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Association Between Anxiety and Upper Limb Functional Disability in Cervical Spondylosis Patients

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ABSTRACT

Background: Cervical spondylosis is a common degenerative cervical spine disorder that may impair upper limb function. Psychological distress such as anxiety is present in musculoskeletal disorders. Limited evidence exists regarding the association of anxiety with amplified disability through behavioral and neurophysiological pathways. Objective: To determine the association between anxiety severity and upper limb functional disability in acute and sub-acute stages of cervical spondylosis patients. Methodology: A cross-sectional observational study enrolled 123 adults (30–55 years) with clinically diagnosed cervical spondylosis from outpatient physiotherapy departments in Lahore, Pakistan. Anxiety severity was assessed using the Hospital Anxiety and Depression Scale-Anxiety subscale (HADS-A) and categorized as normal (0–7), mild (8–10), moderate (11–14), or severe (15–21). Upper limb functional disability was assessed using the Quick DASH and categorized as minimal/no (0–20), mild (21–40), moderate (41–60), or severe (61– 80). Association between anxiety severity and upper limb functional disability was evaluated using chi-square testing, effect size (Cramer's V) and ordinal trend analysis. Results: Mean age was 43.11±5.66 years and 67.5% were female. Anxiety was most commonly moderate (52.0%) and severe (22.0%). Quick DASH disability was most commonly mild (41.5%) and minimal/no (35.0%). Anxiety severity was strongly associated with disability category ($\chi^2(9)=155.08$, $p<0.001$; Cramer's $V=0.648$), with a significant ordinal trend ($\chi^2(1)=78.43$, $p<0.001$). Conclusion: Anxiety severity is strongly and monotonically associated with upper limb functional disability in acute to sub-acute cervical spondylosis, supporting integrated psychological screening and psychologically informed rehabilitation.

Keywords
Cervical spondylosis; anxiety; Quick DASH; HADS-A; upper-limb disability; cross-sectional study.

INTRODUCTION

Cervical spondylosis is a prevalent degenerative disorder of the cervical spine characterized by progressive disc desiccation, loss of disc height, uncovertebral and facet arthropathy, osteophyte formation, and ligamentous thickening that may narrow the neural foramina and spinal canal, producing neck pain and, in some patients, radicular or myelopathic features that compromise upper-limb function (1,2). Biomechanically, degenerative change redistributes load across cervical motion segments and can provoke pain, stiffness, and segmental dysfunction, while neural compromise may impair motor output and sensorimotor control, contributing to upper-extremity weakness and limitations in daily activities (1,3). Functional consequences are clinically salient because even modest impairment in grip, dexterity, or endurance can restrict occupational tasks and self-care, and grip strength reduction has been documented in individuals with cervical spondylosis compared with healthy controls, supporting the relevance of upper-limb functional assessment in this population (3). Although cervical spondylosis is often approached through anatomical and neurological mechanisms, contemporary pain science recognizes that musculoskeletal disability frequently reflects an interaction between tissue pathology, pain processing, and psychosocial factors that shape symptom burden, activity tolerance, and rehabilitation engagement (4).

Anxiety is a common comorbidity in chronic pain and musculoskeletal conditions and can influence disability through multiple pathways, including increased arousal, attentional bias to threat, sleep disruption, reduced self-efficacy, and avoidance behaviors that limit activity participation (4,5). People with chronic musculoskeletal conditions are always anxious, which leads to them experiencing continuous pain and performance limitations and serve as constant source of stressor. This is commonly attributed due to variation in hormone secretions, social demands and neuroendocrine changes as a result of stress (5). In cervical spine disorders, psychological distress is also frequent; among patients with cervical degenerative disc disease, clinically relevant anxiety symptoms have been reported and appear to cluster with greater symptom severity and worse clinical status (2). System-level syntheses further suggest that psychosocial factors, including anxiety and distress, are associated with poorer health outcomes in neck pain cohorts with or without radiculopathy, although the certainty of evidence varies by study design and measurement heterogeneity (6). At the level of upper-limb function, anxiety has been linked with greater self-reported disability and poorer strength-related outcomes in patients with electro physiologically confirmed cervical radiculopathy, indicating that psychological factors can meaningfully reshape perceived and functional limitations in cervical nerve root pathology (7).

Despite this emerging evidence, an important knowledge gap remains regarding the relationship between anxiety severity and upper-limb functional disability specifically among adults with clinically diagnosed cervical spondylosis presenting in acute to sub-acute phases of symptoms, where neurological deficits may be less pronounced and disability gradients may still be clinically meaningful for early rehabilitation planning (8). From a PICO perspective, the population of interest comprises adults with cervical spondylosis in outpatient care; the exposure is anxiety severity; the outcome is upper-limb functional disability; and the clinical context is early-stage presentations in which addressing modifiable psychosocial correlates could plausibly improve function and optimize physiotherapy pathways (2,4,6,7). Establishing whether anxiety severity is associated with graded upper-limb disability in this setting would strengthen the rationale for routine psychological screening alongside functional assessment and may inform integrated management strategies like progressive graded exercises, muscle relaxation strategies and deep breathing exercises to improve overall performance in early cervical spondylosis rehabilitation (4,6). Therefore, this study aimed to determine the association between

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anxiety severity, measured using the Hospital Anxiety and Depression Scale-Anxiety subscale, and upper-limb functional disability, measured using the Quick Disabilities of the Arm, Shoulder and Hand questionnaire, among adults with cervical spondylosis in outpatient physiotherapy departments (9,10).

MATERIALS AND METHODS

An observational cross-sectional study was conducted in outpatient physiotherapy departments of Mansoorah Hospital, Nawaz Sharif Social Security Hospital, and Ganga Ram Hospital, Lahore, Pakistan, to evaluate the association between anxiety severity and upper-limb functional disability among adults with clinically diagnosed cervical spondylosis. Participants were recruited using convenience sampling from the participating outpatient services over a six-month period following institutional approval. Adults aged 30–55 years with clinically diagnosed cervical spondylosis confirmed by clinical assessment and imaging findings were eligible, and symptom duration of 6–13 weeks was required to operationalize acute-to-sub-acute presentation using established duration frameworks for neck pain staging (8). Individuals were excluded if they reported prior cervical spine surgery, acute traumatic cervical injury or fracture, neurological disorders likely to confound upper-limb function (e.g., stroke, multiple sclerosis, peripheral neuropathies), pregnancy or lactation, active infection or metabolic bone disease, or current use of medications that could materially alter anxiety symptoms or neuromuscular performance (e.g., antidepressants, anxiolytics, muscle relaxants) (11–13). To reduce bias from pre-existing conditions that could distort the exposure–outcome relationship, participants were screened via structured history and clinical record review for prior neck injury and known neuropsychological disorders; these variables were also documented as baseline characteristics to support interpretability of the recruited cohort.

After eligibility confirmation, written informed consent was obtained prior to data collection. Demographic and clinical characteristics were recorded using a standardized proforma, including age, sex, and duration of neck pain in weeks, which were prespecified as potential confounders because they can influence both anxiety symptom expression and functional disability profiles in cervical spine disorders. The exposure variable, anxiety, was assessed using the Hospital Anxiety and Depression Scale-Anxiety subscale (HADS-A), a 7-item instrument designed to quantify anxiety symptoms while minimizing contamination by somatic symptomatology common in medical populations (9). Each HADS-A item is scored from 0 to 3, producing a total score from 0 to 21. Anxiety severity was categorized a priori using conventional thresholds: normal (0–7), mild (8–10), moderate (11–14), and severe (15–21), enabling ordinal assessment of severity gradients (9,14). The outcome variable, upper-limb functional disability, was assessed using the QuickDASH, an 11-item patient-reported measure derived from the original DASH instrument to quantify symptom burden and difficulty performing upper-extremity activities (10). Items are scored on a 5-point Likert scale; the total score is calculated and transformed to a 0–100 scale where higher scores indicate greater disability (10). For reproducibility and scoring integrity, QuickDASH scoring was performed according to standard rules requiring completion of at least 10 of the 11 items; when scoring criteria were not met, the questionnaire was treated as non-scorable and excluded from analysis for that variable. Disability categories were prespecified for interpretability: minimal/no disability (0–20), mild (21–40), moderate (41–60), and severe (61–80); a very severe category (81–100) was not retained unless observed in the dataset to avoid empty-category artifacts in categorical analyses and reporting.

To minimize information bias, standardized administration instructions were used for all questionnaires, and participants completed Urdu or English versions based on comprehension. Data were checked at the point of collection for completeness to reduce missingness, and all entries were verified for allowable ranges prior to analysis. Continuous variables were summarized using mean and standard deviation, supplemented by 95% confidence intervals where appropriate to enhance interpretability. Categorical variables were summarized as frequencies and percentages. The primary inferential analysis evaluated the association between anxiety severity category (ordinal exposure) and QuickDASH disability category (ordinal outcome) using the chi-square test of independence, with assumptions assessed by inspection of expected cell counts; where sparse cells occurred, an exact approach was planned to maintain validity. To quantify the magnitude of association beyond statistical significance, effect size was prespecified using Cramer's V with conventional interpretation thresholds reported alongside the chi-square statistic. Given the ordered nature of both variables, a linear-by-linear (Mantel–Haenszel) trend test was additionally prespecified to evaluate monotonic increases in disability across rising anxiety categories. To address confounding, an ordinal logistic regression model was prespecified with QuickDASH disability category as the dependent variable and anxiety severity as the primary predictor, adjusting for age, sex, and duration of neck pain; adjusted odds ratios with 95% confidence intervals were planned to provide clinically interpretable estimates of association strength. All analyses were performed using IBM SPSS Statistics version 27, with a two-sided alpha threshold of 0.05. Ethical conduct was maintained in accordance with institutional requirements and the Declaration of Helsinki principles, including voluntary participation, confidentiality safeguards, and the right to withdraw without consequences to care.

RESULTS

A total of 123 adults with cervical spondylosis were analyzed, with a mean age of 43.11 ± 5.66 years (95% CI 42.10–44.12), and 67.5% (83/123) were female (Table 1). Mean symptom duration was 9.02 ± 2.29 weeks (95% CI 8.61–9.43), reflecting an acute-to-sub-acute cohort (Table 1). Anxiety burden was substantial, with a mean HADS-A score of 12.33 ± 3.04 (95% CI 11.79–12.87); moderate anxiety was most frequent (52.0%), followed by severe anxiety (22.0%) (Table 2). Upper-limb disability was predominantly low-to-mild by category distribution, with 41.5% in mild disability and 35.0% in minimal/no disability, while 13.8% fell in the severe disability category (Table 2).

Table 1. Participant Characteristics (n = 123)

Variable	Summary
Age (years), mean ± SD	43.11 ± 5.66
Age (years), 95% CI of mean	42.10 to 44.12
Sex, n (%)	Male 40 (32.5); Female 83 (67.5)
Neck pain duration (weeks), mean ± SD	9.02 ± 2.29
Neck pain duration (weeks), 95% CI of mean	8.61 to 9.43

The cross-tabulation demonstrated a marked graded pattern: among those with severe anxiety, 63.0% (17/27) were in severe disability, whereas among those with normal anxiety, 100% (8/8) were in minimal/no disability (Table 3). The overall association between anxiety severity and

disability category was statistically significant ($\chi^2(9)=155.08$, $p<0.001$) and large in magnitude (Cramer's V=0.648), with a highly significant ordinal trend indicating progressively higher disability with increasing anxiety severity (linear-by-linear $\chi^2(1)=78.43$, $p<0.001$) (Table 3).

Table 2a. Anxiety (HADS-A) and Upper-Limb Disability (QuickDASH): Continuous Score Summary (n = 123)

Instrument	Construct	Mean	SD	95% CI (Lower)	95% CI (Upper)
HADS-A	Anxiety (total score)	12.33	3.04	11.79	12.87
QuickDASH	Upper-limb disability (total score)	30.97	19.01	27.57	34.36

Table 2b. Anxiety (HADS-A) and Upper-Limb Disability (QuickDASH): Severity/Category Distribution (n = 123)

Instrument	Category Type	Category/Range	n	%
HADS-A	Severity	Normal	8	6.5
HADS-A	Severity	Mild	24	19.5
HADS-A	Severity	Moderate	64	52.0
HADS-A	Severity	Severe	27	22.0
QuickDASH	Disability category	Minimal/No (0–20)	43	35.0
QuickDASH	Disability category	Mild (21–40)	51	41.5
QuickDASH	Disability category	Moderate (41–60)	12	9.8
QuickDASH	Disability category	Severe (61–80)	17	13.8

Table 3. Association Between Anxiety Severity (HADS-A) and QuickDASH Disability Category (n = 123)

Anxiety severity (HADS-A)	Minimal/No (0–20)	Mild (21–40)	Moderate (41–60)	Severe (61–80)	Row total
Normal (0–7)	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8
Mild (8–10)	21 (87.5%)	3 (12.5%)	0 (0.0%)	0 (0.0%)	24
Moderate (11–14)	14 (21.9%)	47 (73.4%)	3 (4.7%)	0 (0.0%)	64
Severe (15–21)	0 (0.0%)	1 (3.7%)	9 (33.3%)	17 (63.0%)	27
Column total	43	51	12	17	123

Table 4. Inferential statistics

Statistic	Value
Pearson Chi-square (df=9)	155.08
p-value	<0.001 ($p \approx 7.81\times10^{-29}$)
Effect size (Cramer's V)	0.648 (large association)
Ordinal trend (linear-by-linear χ^2, df=1)	78.43
Trend p-value	<0.001 ($p \approx 8.27\times10^{-19}$)

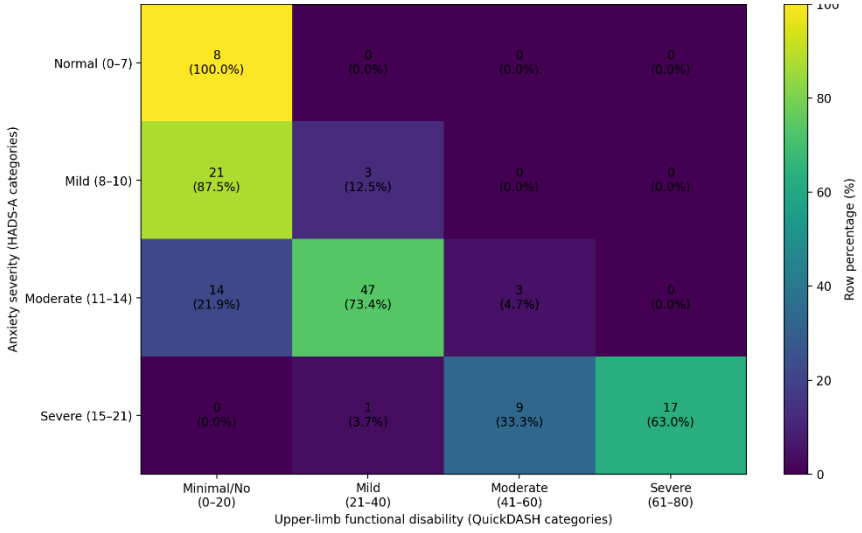

Figure 1 Row-percentage heatmap of QuickDASH disability distribution across anxiety severity levels (HADS-A).

This heatmap demonstrates a strong severity gradient across ordered categories: in the severe anxiety group, 63.0% (17/27) clustered in severe disability (61–80) and 33.3% (9/27) in moderate disability (41–60), whereas the normal anxiety group showed 100.0% (8/8) in minimal/no disability (0–20). The moderate anxiety group concentrated predominantly in mild disability (73.4%, 47/64), while mild anxiety remained largely within minimal/no disability (87.5%, 21/24), visually supporting a monotonic escalation in disability distribution with rising anxiety severity consistent with the significant ordinal trend (Table 3).

DISCUSSION

In this cross-sectional outpatient cohort of adults with clinically diagnosed cervical spondylosis during the acute to sub-acute phase, increasing anxiety severity was strongly associated with greater upper-limb functional disability. The pattern was clinically coherent and monotonic: all participants with normal anxiety were classified in the minimal/no disability category, whereas nearly two-thirds of those with severe anxiety fell

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into severe disability, supported by a large effect size (Cramer's V=0.648) and a highly significant ordinal trend. These findings reinforce the view that disability in degenerative cervical conditions is not solely an expression of structural pathology, but frequently reflects an interaction of nociceptive input, neuromuscular performance, and psychosocial context influencing activity tolerance and perceived capability (4,6).

The observed distribution aligns with broader evidence that psychological distress amplifies pain-related disability in musculoskeletal disorders and may contribute to the persistence of functional limitations through heightened distress, threat appraisal, avoidance behavior, sleep disruption, and reduced adherence to rehabilitation behaviors (4,5). Population based research indicates that anxiety affects nearly one-third of individuals across the lifespan, with a higher prevalence in women, and in chronic musculoskeletal conditions it functions as a persistent psychological stressor that sustains pain perception and contributes to ongoing activity and performance limitations through stress-related neuroendocrine mechanisms. (5). Within cervical degenerative disc disease populations, clinically relevant anxiety symptoms are common and appear to cluster with worse clinical status, supporting the plausibility of anxiety-related disability gradients in cervical disorders (2). In addition, evidence syntheses in cervical spine pain indicate that psychosocial factors including anxiety and distress are associated with poorer health outcomes, although effect certainty varies with study design and measurement heterogeneity (6). The current results contribute to the existing body of knowledge by showing the existence of a specific severity gradient in an outpatient cohort with a history of a longer period of symptoms, during which, psychosocial screening can be especially effective in the prevention of the development of long-term disability behaviors.

When compared with condition-adjacent evidence, the results are directionally consistent with work in cervical radiculopathy showing that anxiety correlates with higher QuickDASH disability and weaker strength-related outcomes, suggesting psychological factors can meaningfully shape both perceived limitation and functional performance in cervical nerve root pathology (7). While the current study did not include objective performance testing (e.g., grip dynamometry) and relied on patient-reported disability, prior comparative research in cervical spondylosis has documented reduced grip strength and endurance versus controls, underscoring that upper-limb impairment is a legitimate functional domain in this condition and may interact with psychological state to influence perceived capacity for daily tasks (3). The predominance of female participants in the present cohort is also notable, as systematic evidence indicates anxiety symptoms are common among adults with chronic pain, with sex-related differences frequently observed, and this distribution may have influenced the observed gradient through differential baseline risk of anxiety and help-seeking patterns (15). Accordingly, while the association detected here is strong, it should be interpreted as an unadjusted relationship in which residual confounding is plausible.

Several methodological considerations should temper causal interpretation. First, the cross-sectional design does not establish temporal directionality; anxiety may contribute to disability via behavioral and neurophysiological pathways, but disability and pain-related interference may also exacerbate anxiety through loss of role function and uncertainty about recovery (4,6). Second, the outcome measure (QuickDASH) captures perceived difficulty and symptom interference and is susceptible to reporting influences from mood and psychological distress, although it remains a validated instrument with strong measurement performance across upper-limb conditions (10). Third, potential confounders such as pain intensity, neck-specific disability, occupational demands, sleep quality, and clinical radiculopathy severity were not modeled; these factors can influence both anxiety and upper-limb function and could partly explain the association magnitude (2,6). Finally, while the cohort intentionally focused on early clinical presentations, generalizability to chronic cervical spondylosis, postoperative cohorts, or advanced myelopathy may differ, as psychological distress profiles and disability mechanisms tend to evolve with disease severity and chronicity.

Clinically, the results support integrating brief anxiety screening into routine assessment pathways for cervical spondylosis alongside functional measures. Since standard physiotherapy often prioritizes posture, pain modulation, and strengthening, adding psychologically informed components graded exposure to feared movements, education addressing threat beliefs, relaxation/breathing strategies, sleep-supportive counseling, and structured reassurance may improve engagement and reduce disability amplification in high-anxiety patients (4,6). Future research should adopt longitudinal designs with prespecified confounding control and include both patient-reported and objective performance metrics (e.g., grip strength, dexterity tests) to clarify whether anxiety predicts subsequent functional trajectory, and whether targeted anxiety-reduction strategies produce measurable functional gains in early cervical degenerative presentations (3,7).

CONCLUSION

Among adults with cervical spondylosis presenting in the acute and sub-acute symptom shows, anxiety severity was strongly and monotonically associated with upper-limb functional disability, with higher anxiety levels corresponding to progressively worse QuickDASH disability categories and a large association magnitude. These findings underscore the clinical importance of incorporating psychological screening into routine cervical spondylosis assessment and suggest that integrating psychologically informed rehabilitation strategies alongside conventional physiotherapy may improve functional outcomes and patient-centered care in this population.

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