using SPSS version 25. Descriptive statistics were used to present frequencies, percentages, means, and standard deviations. CTS was prevalent in both public and private preschool teachers, with a higher burden observed in the private sector. Positive Phalen's test was found in 32.9% of private teachers compared to 24.8% of public teachers. Based on BCTQ severity scores, severe to very severe CTS was reported in 51.4% of private teachers, whereas 25.2% of public teachers fell into these categories. Functional impairment was also more pronounced in private teachers, with severe functional limitation reported in 58.7% compared to 33.0% in the public sector. Females constituted the majority of affected participants (87.1%). Carpal Tunnel Syndrome is highly prevalent among preschool teachers, particularly in the private sector, where

greater severity and functional impairment were observed. Early screening, ergonomic modifications, and physiotherapy-led preventive interventions are recommended to reduce CTS-related disability and improve occupational health outcomes.

Carpal Tunnel Syndrome; Preschool Teachers; Occupational Health; Boston Carpal Tunnel Questionnaire; Physiotherapy
Index Terms- Carpal Tunnel Syndrome; Preschool Teachers; Occupational Health; Boston Carpal Tunnel Questionnaire; Physiotherapy

I. INTRODUCTION

Carpal Tunnel Syndrome is a neuromuscular disorder of the median nerve compression in the wrist. (1)

Workers who perform their jobs using their upper extremities like hands, wrists, and fingers are more prone to CTS. (2)

CTS is the most common entrapment neuropathy of the median nerve and accounts for 90% of the neuropathies. Common signs and symptoms of CTS include numbness and a tingling sensation (3). On the Phalen's Test, it will show pain, numbness, and tingling like sensations in the thumb, index, and middle finger. (4)

Historically, it was thought that injury due to the repetitive movements cause nerve damage and may make one prone to developing CTS. The most common work-related risk factors to CTS are forceful excursion, awkward wrist/hand postures, repetitive movements. (5) The well-known fundamental related risk factors with CTS are diabetes mellitus, hypothyroidism, old wrist fracture, and rheumatoid arthritis. (6) Although CTS incidences are common across all age groups, it is more prevalent for adults between the age of 40 and 60 years. In regions like the United Kingdom, CTS occurrence is between

7%-16%, which is relatively higher as compared to the 5% incidence rates in the United States. Most western nations indicate a rise in the number of work-related musculoskeletal disorders (WMSDs). This is associated with increased strain and repetitive movements by individuals. Europe, in 1998, for instance, reported more than 60% of upper limb musculoskeletal disorders recognized as work-related being CTS incidences. (7) Preschool teachers are a high-risk occupational group for Carpal Tunnel Syndrome (CTS) due to repetitive fine motor activities, prolonged writing, frequent use of teaching materials, and sustained or awkward wrist postures during classroom tasks. Differences in workload, class size, teaching resources, and ergonomic support between private and public preschool settings in Lahore may influence the development and severity of CTS. Despite the functional limitations and reduced work efficiency associated with CTS, there is limited local data comparing its prevalence in these two sectors. This comparative study will help physiotherapists identify sector-specific occupational risk factors, plan early screening programs, design preventive and ergonomic interventions, and promote evidence-based rehabilitation strategies to improve hand function, work performance, and overall quality of life among preschool teachers.

III. RESULTS

A total of 310 preschool teachers participated in the study, comprising 109 (35.2%) public sector and 201 (64.8%) private sector teachers. The mean age of participants was 29.31 ± 7.79 years. The majority were female ($n = 270, 87.1\%$), while 39 (12.6%) were male.

Phalen's test was positive in 77 (24.8%) public sector and 102 (32.9%) private sector teachers, indicating a higher prevalence of clinically positive CTS among private preschool teachers. Negative Phalen's test was observed in 80 (25.8%) public and 51 (16.5%) private sector teachers shown in table 1

Based on the Boston Carpal Tunnel Questionnaire (BCTQ) severity and functional scoring, CTS was prevalent in both public and private sector teachers, with a higher burden observed in the private sector.

Among public sector teachers, mild CTS was observed in 42 (34.1%), moderate in 40 (40.7%), severe in 20 (16.3%), and very

II. IDENTIFY, RESEARCH AND COLLECT IDEA

A comparative cross-sectional study was conducted in federal institute of health science Lahore (ref no.# FIHS/RW/LHR/2520) after obtaining IRB approval. Using a non-probability convenient sampling method, 310 participants according to inclusion and exclusion criteria. Age between 22-40 years, both male and female public & private pre-school teachers, public & private pre-school teachers, minimum of 2-years of active participation in pre-school as teachers, working hours between 6-8 hours, symptoms like pain, burning, and tingling in hand were included. Exclusion Criteria was retired pre-school teachers, high school teachers, prior diagnosis / pre-medical condition, taking any Current treatment, Wrist fracture / Deformity. Assessment tools include the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) (8) for functional disability & pain and Phalen's Test (9) to diagnose carpal tunnel syndrome. Ethical guidelines were followed, and informed consent was obtained from teachers. Data collection involved demographic. Statistical analysis was performed using SPSS Statistics (Version 25.0), with quantitative data presented as means and standard deviations, and qualitative data as frequencies and percentages.

severe CTS in 11 (8.9%) participants. In private sector teachers demonstrated a higher prevalence of advanced CTS, with 46 (23.4%) having mild symptoms, 50 (25.4%) moderate, 81 (41.2%) severe, and 20 (10.2%) very severe CTS shown in table 2

Functional impairment analysis revealed that among public sector teachers, 42 (38.5%) had mild functional limitation, 20 (18.3%) moderate, 36 (33.0%) severe, and 11 (10.1%) very severe functional impairment. Among private sector teachers, functional impairment was predominantly severe, affecting 118 (58.7%) teachers, followed by 40 (19.9%) mild, 27 (13.4%) moderate, and 15 (7.5%) very severe functional limitation. Shown in Table 3

Overall, CTS prevalence and severity were notably higher among private sector preschool teachers compared to public sector teachers.

Table No. 1: Phalen test

	PHALEN TEST (POSTIVE)	PHALEN TEST (POSTIVE)
PUBLIC	77 (24.8)	80 (25.8)
PRIVATE	102 (32.9)	51 (16.5)

Table no. 2: Categorization of BCTQ Severity Scoring (N= 310)

BCTQ SSS	PUBLIC	PRIVATE
Mild	42 (34.1)	46 (23.4)
Moderate	40 (40.7)	50 (25.4)
Severe	20 (16.3)	81 (41.1)
Very Severe	11 (8.9)	20 (10.2)

Table no. 3: Categorization of BCTQ Function Scoring (N=310)

BCTQ FSS	Public	Private
Mild	42 (38.5)	40 (19.9)
Moderate	20 (18.3)	27 (13.4)
Severe	36 (33)	119 (58.7)
Very Severe	11 (10.1)	15 (7.5)

IV. DISCUSSION

The present study aimed to compare the prevalence and severity of Carpal Tunnel Syndrome (CTS) among public and private preschool teachers in Lahore. The findings demonstrate that CTS is prevalent in both sectors; however, a significantly higher burden of CTS—particularly severe and very severe forms—was observed among private preschool teachers. These results highlight occupational disparities that may influence the development and progression of CTS in this population.

In the current study, private sector preschool teachers exhibited a higher frequency of positive Phalen's test results compared to

public sector teachers, suggesting a greater prevalence of clinically evident CTS. Phalen's test is a widely accepted provocative test for CTS, and its diagnostic utility has been supported by previous research indicating reasonable sensitivity and specificity when used alongside clinical assessment tools (9). The higher positivity rate among private teachers may reflect prolonged wrist flexion activities, increased workload, and limited ergonomic adaptations in private preschool settings.

Severity assessment using the Boston Carpal Tunnel Questionnaire (BCTQ) revealed that more than half of private sector teachers fell into the severe to very severe categories, whereas public sector teachers predominantly demonstrated mild to moderate CTS. Similar trends have been reported in occupational groups exposed to repetitive hand use and sustained awkward wrist postures (10). Preschool teachers are frequently involved in fine motor tasks such as writing, drawing, cutting, lifting children, and handling teaching aids, all of which increase median nerve compression risk. The greater severity in private sector teachers may be attributed to larger class sizes, longer working hours, fewer rest breaks, and limited access to ergonomic furniture and occupational health support.

Functional impairment findings further reinforce this disparity, as severe functional limitation was markedly higher among private preschool teachers. Functional disability associated with CTS significantly affects daily activities, work efficiency, and quality of life. Previous studies have demonstrated a strong correlation between BCTQ functional scores and clinical severity of CTS (11). The higher functional impairment observed in private sector teachers suggests delayed reporting, lack of early screening, and minimal access to preventive or rehabilitative interventions.

The predominance of female participants in this study is consistent with existing literature indicating a higher prevalence of CTS among females (12). Hormonal influences, smaller carpal tunnel dimensions, and increased engagement in repetitive manual tasks are proposed explanations for this gender disparity. Additionally, although CTS is commonly reported in individuals aged 40–60 years, the relatively young mean age in this study

underscores the role of occupational exposure rather than age-related degenerative factors, as supported by previous epidemiological findings (13).

Comparisons with other occupational studies conducted among dentists, healthcare workers, and manual professionals also reveal elevated CTS prevalence associated with repetitive hand use and poor ergonomic practices (10). These findings emphasize that preschool teaching, particularly in resource-limited private institutions, should be recognized as a high-risk occupation for work-related musculoskeletal disorders, including CTS.

From a physiotherapy perspective, these results underscore the importance of early identification, ergonomic education, and preventive strategies tailored to the specific demands of preschool teaching. Implementing workplace modifications, promoting wrist-neutral postures, scheduling rest breaks, and conducting routine CTS screening—especially in private sector institutions—may help reduce disease burden and improve functional outcomes.

V. CONCLUSION

Carpal Tunnel Syndrome is prevalent among preschool teachers in Lahore, with a significantly higher severity and functional impairment observed in the private sector. Private preschool teachers demonstrated more frequent positive clinical findings and advanced CTS compared to public sector teachers, likely due to greater occupational exposure and limited ergonomic support. These findings emphasize the need for early screening, ergonomic interventions, and physiotherapy-led preventive strategies, particularly in private preschool settings, to reduce CTS-related disability and improve occupational health outcomes.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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AUTHORS

First Author – Amna AD, DPT, College of Physical Therapy, Government College University Faisalabad, Pakistan

Second Author – Hamna Afzal, DPT, MS-OMPT, Department of Physiotherapy, Services Hospital Lahore, Pakistan

Third Author – Shahwaiz Moeen, Department of Physical Therapy, King Edward Medical University Lahore, Pakistan

Fourth Author – Eesha Zahid, ^{Department of Physical Therapy,} University of Health Sciences, Lahore, Pakistan

Correspondence Author – Hamna Afzal, DPT, MS-OMPT,

Department of Physiotherapy, Services Hospital Lahore, Pakistan