Research Article

Prevalence of carpal tunnel syndrome in female arts and textile students: a cross sectional survey

Rabia Rashid[1]*, Saadia Aziz[1], Hifza Iqbal[2], Zahid Mehmood[3]

ABSTRACT

Background: Carpal tunnel syndrome (CTS) is a common form of entrapment due to compression of median nerve, related to repetitive actions on the wrist. Female students in arts and textiles, particularly are most vulnerable as they are subject to repetitive fine-motor activities and minimal body ability in ergonomics.
Objective: To find the prevalence of Carpal Tunnel Syndrome (CTS) in female arts and textile students

Methods: A descriptive cross-sectional study was conducted using non probability convenience sampling from July 2025 to October 2025 among n=336 female students aged 17-30 years from arts and textile departments in Islamabad and Rawalpindi, engaged in drawing, painting, or sculpting. Data were collected through Durkan test and Boston Carpal Tunnel Questionnaire (BCTQ) which includes the Symptom Severity Scale (SSS) and the Functional Status Scale (FSS).

Results: The mean age of participants was 23.00±2.90 years, with a mean BMI of 22.88±4.79. The CTS prevalence was 53 (15.8 %) on Durkan compression test. The FSS score was 19.32±6.27, indicating predominantly moderate symptom severity and functional limitation. Overall, n=192(57.1%) of participants exhibited moderate symptom severity, and n=224(65.8%) reported moderate functional impairment.

Conclusion: This study found the presence of carpal tunnel syndrome among female arts and textile students alongside moderate CTS symptoms, suggesting early nerve compression due to repetitive hand activities.

Keywords: *arts and textile, boston carpal tunnel questionnaire, carpal tunnel syndrome, ergonomics.*

Designation & Affiliation
1. Consultant Physiotherapist, at Tanveer Hospital Wah Cantt, Pakistan.
2. Physiotherapist, Clinical Internship in Armed Forced Institute of Cardiology (AFI) Nursing Institute for Healthcare Design and (NIHD) Rawalpindi, Pakistan.
3. Assistant Professor, Ibadat International University Islamabad, Pakistan.

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Correspondence*
Rabia Rashid, Consultant Physiotherapist, at Tanveer Hospital Wah Cantt, Pakistan.
E-mail: rabiarashid171@gmail.com

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is among the most commonly occurring entrapment neuropathy whose pathophysiology results due to compression of the median nerve in the ossical constraints of the carpal tunnel[1]. The carpal bones make up the dorsal border and the flexor retinaculum makes up the volar bordering, both forming a closed compartment which encloses the nerve and tendons[2,3]. As such, CTS constitutes the most common neuropathic disease in the compression of upper limbs nerves[4,5]. The symptoms of the syndrome are pain and paresthesia, numbness and muscular weakness that affect the territory of the median nerve, often worsening the functioning of hands and general quality of life[6]. Etiology of CTS has multifactorial components of anatomic variance, biomechanical load, systemic disease, and occupational exposure[7]. Sustained repeated wrist movements, maintained grip position and manual dexterity are clinically reported risk factors that increase the intracarpal pressure and subsequently lead to the compression of the nerves[8].

Epidemiological researches always revealed that females are more likely to be affected by CTS compared to males due to their anatomical characteristics like smaller carpal tunnels and variations in hormones which affect the elasticity of connective tissue and their engagement in job that involves repetitive use of the hands[9]. According to population study, it is common that the risk of CTS is two to four times greater in women as compared to male[10]. Recent prevalence data indicate 18.7% in Kuwait female office workers[11], 2.0% in the Japanese general population (OR 7.33 for females)[12], and 21% in a meat-packing cohort with higher incidence in women (18.4 vs 9.7 per 100 person-years; RR 1.9)[13]. Taiwan national data show =0.4% annual incidence, higher in females [14], while European surveys report up to 9% prevalence in women versus 0.6-2% in men[15]. Moreover, women who practices arts, crafts and textile use are especially susceptible because of repetitive hand movements, awkward positions of the wrist as well as poor ergonomic habits[12]. Approximately 30-50% of CTS is due to occupational and activity-related factors, with high body mass index (BMI >25 kg/m²) being linked to two-fold greater risk of developing CTS[16].

The drawing, stitching, embroidery, cutting, and designing through the computer performed by the students of arts and textile require prolonged and repeated movements of the wrists, which puts a significant strain on the flexor tendons and soft tissues around them[17]. These activities can over time result in micro trauma, inflammation, and compression of the median nerve thus posing a risk of CTS in young age[18]. Female students enrolled in arts and textile program are vulnerable targeted population of musculoskeletal research , in contrast to industrial or office workers, is unaware of the ergonomics, early symptoms detection, and preventative measure[1].

Despite substantial literature addressing CTS in industrial and office-based workers, limited evidence exists regarding its burden among student populations, particularly female students engaged in fine motor-intensive academic disciplines. The detailed source of CTS prevalence in the group of individuals will be essential in applying early diagnosis tools, ergonomic training, and avoiding long-term progressive functional loss. It is against this background that the current study aimed at defining the prevalence as well as the severity of CTS symptoms among female students in the arts and textile fields.

METHADOLOGY

Study Design

Cross-sectional survey was conducted among female arts and textile students in Rawalpindi and Islamabad over a four-month period, from July 2025 to October 2025.

Participants

Participants included were female students age 17-30 years enrolled in the arts and textile departments, specifically those studying drawing, painting, and sculpting. Individuals with hand disorders, neurological or psychological conditions, diabetes mellitus, or outside the specified age range were excluded. Data were collected after obtaining informed consent, and after it was received, a demographic information sheet was filled in and then the standardized questionnaire.

Sample Size

A total of n=336 participants were selected through a convenience sampling technique, with the sample size determined using open *Epi Tool* at the 95% confidence interval and 5% margin of error.

Variables

Durkan test was used for the diagnosis of carpal tunnel syndrome and Boston Carpal tunnel Questionnaire (BCTQ) were used to collect data. To diagnose a carpal tunnel syndrome , the median nerve sensitivity in compression test by Durkan is 0.67 (IQR: 0.46-0.82) [19]. The validated instrument, Boston Carpal Tunnel Questionnaire (BCTQ) was used to determine the severity of the symptoms and the functional status of the patients having carpal tunnel syndrome. The BCTQ has two subscales: Symptom Severity Scale (SSS) and the Functional Status Scale (FSS). The symptoms severity scale contains 11 items rated as a five-point

Likert scale, with possible scores, starting with 1 (no symptoms) to the end point of 5 (very severe symptoms). The overall SSS score ranges from 11 to 55 with higher scores depicting severe symptoms. Studies have demonstrated that the SSS has been found to be stable and is useful in assessing the effects of the treatment when it is applied to patients with CTS while checking the severity of the symptoms[20]. The FSS has 8 items that measures functional limitations imposed on the sufferers of CTS and are rated on a scale of 1 (no difficulty) to 5 (very severe difficulty). The FSS has a total score of 8 to 40, as higher the score, the more impaired the daily activities[21].

Statistical Analysis

The analysis was done with SPSS version 27, frequencies and percentages were calculated in the categorical variables and, means with standard deviation in the continuous variables. The chi square test of association was used to find association between categorical variables. This approach guarantees a precise and thorough analysis of the prevalence and the severity of the carpal tunnel syndrome symptoms in female arts and textile students.

Ethical Approval

Ethical approval was obtained from Ethical Research Committee from Sarhad University of Science and Information Technology with Ref. SUIT/REC/2025/024

RESULTS

The mean age of n=336 participants was 23.00±2.90 years, range between 18 to 30 years. In terms of anthropometric measurements the mean Body Mass Index (BMI) of the cohort was 22.88 4.79 which takes the sample to the normative range though there is a significant range of individual variation between underweight and obese groups. The daily activity patterns provided an average of 5.881±0.794 hours work a day.

Table 1: Frequency and percentage distribution of participants by demographic and clinical categories (N=336)

Variable	Category	Frequency (n)	Percentage (%)
Discipline	Textile	173	51.5
	Arts	163	48.5
Working Hours per Day	7 hours	89	26.5
	6 hours	119	35.4
	5 hours	128	38.1
Age Groups (years)	27-30	46	13.7
	22-26	180	53.6
	17-21	110	32.7
BMI Groups	Obesity Class III (≥40)	2	0.6
	Obesity Class II (35-39.9)	8	2.4
	Obesity Class I (30-34.9)	18	5.4
	Overweight (25-29.9)	70	20.8
	Normal (18.5-24.9)	170	50.6
	Underweight (<18.5)	68	20.2

In measuring the symptomatology and functional capability, the average of the Symptom Severity Scale (SSS) was 24.93 at 8.63 which represent the middle level of discomfort in the entire group with a range on the mild side right to the severe side. The outcome of the functional capacity measured using the Functional Status Scale (FSS) offers a mean of 19.32+6.27, which implies a noticeably visible effect on day to day living. By adding these dimensions to the total categorization of Boston Questionnaire, the average score was at 43.82 14.62. Since the maximum score is 77, it had a dichotomy whereby some of the participants were relatively well adjusted, and others faced considerable overall difficulty because of their condition.

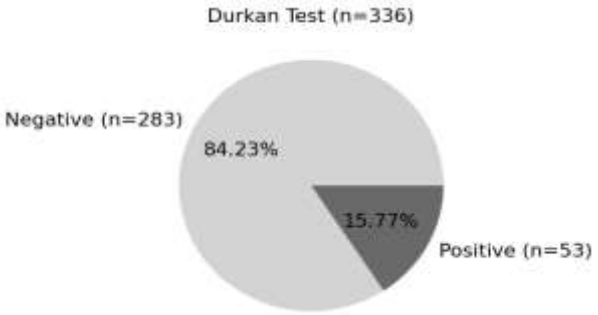

Figure 1: Prevalence of carpal tunnel syndrome

There was a significant association between the Durkan test and Symptom Severity Scale (SSS) (p=0.012). Among participants with moderate symptoms (23-44), 31 (58.5%) tested positive and 113 (39.9%) tested negative. In the mild symptom group (11-22), 22 (41.5%) were positive and 170 (60.1%) were

negative. A significant association was also found between the Durkan test and Functional Status Scale (FSS) (p=0.002). All participants with severe functional limitation (31-40) were Durkan positive 14(26.4%), with no negative cases. In the moderate functional group (16-30), 19(35.4%) were positive and 82(28.9%) were negative. In the mild functional group (8-15), 20(37.7%) were positive and 201 (71.1%) were negative.

Table 2: Association of Durkan Test with Symptom Severity Scale (SSS) and Functional Status Scale (FSS)

Variable	Category	Negative n (%)	Positive n (%)	Total (n)	χ^2	p-value
Symptom Severity Scale (SSS)	Moderate (23-44)	113 (39.9)	31 (58.5)	144	6.29	0.012*
	Mild (11-22)	170 (60.1)	22 (41.5)	192		
Functional Status Scale (FSS)	Severe (31-40)	0(0)	14 (26.4)	14	82.91	0.002**
	Moderate (16-30)	82 (28.9)	19 (35.4)	101		
	Mild (8-15)	201 (71.1)	20 (37.7)	221		

Significance level- p<0.05, p<0.01** & p<0.001***; χ^2- chi-square test; n- frequency; %-percentage*

DISCUSSION

The current study found the prevalence and severity of the carpal tunnel syndrome (CTS) symptoms in the female arts and textile students through use of both objective clinical tests (Durkan test), as well as patient-reported outcome measures, i.e.: the Boston Carpal Tunnel Questionnaire (BCTQ). There were 53 (15.8%) participants were positive on Durkan compression test among 336 participants. The self-reported symptoms and impaired functions were strong with the mean SSS of 24.93±8.63, FSS of 19.32±6.27 and total BCTQ of 43.82±14.62. Although the relative objective positivity rate was rather low, a high percentage of the participants described moderate-to-severe symptom burden and functional limitation. This divergence emphasizes the fact that provocative clinical testing when utilized independently can underestimate the occurrence of early or subclinical CTS therefore providing the need to integrate the use of objective testing with patient-reported outcome measures (PROMs) to create an effective diagnostic paradigm[22,23,24].

The prevalence of carpal tunnel syndrome is dependent on the demographic factors and workplace exposures. Yaseen et al. (2024) recorded a more favourable Durkan positivity result (55.4 %) among pregnant women, thus demonstrating the effect of physiological and temporal determinants. This rate of 15.8 % positivity is relatively smaller, but it supports the opinion that repeated fine-motor activities of arts and textile disciplines contribute to a material increase in the risk of CTS without pregnancy-related factors[25].

Office and industrial populations demonstrate similar patterns. Feng et al., 2021 and Omole et al., 2023 reported high rates of self-reported wrist and hand symptoms among office workers and design students exposed to prolonged computer or drawing tasks[26,27]. Our findings echo these patterns, indicating that repetitive fine-motor tasks in academic settings can produce early CTS signs at a younger age[27].

Meta-analyses show that provocative manoeuvres such as Durkan and Phalen have moderate sensitivity (Durkan =0.67; Phalen =0.57) and variable specificity[22]. Our observation of low Durkan positivity but high PROM-reported symptom burden aligns with this evidence, supporting the notion that provocative tests may miss early or evolving CTS presentations[24].

Modified provocative tests (e.g., Modified Phalen) achieve higher sensitivity but reduced specificity[28]. Reliance solely on Durkan would underestimate CTS burden; incorporation of PROMs such as the BCTQ allows detection of subclinical or functionally meaningful symptoms, guiding early intervention[25,28].

BCTQ is proven measures that describe the severity of the symptoms and the functional limitation of heterogeneous population [23,29]. The SSS and FSS scores of current study are consistent with women in repetitive and hand-intensive work and school studies, thus highlighting that functional diminution can be maintained even in a low provocative test positivity[27,30].

The female sex is considered a known risk factor of CTS, which can be explained by a smaller diameter of the carpal tunnel and hormonal factors [25,26]. The group of females only in this case is a high risk population particularly in manual repetitive tasks. Cumulative loading associated with prolonged fine motor activities (sewing, cross stitching, drawing and digital designing) may trigger the impairment of the early median nerve[26,27,29,31]. BMI also moderates the risk of CTS; half of the respondents had normal BMI with almost 29 percent being overweight or obese, a reflection of the literature showing that high BMI correlates to high intracarpal pressure and CTS vulnerability[26,29].

It is indicated in the evident discrepancy between positive results of the Durkan test and PROM-reported morbidity that a composite assessment model is urgently needed. Diagnostic certainty cannot be obtained by solely using a

single provocative test, an integrated algorithm created to integrate provocative manoeuvres with PROMs, and provided that it is practicable, electrophysiological studies, will provide more better appreciation of the CTS status. Resource-limited academic institutions can consider using PROMs as the primary warning sign of functional impairment, whereas nerve conduction examination is used in the presence of persistent or progressive manifestations. Early identification will allow the timely ergonomic education and specific interventions to prevent the subclinical or moderate CTS development to severe disability[22,24].

It is legitimate to introduce ergonomic training to the arts and textile programs. Workstation optimization, wrist stabilizing exercises, micro-break routines and nerve- gliding routines have all been debated as interventions able to prevent CTS risk and symptomatic progression[27,29,32]. Periodic screening procedures making an interventions of objective monitoring alongside PROMs might recruit at-risk students early enough to enable direct educational interventions and maintenance of integrity.

Longitudinal studies that include nerve conduction studies need to be conducted in the future to clarify the incidence, progression, and exposure-response relationships of CTS in the young and hand-intensive population[5,22,23]. Imaging techniques, such as ultrasound and elastography, could be used in a combination with PROMs and clinical correlates, which will provide anatomical verification of median nerve changes[31,33,34]. Subgroup comparisons between males and females or arts and textile specialists may serve as an informer of tailor-made preventive measures.

CONCLUSION

The study found the existence of carpal tunnel syndrome among female students involved in arts and textiles, most of whom reported moderate symptoms and limitations in functionalities the measurement of which was by the use of BCTQ. To the extent that monotonous hand use that is intrinsic in the academic tasks leads to the early compression of the median nerve in this group of people. A combination of objective clinical testing and patient-reported outcome measures will provide a more detailed assessment of the CTS impact of the academic group. To this end, therefore, timely ergonomic training, frequent screening, and preventive interventions are mandatory to protect the hand functions of the students, reduce the symptoms and academic productivity.

DECLARATIONS & STATEMENTS

Author's Contribution

RR, SA, and ZM: substantial contributions to the conception and design of the study.
RR, HI, and ZM: acquisition of data for the study.
SA, HI and ZM: interpretation of data for the study.
RR and ZM: Analysis of the data for the study.
RR, SA, HI and ZM: drafted the work.
RR, SA, HI and ZM: revised it critically for important intellectual content.
RR, SA, HI and ZM: final approval of the version to be published and agreement to be accountable for all aspects. of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

Cross-sectional survey was conducted among female arts and textile students in Rawalpindi and Islamabad over a four-month period, from July 2025 to October 2025.

AI Use Statement

The authors used Grammarly to improve language clarity during manuscript preparation. All interpretations, conclusions, and original ideas remain solely those of the authors and approved by the authors.

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Funding Sources

None to declare.

Conflicts of Interest

None to declare.

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