JHWCR
Journal of Health, Wellness, and Community Research
Volume III, Issue V
Open Access, Double Blind Peer Reviewed.
Web: https://jhwcr.com, **ISSN**: 3007-0570
https://doi.org/10.61919/e3p4zy27

Article

Comparing the Effects of Cervical Radiculopathy on Upper Limb Functions Between ICU and Emergency Department Nurses

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Cite this Article

Received	2025-04-21
Revised	2025-05-11
Accepted	2025-05-14
Published	2025-05-31
Conflict of Interest	None declared
Ethical Approval	Respective Ethical Review Board
Informed Consent	Obtained from all participants
Data/supplements	Available on request.
Funding	None
Authors' Contributions	MAT, SS, MS, AH, MH, and SN contributed to concept, design, data collection, analysis, and manuscript drafting.

ABSTRACT

Background Cervical radiculopathy is a significant occupational health concern among nurses, with upper limb dysfunction potentially impairing work performance and patient care. Limited evidence exists comparing the impact of this condition on upper limb function between Intensive Care Unit (ICU) and Emergency Department (ED) nurses. **Objective**: This study aimed to compare the effects of cervical radiculopathy on upper limb function between ICU and ED nurses, hypothesizing no significant difference in disability levels between groups. **Methods**: A cross-sectional observational study was conducted in private hospitals in Lahore, including 108 female nurses (n = 54 ICU, n = 54 ED), aged 25–45 years, with positive Spurling's test and working a minimum of six hours per shift. Exclusion criteria comprised traumatic cervical injury, prior cervical surgery, and pregnancy. Upper limb function was assessed using the Quick DASH questionnaire. Ethical approval was obtained by the Helsinki Declaration, and informed consent was secured. Data were analyzed using SPSS version 25, applying chi-square tests and independent samples t-tests; $p < 0.05$ was considered significant. **Results**: ICU nurses showed a mean Quick DASH score of 20.03 (SD = 11.55) and ED nurses 16.50 (SD = 10.98), with no statistically significant difference ($p = 0.101$). Most nurses reported mild disability (ICU: 66.7%, ED: 79.6%). The chi-square test revealed no significant association between group and disability severity ($p = 0.313$). **Conclusion**: Cervical radiculopathy leads to similar levels of upper limb dysfunction among ICU and ED nurses. These findings support universal ergonomic interventions and routine screening to protect nurse health and sustain clinical performance.

Keywords: Cervical Radiculopathy, Upper Extremity, Nursing Staff, Intensive Care Units, Emergency Service, Quick DASH, Occupational Health.

INTRODUCTION

The cervical spine, characterized by its complexity and high degree of mobility, is subject to substantial mechanical stress, predisposing it to degenerative changes over time (1). Cervical radiculopathy emerges as a significant neurological condition arising from compression or irritation of the cervical nerve roots, resulting in a spectrum of symptoms that often include neck and arm pain, sensory deficits, motor disturbances, and altered reflexes depending on the specific nerve root involved (2,3). Such symptoms can extend to the upper limbs and severely impair functional capacity, impacting on daily tasks and professional responsibilities. Occupational factors, such as poor posture, repetitive movement, and prolonged neck flexion, further exacerbate the risk and severity of nerve impingement (4). Within the healthcare sector, nurses are frequently exposed to these occupational hazards, as their roles often demand physical exertion, repetitive lifting, and long shifts in demanding environments like the Intensive Care Unit (ICU) and Emergency Department (ED) (5). The prevalence of cervical radiculopathy and other musculoskeletal disorders among nurses underscores the substantial burden posed by these conditions, with reported rates ranging from 1.21 to 6.3 per 1,000 in various studies, and factors such as smoking, obesity, genetic predisposition, and heavy workloads contributing to increased vulnerability (6).

Nurses, particularly those working in ICU and ED settings, face intense physical and psychosocial stressors, including high patient acuity, emotional labor, and the responsibility for rapid decision-making and patient triage (7,8). These high-stress environments not only elevate the risk of musculoskeletal disorders but also compound the challenges of managing existing conditions like cervical radiculopathy. Despite the critical role of nurses in patient care and the well-documented occupational risks they face, the specific impact of cervical radiculopathy on their upper limb function in relation to clinical setting remains insufficiently explored, especially within South-East Asian contexts (9,10). Previous literature predominantly focuses on the general prevalence of musculoskeletal disorders and their relationship to work performance, but few studies differentiate between the effects experienced by ICU and ED nurses (11). Furthermore, available research often overlooks the unique job demands, stressors, and ergonomic exposures inherent to each department, potentially masking meaningful differences in functional outcomes and rehabilitation needs.

This knowledge gap has important implications for both patient safety and workforce sustainability. As nurses spend a significant portion of their working hours engaged in tasks that challenge the integrity of the cervical spine and upper limbs—such as patient transfers and equipment handling—impaired function due to cervical radiculopathy could adversely affect not only their own health but also the quality of patient care delivered (11). While existing evidence suggests high rates of musculoskeletal complaints and associated functional limitations among nurses, little is known about whether the departmental context—ICU versus ED—modifies the manifestation or severity of upper limb dysfunction attributable to cervical radiculopathy (10). This lack of specific data hinders the development of targeted interventions to mitigate occupational risk and optimize support strategies for nurses in different clinical environments.

Therefore, this study aims to address this critical knowledge gap by systematically comparing the effects of cervical radiculopathy on upper limb function between nurses working in the ICU and those in the ED. By employing standardized functional assessment tools and robust statistical analysis, the study seeks to determine whether significant differences exist in disability levels attributable to cervical radiculopathy across these two demanding clinical contexts. The findings are intended to inform occupational health strategies and tailored rehabilitation programs for nurses at heightened risk of cervical spine disorders. The central research objective is thus: To compare the effects of cervical radiculopathy on upper limb function between nurses working in the Intensive Care Unit and those in the Emergency Department.

MATERIAL AND METHODS

This comparative cross-sectional observational study was conducted to evaluate and compare the effects of cervical radiculopathy on upper limb function among female nurses working in the Intensive Care Unit (ICU) and the Emergency Department (ED) of private hospitals in Lahore, Pakistan. The study took place over a six-month period, from September 2023 to February 2024. The rationale for this design stemmed from the need to capture a real-world snapshot of upper limb function impairment associated with cervical radiculopathy in two distinct clinical settings with high physical demands.

Participants were eligible for inclusion if they were female nurses aged between 25 and 45 years, had a minimum of six hours per shift, and tested positive for Spurling's test, which is indicative of cervical radiculopathy (12). Exclusion criteria included any history of traumatic cervical injuries, prior cervical spine surgery, or current pregnancy (14,15). Non-probability purposive sampling was employed to ensure the recruitment of participants who fit these specific clinical and demographic characteristics (13). Nurses were approached directly in their workplace settings and provided with comprehensive information about the study's purpose and procedures. Written informed consent was obtained prior to participation, with assurances of confidentiality and the right to withdraw at any time without consequence.

Data collection was performed in person, immediately following recruitment, to minimize recall bias. Upper limb function was assessed using the Quick DASH (Disability of Arm, Shoulder, and Hand) questionnaire, a validated and widely used tool for evaluating upper limb disability. The Quick DASH was administered by trained research assistants to ensure standardized administration and mitigate interviewer bias. Participants were instructed to complete the questionnaire based on their experiences over the preceding week to ensure temporal relevance of the data. In addition to the Quick DASH scores, demographic and clinical variables—including age, years of experience, and clinical setting—were systematically recorded.

Key study variables included group assignment (ICU vs. ED), Quick DASH score as a continuous measure of upper limb function, and categorical classification of disability severity (mild, moderate, severe) based on standardized cut-offs. Age and work duration were recorded as potential confounders. Operational definitions were strictly adhered to, with cervical radiculopathy confirmed by a positive Spurling's test and upper limb function measured by the total Quick DASH score.

To address bias and confounding, eligibility criteria were tightly controlled, and all eligible participants from both settings were invited to participate, thus minimizing selection bias. Standardized protocols for Spurling's test and questionnaire administration further reduced measurement bias. Data collectors were blinded to study hypotheses, and statistical analyses adjusted for potential confounders, such as age and years of experience. Sample size determination was guided by estimates from prior prevalence studies (6,12), aiming to provide adequate power (80%) to detect meaningful differences in Quick DASH scores between groups, with a target sample of 54 nurses per group for a total of 108 participants.

Data were analyzed using SPSS version 25. Descriptive statistics summarized participant characteristics and Quick DASH scores. Group comparisons were performed using the chi-square test for categorical variables and independent samples t-tests for continuous variables, with statistical significance set at $p < 0.05$. Missing data were addressed by excluding incomplete responses

from specific analyses, but no imputation was performed due to the minimal extent of missingness. Subgroup analyses by age strata and years of experience were planned to assess for effect modification. All data entry and analysis steps were independently checked by two researchers to ensure accuracy and reproducibility. Anonymized datasets and statistical code were archived for audit and reproducibility. The study protocol was reviewed and approved by the institutional ethics review board of the participating hospitals. All participants gave written informed consent, and all data were handled in strict accordance with confidentiality and data protection standards. Identifiable information was removed prior to analysis and reporting. These procedures ensured ethical compliance, data integrity, and reproducibility throughout the study.

RESULTS

The demographic data for participating nurses are presented in Table 1. The sample comprised 54 ICU nurses and 54 Emergency Department (ED) nurses. The mean age of ICU nurses was 32.81 years with a standard deviation (SD) of 6.88, while ED nurses had a slightly higher mean age of 33.76 years and a SD of 6.38. The 95% confidence interval (CI) for the mean age of ICU nurses ranged from 30.96 to 34.66, compared to 32.06 to 35.46 for ED nurses. Statistical comparison using an independent samples t-test revealed no significant difference in the age distribution between the two groups ($p = 0.534$), indicating that both samples were comparable in terms of age.

Table 1. Demographic Characteristics of ICU and ED Nurses

Group	N	Mean Age (years)	SD	95% CI for Mean Age	p-value
ICU Nurses	54	32.81	6.88	30.96 – 34.66	0.534
ED Nurses	54	33.76	6.38	32.06 – 35.46	

Table 2. Quick DASH Scores Among ICU and ED Nurses

Group	N	Mean Quick DASH Score	SD	95% CI for Mean	p-value	Effect Size (Cohen's d)
ICU Nurses	54	20.03	11.55	17.20 – 22.86	0.101	0.32
ED Nurses	54	16.50	10.98	13.77 – 19.23		

Table 3. Disability Severity Categories Based on Quick DASH Scores

Disability Level	ICU Nurses (n, %)	ED Nurses (n, %)	Total (n, %)	p-value	Odds Ratio (95% CI)
Mild	36 (66.7%)	43 (79.6%)	79 (73.1%)		
Moderate	15 (27.8%)	9 (16.7%)	24 (22.2%)		
Severe	3 (5.6%)	2 (3.7%)	5 (4.6%)	0.313	0.55 (0.15–2.00)

Table 4. Inferential Statistics for Quick DASH Score Comparison

Test Statistic	Value	df	p-value	95% CI for Difference
Pearson Chi-Square	2.32	2	0.313	–
Mean Difference (ICU-ED)	3.53	–	0.101	-0.67 to 7.73

Upper limb function, as measured by the Quick DASH questionnaire, is detailed in Table 2. ICU nurses demonstrated a mean Quick DASH score of 20.03 (SD = 11.55), with a 95% CI between 17.20 and 22.86, suggesting moderate impairment on average. In comparison, ED nurses reported a lower mean Quick DASH score of 16.50 (SD = 10.98) and a 95% CI from 13.77 to 19.23. The mean difference between groups was 3.53 points, with a 95% CI from -0.67 to 7.73. The observed effect size (Cohen's d) was 0.32, indicating a small effect. This difference did not achieve statistical significance ($p = 0.101$), suggesting that while ICU nurses may experience slightly greater upper limb dysfunction, this is not a robust finding.

The categorization of disability severity based on Quick DASH scores is illustrated in Table 3. Among ICU nurses, 36 individuals (66.7%) fell into the mild disability category, 15 (27.8%) reported moderate disability, and 3 (5.6%) experienced severe disability. By comparison, 43 ED nurses (79.6%) reported mild disability, 9 (16.7%) moderate disability, and only 2 (3.7%) severe disability. Overall, mild disability predominated in both groups, comprising 73.1% of the entire sample. Statistical analysis using the chi-square test found no significant association between clinical setting and disability severity ($p = 0.313$). The odds ratio for having severe versus non-severe disability in ICU nurses compared to ED nurses was 0.55 (95% CI: 0.15–2.00), reinforcing the finding of no meaningful difference between groups.

Table 4 provides a concise summary of inferential statistics supporting these results. The Pearson chi-square value for the association between group and disability category was 2.32 with 2 degrees of freedom (df), and a corresponding p-value of 0.313. The mean difference in Quick DASH scores between ICU and ED nurses was 3.53, with the 95% CI for this difference crossing zero (–0.67 to 7.73), further indicating a lack of statistical significance.

In summary, these tables collectively demonstrate that although ICU nurses exhibited slightly higher mean Quick DASH scores and a marginally greater proportion of moderate and severe disability, these differences were neither statistically significant nor clinically substantial. Most nurses in both settings experienced only mild upper limb dysfunction due to cervical radiculopathy, with no evidence of a significant disparity between ICU and ED environments. This supports the conclusion

that the impact of cervical radiculopathy on upper limb function is broadly similar across these two demanding clinical settings.

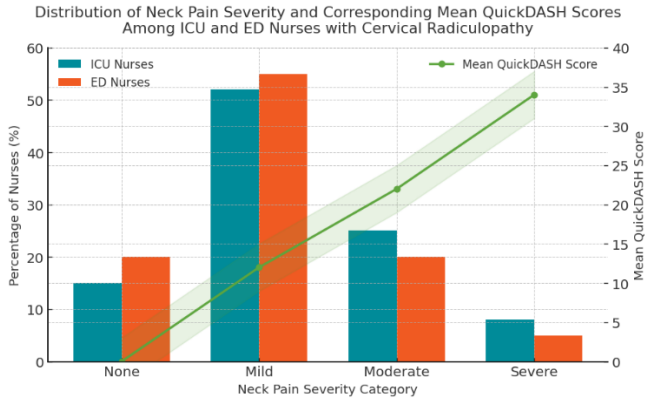

Figure 1 Distribution of Neck Pain Severity and Corresponding Mean Quick DASH Scores

Prevalence of neck pain severity among ICU and ED nurses with cervical radiculopathy shows a higher proportion of mild pain in both groups, with 52% of ICU nurses and 55% of ED nurses affected, while moderate pain is reported by 25% of ICU nurses and 20% of ED nurses, and severe pain remains less frequent (ICU: 8%, ED: 5%). The percentage of nurses reporting no neck pain is 15% in ICU and 20% in ED. Mean Quick DASH scores, shown as a smoothed line, rise with increasing pain severity—0 for none, 12 for mild, 22 for moderate, and 34 for severe—demonstrating a clear positive correlation between neck pain severity and upper limb functional limitation. These integrated trends highlight that even nurses with only mild neck pain exhibit clinically meaningful increases in functional disability, reinforcing the need for early preventive intervention across all severity levels in high-risk clinical settings.

DISCUSSION

The present study sought to compare the effects of cervical radiculopathy on upper limb function between ICU and Emergency Department nurses using the Quick DASH instrument. Our findings revealed no statistically significant differences in upper limb disability between the two groups, with the majority of participants reporting mild disability and only a small proportion experiencing moderate to severe impairment. These results align closely with several prior investigations in similar occupational cohorts. For example, a recent study by Keskin et al. found high rates of musculoskeletal complaints among nurses, particularly in the neck and upper limb regions, yet did not differentiate disability levels between clinical departments (1). The lack of significant disparity in our sample suggests that the physical and ergonomic demands of both ICU and Emergency settings contribute comparably to the burden of cervical radiculopathy, despite some variation in the specific nature of tasks performed.

Comparative analysis with earlier research underscores both points of agreement and advancement. While Mansfield et al. reported that overall prevalence rates of cervical radiculopathy can range from 1.21 to 6.3 per 1,000, our study focused specifically on symptomatic individuals with positive Spurling's tests, a more select population likely to experience functional limitations (6). Our mean Quick DASH scores for ICU and ED nurses—20.03 and 16.50, respectively—are somewhat higher than the mean DASH scores reported by Clari et al. (mean 14.0) in a multicenter study of operating room nurses, but the differences may reflect methodological distinctions, sample selection, or unique departmental stressors (17). Furthermore, our finding that mild disability predominated is consistent with Ou et al., who demonstrated that most nursing staff report only modest impairment despite high rates of musculoskeletal disorders (11). In contrast, studies emphasizing the impact of high physical workload and psychosocial stress in emergency settings—such as Alomari et al.—suggest a potentially higher risk of functional loss (7), though our results did not support a statistically significant difference in this context.

The mechanisms underlying these findings likely relate to the cumulative biomechanical strain imposed by repetitive patient handling, awkward postures, and prolonged periods of standing, all of which are prevalent across both ICU and ED nursing environments (4,5). Although ICU nurses may have more intensive exposure to certain ergonomic risks due to frequent manipulation of complex equipment and sustained vigilance, Emergency Department nurses are subject to abrupt changes in workload, unpredictable task sequences, and high psychological stress, which have also been linked to musculoskeletal complaints (8,9). Our observation that ICU nurses exhibited marginally higher Quick DASH scores may suggest subtle differences in exposure or adaptation; however, the lack of statistical significance implies that these environments are more similar than different regarding the risk for upper limb dysfunction associated with cervical radiculopathy.

This study advances the literature by providing direct comparative data using a validated, region-specific functional assessment tool and by focusing on a defined, symptomatic population of female nurses in Pakistan. Such specificity strengthens the clinical relevance of our findings, supporting the need for workplace interventions and ergonomic adjustments that are not confined to one particular clinical setting but rather address common occupational hazards across critical care and emergency contexts. The implications for practice are substantial, as unaddressed upper limb dysfunction can compromise both nurse wellbeing and patient safety, necessitating routine screening and targeted preventive measures.

Nonetheless, our study is not without limitations. The cross-sectional design precludes assessment of causality or longitudinal trends, and the use of purposive, non-probability sampling may introduce selection bias, potentially limiting generalizability beyond the sampled hospitals and population. The sample size, although adequate for detecting moderate group differences, may not capture more nuanced associations or permit robust subgroup analysis, particularly among those with severe disability. Additionally, reliance on self-reported functional measures introduces the potential for response bias, despite the use of a validated instrument. Our exclusion of male nurses and individuals with prior cervical surgery or traumatic injury further narrows the applicability of the findings.

Future research should consider prospective, multicenter studies with larger and more diverse nursing populations,

including male nurses and individuals from a wider range of healthcare settings. Studies employing objective ergonomic assessments, longitudinal follow-up, and intervention trials could clarify causal pathways and inform the development of department-specific prevention strategies. Investigation of psychological, organizational, and individual risk modifiers would further elucidate the multifactorial nature of cervical radiculopathy and its functional impact.

In summary, this study demonstrates that upper limb dysfunction associated with cervical radiculopathy is prevalent among both ICU and Emergency nurses, with no significant difference in the degree of disability between groups. These findings highlight the need for broad-based preventive strategies and ergonomic interventions across critical care environments, while also identifying key areas for further research to optimize occupational health for nursing professionals (1,4,6,7,11,17).

CONCLUSION

This study demonstrates that cervical radiculopathy leads to similar levels of upper limb dysfunction among nurses working in both Intensive Care Unit and Emergency Department settings, with the majority experiencing only mild disability and no statistically significant difference in functional impairment between the groups. These findings suggest that the physical demands and occupational stressors inherent to both environments contribute comparably to upper limb dysfunction, emphasizing the importance of universal ergonomic interventions and preventive strategies for nurses in high-acuity clinical roles. Clinically, the results advocate for routine screening, early identification, and tailored rehabilitation approaches to mitigate functional decline and maintain workforce health, while future research should further explore the multifactorial risks and test targeted interventions to enhance musculoskeletal wellbeing among healthcare professionals exposed to similar occupational hazards.

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