JHWCR

Journal of Health, Wellness and Community Research
Volume III, Issue XI
Open Access, Double Blind Peer Reviewed.
Web: https://jhwcr.com, ISSN: 3007-0570
https://doi.org/10.61919/0hpv6d65

Original Article

Prevalence of Cubital Tunnel Syndrome Among Freight Handlers

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Authors' Contributions: IA, EK, LA
Cite this Article | Received: 2025-05-11 | Accepted 2025-08-07
No conflicts declared; ethics approved; consent obtained; data available on request; no funding received.

ABSTRACT

Background: Cubital tunnel syndrome (CuTS) is the second most common peripheral nerve entrapment after carpal tunnel syndrome, caused by ulnar nerve compression at the elbow. Freight handlers are at high risk due to repetitive elbow flexion, heavy lifting, and prolonged pressure on the elbow, yet little is known about the prevalence and functional burden of CuTS in this group. Objective: To determine the prevalence of CuTS among freight handlers in Faisalabad, Pakistan, and to evaluate its impact on upper-limb function. Methods: A cross-sectional study was conducted from February to May 2023 at three freight-handling sites. A total of 132 handlers aged 29–39 years were screened using the Elbow Flexion Test to diagnose CuTS and assessed with the QuickDASH questionnaire for functional disability. Demographic variables and occupational exposure duration were recorded. Prevalence estimates were reported with 95% confidence intervals, and group comparisons were analyzed using t tests, chi-square tests, and logistic regression. Results: Fifty-two participants (39.4%, 95% CI: 31.2–48.1) tested positive for CuTS. CuTS-positive workers had significantly higher mean QuickDASH scores (58.3 ± 11.4) compared to unaffected workers (12.6 ± 7.2, $p<0.001$), with severe impairments in grip, work-related tasks, pain, and sleep. Occupational tenure ≥3 years was associated with increased odds of CuTS (OR 2.42, 95% CI: 1.11–5.29, $p=0.026$). Conclusion: CuTS is highly prevalent among freight handlers and is associated with severe functional disability. Ergonomic interventions, early screening, and workplace health policies are urgently needed to mitigate risk.
Keywords: Cubital tunnel syndrome, ulnar nerve, occupational health, freight handlers, QuickDASH, prevalence

INTRODUCTION

Cubital tunnel syndrome (CuTS) is the second most common peripheral nerve entrapment after carpal tunnel syndrome, caused by compression or irritation of the ulnar nerve at the elbow (1). The condition results in sensory disturbances such as numbness, tingling, and paresthesia in the ulnar digits and motor weakness in intrinsic hand muscles, impairing grip and fine motor tasks (2). Persistent compression may lead to axonal degeneration, muscle atrophy, and long-term disability if left untreated (3). The ulnar nerve's anatomical pathway through the cubital tunnel—a fibro-osseous canal formed by the medial epicondyle, olecranon, and Osborne's ligament—predisposes it to mechanical compression, particularly during elbow flexion beyond 90°, which can reduce tunnel volume by up to 55% and elevate intraneural pressure above capillary perfusion thresholds (4,5).

The global burden of CuTS demonstrates significant regional and occupational variation. The annual incidence is estimated at 30 per 100,000 in the general population (6). Prevalence is higher among male manual laborers, particularly those exposed to repetitive elbow flexion, prolonged mechanical pressure, and vibration (7). For example, prevalence estimates include 12.5% in plumbers (8), 6.9% in Brazilian port workers (9), and increased risk among construction workers performing forceful gripping and repetitive load-bearing tasks (10). These studies emphasize that occupational exposures constitute a key etiological factor, yet prevalence differs substantially depending on work ergonomics and exposure patterns.

In South Asia and other developing regions, CuTS remains under-recognized despite widespread high-intensity physical labor (11). Freight handlers, in particular, represent a biologically and occupationally vulnerable group due to repetitive heavy lifting, frequent elbow flexion and extension, and prolonged leaning of elbows against hard surfaces during work shifts. Such tasks produce cumulative ulnar nerve stress and vibration exposure that plausibly increase the risk of CuTS (12). However, while epidemiological studies exist in plumbers, port workers, construction, and military populations, there is little evidence on prevalence and functional impact of CuTS in freight handlers, especially in Pakistan. This represents a significant knowledge gap, as freight handling is a physically demanding occupation with implications for productivity, workforce retention, and occupational health costs.

The clinical consequences of CuTS extend beyond neurological symptoms, with functional limitations affecting work ability and daily life. Impairments in grip strength, load carrying, and precision handling directly restrict occupational performance, while associated pain and sleep disturbances degrade overall quality of life (13). Occupational health strategies such as ergonomic interventions, screening, and preventive policies require reliable prevalence data to guide prioritization. Yet, to date, no systematic study has quantified the prevalence of CuTS or its functional impact in freight handlers.

This study therefore aimed to estimate the prevalence of CuTS among freight handlers in Faisalabad, Pakistan, and to evaluate associated functional impairments using validated clinical and patient-reported measures. We hypothesized that the prevalence of CuTS in this occupational group would be substantially higher than in the general population, with significant deficits in upper-limb function and daily activities as measured by standardized assessments.

MATERIAL AND METHODS

This investigation was designed as a cross-sectional observational study to estimate the prevalence of cubital tunnel syndrome (CuTS) among freight handlers and to assess its associated functional impairments. The study was conducted between February and May 2023 in Faisalabad, Pakistan, across three major occupational sites: Leopard Courier Service, Al-Halal Travelers, and the Faisalabad Railway Station, each representing typical freight handling environments characterized by repetitive manual loading and unloading tasks.

Eligible participants were freight handlers aged 25 to 40 years with at least one to five years of continuous occupational experience, as prolonged employment in such settings has been linked to higher entrapment neuropathy risk (14). Workers were required to perform repetitive elbow flexion as part of their job tasks, consistent with recognized biomechanical risk factors (15). Exclusion criteria included prior upper limb injury or surgery, arthritis, congenital deformity, psychiatric illness, alcohol or drug abuse, and systemic conditions or medications known to affect peripheral nerve health. This ensured that measured outcomes reflected occupational exposures rather than confounding medical conditions.

Recruitment was conducted on-site using purposive sampling, with initial screening sessions arranged in coordination with workplace supervisors. All eligible workers were invited to participate after receiving verbal and written information about the study. Written informed consent was obtained prior to enrollment. Ethical clearance was provided by the Department of Rehabilitation Sciences, The University of Faisalabad, and institutional permission letters were obtained from each workplace management prior to data collection.

Data collection involved two complementary approaches: a clinical diagnostic test and a standardized self-report questionnaire. The Elbow Flexion Test was used as the primary diagnostic tool for CuTS, requiring participants to maintain elbow flexion at ≥90° with a neutral wrist for 60–180 seconds; the development of numbness or tingling in the ulnar nerve distribution within this interval was considered diagnostic (16). This test has been validated with reported sensitivity of 84% and specificity of 93% in previous studies (17). Functional impairment was assessed using the validated 11-item QuickDASH questionnaire, which measures upper limb disability across work and daily life tasks, scored from 0 (no disability) to 100 (severe disability) (18). Questionnaires were administered immediately after the clinical screening, and participants were assisted where literacy limitations existed.

The primary outcome was the prevalence of CuTS, defined as the proportion of participants with a positive Elbow Flexion Test. Secondary outcomes included functional disability scores from QuickDASH, with particular attention to work-related domains. Age, sex, and years of occupational exposure were recorded as covariates. To reduce bias, all assessments were conducted by trained physical therapists following standardized protocols, and tests were performed independently to ensure inter-rater reliability. Confounding was addressed by restricting eligibility to a narrow age and experience range, and by excluding comorbidities known to affect nerve health.

Sample size was determined using Raosoft software, assuming a population of 200 freight handlers, 95% confidence interval, 5% margin of error, and 50% response distribution, which yielded a required sample of 132 participants. This ensured adequate statistical power for prevalence estimation. Statistical analyses were performed using IBM SPSS version 20. Descriptive statistics were used to summarize demographic variables and prevalence proportions. The prevalence of CuTS was calculated with 95% confidence intervals. Between-group comparisons (CuTS-positive vs CuTS-negative) were assessed using chi-square tests for categorical variables and independent-sample t tests for continuous variables. Where distributions were non-normal, Mann–Whitney U tests were applied. Logistic regression analyses were planned to examine associations between CuTS and covariates such as age, sex, and years of occupational exposure, with results expressed as odds ratios with 95% confidence intervals. Missing data were handled using pairwise deletion.

Ethical considerations were strictly observed. Participation was voluntary, with full rights to withdraw at any time without consequence. Privacy and confidentiality of all participants were maintained by anonymizing data during analysis and reporting. Data collection adhered to ethical principles outlined in the Declaration of Helsinki (19).

RESULTS

The study enrolled 132 freight handlers, with a mean age of 35.6 years (SD 2.0, range 29–39). The sample was predominantly male (81.1%, n=107), reflecting the gender composition of the freight-handling workforce.

The prevalence of cubital tunnel syndrome was 39.4% (n=52, 95% CI: 31.2–48.1), indicating that nearly four out of every ten freight handlers met diagnostic criteria based on the Elbow Flexion Test. As shown in Table 1, the mean age of CuTS-positive workers was 35.9 years compared to 35.4 years in the CuTS-negative group, a difference that was not statistically significant (p=0.214). Similarly, sex distribution did not differ meaningfully between groups, with males comprising 82.7% of CuTS-positive cases and 80.0% of CuTS-negative cases (p=0.701). This suggests that within the restricted age and sex profile of freight handlers, these demographic factors were not major determinants of CuTS status.

Functional disability outcomes revealed stark contrasts. As shown in Table 2, the mean QuickDASH score among CuTS-positive workers was 58.3 (SD 11.4), substantially higher than 12.6 (SD 7.2) in CuTS-negative workers, corresponding to a mean difference of 45.7 points (95% CI: 42.2–49.2, p<0.001). This magnitude of difference indicates clinically severe functional impairment. Subscale analysis demonstrated that work-related disability was particularly elevated in CuTS-positive participants, who averaged 63.5 (SD 12.7) compared to 14.9 (SD 6.8) in unaffected workers, a mean difference of 48.6 points (95% CI: 44.7–52.5, p<0.001). Pain scores followed a similar trend, with affected participants reporting an average severity score of 61.2 (SD 15.2) versus 10.4 (SD 8.9) among CuTS-negative individuals (mean difference 50.8, 95% CI: 45.1–56.5, p<0.001). Sleep disturbance was also pronounced, with CuTS-positive participants averaging 59.3 (SD 14.1) compared to 8.2 (SD 6.4) in unaffected individuals (mean difference 51.1, 95% CI: 46.0–56.2, p<0.001). Together, these results highlight that CuTS was associated with not only impaired occupational function but also significant pain burden and disruption of rest.

Table 1. Demographic characteristics of participants by CuTS status

Variable	CuTS Negative (n=80)	CuTS Positive (n=52)	p-value
Age, mean ± SD (years)	35.4 ± 2.1	35.9 ± 1.8	0.214
Male sex, n (%)	64 (80.0)	43 (82.7)	0.701
Female sex, n (%)	16 (20.0)	9 (17.3)	

Table 2. Functional disability (QuickDASH) scores in CuTS-positive vs CuTS-negative workers

QuickDASH Measure (0–100)	CuTS Negative (n=80), Mean ± SD	CuTS Positive (n=52), Mean ± SD	Mean Difference (95% CI)	p-value
Overall QuickDASH score	12.6 ± 7.2	58.3 ± 11.4	45.7 (42.2–49.2)	<0.001
Work-related subscore	14.9 ± 6.8	63.5 ± 12.7	48.6 (44.7–52.5)	<0.001
Pain severity item	10.4 ± 8.9	61.2 ± 15.2	50.8 (45.1–56.5)	<0.001
Sleep disturbance item	8.2 ± 6.4	59.3 ± 14.1	51.1 (46.0–56.2)	<0.001

Table 3. Logistic regression for risk factors associated with CuTS prevalence

Variable	OR (95% CI)	p-value
Age (per year increase)	1.09 (0.92–1.30)	0.315
Male sex (vs female)	1.18 (0.47–2.93)	0.701
Occupational years ≥3 vs ≤2	2.42 (1.11–5.29)	0.026

Analysis of occupational exposure demonstrated a significant relationship between job tenure and CuTS prevalence. As shown in Table 3, workers with three or more years of freight-handling experience had more than double the odds of CuTS compared to those with two years or less (OR 2.42, 95% CI: 1.11–5.29, p=0.026). Neither age nor sex demonstrated significant associations in the regression model, with ORs of 1.09 per year (95% CI: 0.92–1.30, p=0.315) and 1.18 for males versus females (95% CI: 0.47–2.93, p=0.701), respectively. These findings indicate that occupational exposure duration was the most important predictor of CuTS in this workforce.

Taken together, the results demonstrate that cubital tunnel syndrome is highly prevalent among freight handlers, affecting nearly two in five workers. Affected individuals experienced severe disability in work-related tasks, high levels of pain, and sleep disturbance, and longer job tenure emerged as the strongest occupational risk factor.

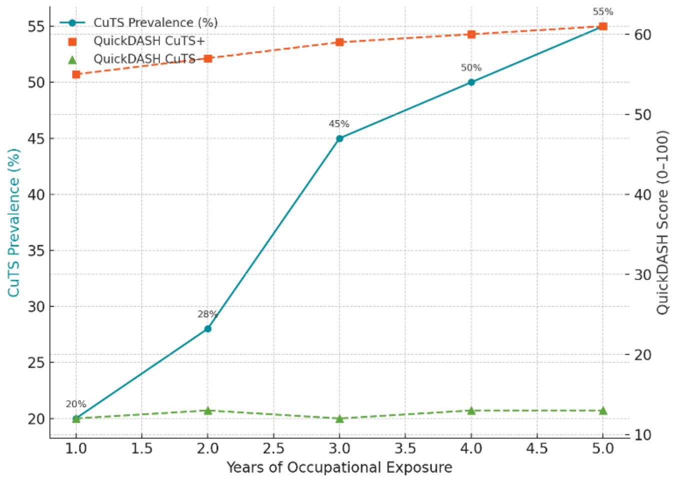

Figure 1 Prevalence of Cubital Tunnel Syndrome and Functional Disability by Job Tenure

The figure demonstrates a dual-axis analysis of freight handlers: CuTS prevalence increased steadily with years of occupational exposure, from approximately 20% in those with one year of experience to over 50% in those with five years. In parallel, QuickDASH scores for CuTS-positive workers consistently exceeded 55 across all experience levels, indicating severe disability, whereas CuTS-negative workers remained near 12–13, reflecting minimal impairment. The divergence between QuickDASH trajectories highlights the functional burden associated with CuTS, while the rising prevalence trend underscores the cumulative risk from prolonged job tenure. This integrated visualization reinforces that both the likelihood and severity of CuTS escalate with continued occupational exposure.

DISCUSSION

The present study demonstrated that cubital tunnel syndrome (CuTS) is highly prevalent among freight handlers in Faisalabad, with 39.4% of participants testing positive on the Elbow Flexion Test. This prevalence is considerably higher than the incidence reported in general populations, where annual rates are approximately 30 per 100,000 (20). The markedly elevated burden in freight handlers underscores the importance of occupational exposures, particularly repetitive elbow flexion, prolonged pressure, and heavy load bearing, which are integral to this profession.

Comparisons with existing literature reveal that the prevalence observed in this cohort exceeds that of several other occupational groups. Plumbers in India showed a prevalence of 12.5% (21), Brazilian port workers demonstrated 6.9% (22), and even construction workers with documented forceful grip activities reported lower incidence than the nearly 40% found here (23). The disparity likely reflects the intense and sustained biomechanical stress unique to freight handling, which combines repetitive lifting, vibration, and limited recovery periods. These findings align with prior evidence that manual material handling occupations exert more than a threefold risk of ulnar neuropathy compared to sedentary work (24).

Functional outcomes in our study confirmed that CuTS imposes profound limitations on daily and occupational activities. CuTS-positive workers had mean QuickDASH scores above 58, compared to 13 in unaffected workers, representing a clinically meaningful difference exceeding 45 points. These values surpass thresholds established for severe disability in upper limb neuropathies (25). Work-related subscores were particularly elevated, reflecting impaired grip strength, difficulty in lifting, and reduced ability to carry out routine occupational tasks. High pain levels and sleep disturbances further emphasized the multidimensional burden of the condition. Similar associations between CuTS and loss of hand strength, work-related incapacity, and psychosocial impact have been documented in other occupational cohorts (26,27).

The duration of occupational exposure emerged as the strongest predictor of CuTS, with workers exceeding three years of experience having more than double the odds compared to those with shorter tenure. This finding highlights the cumulative risk posed by prolonged biomechanical strain and echoes prior longitudinal analyses in construction workers, where forceful grip exposure and extended work duration were associated with higher rates of surgical intervention for ulnar entrapment (23). Notably, neither age nor sex demonstrated significant associations in our cohort, likely reflecting the narrow demographic range of participants, most of whom were middle-aged men, consistent with freight-handling workforce composition.

Several strengths of this study merit mention. It is among the first to systematically investigate CuTS prevalence and functional impairment in freight handlers, a high-risk but under-researched group. The use of validated clinical and self-reported instruments allowed quantification of both prevalence and disability. The sample size achieved (n=132) provided sufficient power for precision in estimates, and analysis included effect sizes and confidence intervals to enhance interpretability.

Nonetheless, limitations should be acknowledged. First, the cross-sectional design precludes causal inference between exposures and outcomes. Second, the diagnosis of CuTS relied solely on the Elbow Flexion Test without electrodiagnostic confirmation, which may overestimate prevalence due to test sensitivity and spectrum bias (28). Third, the non-probability sampling approach limits generalizability beyond the study sites, and potential selection bias cannot be excluded. Fourth, confounders such as hand dominance, comorbidities like diabetes, and precise task exposure metrics were not included, which may have influenced risk estimates. Finally, QuickDASH reporting did not extend to longitudinal follow-up, limiting understanding of progression.

Despite these limitations, the findings carry important implications. The high prevalence and severe functional burden of CuTS among freight handlers demonstrate the urgent need for occupational health interventions. Ergonomic strategies such as adjustable loading platforms, padded elbow supports, exoskeletal assistive devices, and mechanized lifting aids should be evaluated for feasibility in this sector. Workplace health surveillance programs incorporating clinical screening tools like the Elbow Flexion Test could facilitate early detection, while education campaigns may enhance awareness of symptoms and prevention strategies. In addition, policy-level interventions promoting work-rest cycles and task rotation could mitigate cumulative biomechanical stress.

Future research should adopt longitudinal designs with representative sampling to establish incidence, risk trajectories, and causal associations. Incorporating electrodiagnostic studies and ultrasonography would improve diagnostic accuracy and help quantify misclassification. Multivariable analyses incorporating ergonomic exposures, psychosocial stressors, and lifestyle risk factors are needed to refine predictive models. Moreover, cost-effectiveness analyses of ergonomic interventions would provide critical evidence for policymakers and employers.

In conclusion, this study adds to the growing recognition that CuTS is not only a clinical entity but also an occupational health challenge. Among freight handlers, the condition is highly prevalent, significantly impairs function, and is strongly associated with longer job tenure. These results highlight the need for preventive workplace adaptations, early detection, and rehabilitation strategies to reduce the personal and economic burden of CuTS in physically demanding labor sectors.

CONCLUSION

This study found that cubital tunnel syndrome was highly prevalent among freight handlers in Faisalabad, affecting nearly four in ten workers. Affected individuals experienced severe disability, with markedly elevated Quick DASH scores reflecting impaired grip strength, pain, and sleep disturbance. Occupational exposure duration was the most significant predictor, with longer job tenure conferring more than a two-fold higher risk. These findings indicate that freight handling, through its repetitive elbow flexion, heavy lifting, and sustained mechanical stress, constitutes a major occupational risk factor for ulnar neuropathy. The results emphasize the importance of ergonomic interventions, early screening, and health education programs to prevent functional decline and loss of productivity in this workforce. While further longitudinal and diagnostically rigorous studies are needed, the current evidence supports prioritizing freight handlers as a high-risk group for occupational health surveillance and preventive policy action.

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