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Original Article

Urdu Version of the Copenhagen Neck Functional Disability Scale for Chronic Neck Pain: A Reliability and Validity Study

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ABSTRACT

Background: Chronic neck pain is associated with persistent pain, functional limitation, reduced participation in daily activities, and impaired health-related quality of life. Reliable and culturally adapted patient-reported outcome measures are required for accurate assessment of neck-related disability in Urdu-speaking populations. Objective: To translate, culturally adapt, and evaluate the reliability and validity of the Urdu version of the Copenhagen Neck Functional Disability Scale among patients with chronic neck pain. Methods: This psychometric validity and reliability study included 120 participants with chronic neck pain. The Copenhagen Neck Functional Disability Scale was translated into Urdu using forward translation, synthesis, back translation, expert committee review, and pre-final testing. Internal consistency was assessed using Cronbach's alpha. Test–retest and inter-rater reliability were assessed using intraclass correlation coefficients. Construct validity was examined through correlations with the Neck Disability Index, Neck Pain and Disability Scale, and SF-36. Results: The mean age of participants was 39.8 ± 10.2 years, and 56.7% were female. The Urdu CNFDS demonstrated excellent internal consistency (Cronbach's $\alpha = 0.92$), test–retest reliability (ICC = 0.95, 95% CI: 0.93–0.97), and inter-rater reliability (ICC = 0.93, 95% CI: 0.90–0.96). Strong positive correlations were observed with NDI ($r = 0.88$, $p < 0.001$) and NPDS ($r = 0.84$, $p < 0.001$), while a strong negative correlation was found with SF-36 ($r = -0.76$, $p < 0.001$). Conclusion: The Urdu CNFDS is a reliable and valid instrument for assessing neck pain-related functional disability among Urdu-speaking patients with chronic neck pain. Keywords: Chronic neck pain; Copenhagen Neck Functional Disability Scale; Urdu translation; reliability; validity; psychometric study; patient-reported outcome measure.

INTRODUCTION

Chronic neck pain is a common musculoskeletal condition associated with persistent pain, restricted cervical mobility, impaired activities of daily living, reduced work productivity, and diminished health-related quality of life. Beyond pain intensity alone, the clinical burden of chronic neck pain is strongly influenced by disability, functional limitation, fear of movement, and difficulty performing routine domestic, occupational, and social activities. Accurate assessment of these dimensions is therefore essential for diagnosis, treatment planning, monitoring rehabilitation outcomes, and comparing findings across clinical and research settings. Because neck-related disability is subjective and multidimensional, patient-reported outcome measures remain central to its evaluation, particularly when the objective is to quantify the patient's perceived functional limitation rather than only clinician-observed impairment (1).

Several instruments are available for assessing neck pain and related disability, including the Neck Disability Index, Neck Pain and Disability Scale, and generic health-related quality-of-life tools such as the SF-36. These instruments provide useful information; however, each differs in construct focus, item structure, scoring interpretation, and cultural applicability. The Copenhagen Neck Functional Disability Scale is a neck-specific patient-reported outcome measure developed to evaluate functional disability related to neck pain through items reflecting pain-related limitations and activities of daily living. Its clinical value depends not only on the original psychometric quality of the instrument but also on whether translated versions preserve conceptual equivalence, linguistic clarity, cultural relevance, and measurement reliability in the population in which they are used (2,3).

Translation alone is insufficient when adapting a patient-reported outcome measure for a new language or culture. Words, expressions, health beliefs, daily activity patterns, and interpretation of disability can vary considerably across populations, and a literal translation may alter the meaning of items or reduce response accuracy. For this reason, cross-cultural adaptation requires a systematic process involving forward translation, synthesis, back translation, expert committee review, pre-final testing, and psychometric evaluation. A valid translated instrument should demonstrate internal consistency, test–retest reliability, inter-rater reliability where applicable, and construct validity through theoretically expected associations with established measures of similar and related constructs (4,5).

In Pakistan, Urdu is widely used for communication in clinical and community settings, yet many standardized musculoskeletal outcome measures remain unavailable in rigorously validated Urdu versions. The absence of an Urdu version of the Copenhagen Neck Functional Disability Scale limits its use among Urdu-speaking patients with chronic neck pain and restricts comparison of local findings with international evidence. Although instruments such as the Neck Disability Index, Neck Pain and Disability Scale, and SF-36 may be used for related assessment, they do not eliminate the need to validate the Copenhagen Neck Functional Disability Scale in the local language because each tool measures disability and quality of life through different domains and response structures. Establishing the reliability and validity of an Urdu Copenhagen Neck Functional Disability Scale would therefore support more consistent assessment of neck-related functional disability in Pakistani clinical practice and research (6,7).

The present study was designed as a psychometric validity and reliability study to translate, culturally adapt, and evaluate the Urdu version of the Copenhagen Neck Functional Disability Scale among patients with chronic neck pain in Pakistan. The study specifically assessed internal consistency, test–retest reliability, inter-rater reliability, and construct validity by examining correlations of the Urdu Copenhagen Neck Functional Disability Scale with the Neck Disability Index, Neck Pain and Disability Scale, and SF-36. It was hypothesized that the Urdu version of the Copenhagen Neck Functional Disability Scale would demonstrate acceptable-to-excellent internal consistency and reliability, positive correlations with established neck disability measures, and a negative correlation with SF-36 scores, supporting its validity for assessing pain-related functional disability among Urdu-speaking patients with chronic neck pain.

MATERIALS AND METHODS

This study was conducted as a psychometric validity and reliability study involving translation, cross-cultural adaptation, and field testing of the Urdu version of the Copenhagen Neck Functional Disability Scale in patients with chronic neck pain. The design incorporated a structured translation process followed by evaluation of internal consistency, test–retest reliability, inter-rater reliability, and construct validity. Although participant assessment was performed at defined time points, the methodological purpose of the study was not simple prevalence estimation but validation of a patient-reported outcome measure for use in an Urdu-speaking chronic neck pain population.

The English version of the Copenhagen Neck Functional Disability Scale was translated and culturally adapted into Urdu through a multistep process based on established principles for cross-cultural adaptation of self-report health measures. Two independent bilingual translators whose mother tongue was Urdu produced forward translations of the original English scale. One translator had a physiotherapy background and was familiar with the clinical construct being measured, while the second translator had language expertise and was not primarily responsible for clinical interpretation. The two forward translations were compared and synthesized into a single Urdu version after resolving differences in wording, conceptual equivalence, and clarity. This synthesized version was then back-translated into English by a language specialist who was blinded to the original English scale. The back-translated version was compared with the original instrument by an expert committee consisting of the supervisor, translators, independent physiotherapists, and researchers. The committee evaluated semantic, idiomatic, experiential, and conceptual equivalence and revised the Urdu version until consensus was reached.

The pre-final Urdu version was tested among patients with chronic neck pain to assess comprehension, clarity, acceptability, and cultural relevance. Participants were asked to complete the questionnaire independently where possible and were then invited to explain their understanding of each item. Difficult wording, ambiguous phrases, layout issues, and response difficulties were discussed and reviewed by the expert committee before finalization of the Urdu version. The finalized Urdu Copenhagen Neck Functional Disability Scale was then used for psychometric testing in the study population.

Participants were recruited from community and rehabilitation settings using non-probability convenience sampling. Eligible participants were adults aged 20 to 60 years of either sex with primary chronic neck pain and pain-related limitation of cervical movement or activities of daily living. Participants were required to understand Urdu sufficiently to complete the questionnaires and to provide informed consent. Individuals were excluded if they had rheumatic disease, severe inflammatory joint disease, cardiac disease, previous cervical or thoracic spine injury, systemic disease associated with spinal instability, or any change in general health status or medication use during the reliability assessment interval that could alter pain or functional performance. Participants who were unable to complete the questionnaire reliably were not included in the final analysis.

A total of 120 participants with chronic neck pain were included. The sample size was selected to provide adequate participant-to-item representation for a 15-item instrument and to permit reliable estimation of internal consistency, test–retest reliability, inter-rater reliability, and construct validity correlations. The sample also exceeded the commonly used minimum threshold for preliminary psychometric validation of patient-reported outcome measures, where at least 5–10 participants per item are generally considered appropriate for scale-level reliability and validity testing.

Data were collected using a standardized assessment protocol. Demographic information included age, sex, and marital status. The primary outcome measure was the Urdu version of the Copenhagen Neck Functional Disability Scale, which contains 15 items assessing neck pain-related functional disability and limitations in daily activities. Secondary outcome measures included the Neck Disability Index, the Neck Pain and Disability Scale, and the SF-36. The Neck Disability Index and Neck Pain and Disability Scale were used to examine convergent validity because higher scores on these tools reflect greater neck-related pain and disability. The SF-36 was used to examine the expected inverse relationship between neck-related disability and general health-related quality of life.

Reliability was assessed through repeated administration of the Urdu Copenhagen Neck Functional Disability Scale. For inter-rater reliability, two trained assessors administered the scale to the same participants during the same assessment session using a standardized procedure and a fixed short interval to minimize true clinical change. For test–retest reliability, the scale was re-administered after one week by the same assessor. Before retesting, participants were screened for changes in general health

status, medication use, or treatment exposure that could influence neck pain or functional performance. Participants reporting relevant change during this interval were excluded from the reliability analysis to reduce measurement bias caused by true clinical change rather than instrument instability.

Several procedures were used to minimize bias and improve reproducibility. Translators worked independently during forward translation, the back translator was blinded to the original scale, and all discrepancies were resolved through expert committee review rather than by a single investigator. Data collection followed a uniform sequence for all participants. The same instructions were provided before questionnaire completion, and participants were allowed clarification only regarding procedure, not item meaning. The retest interval was selected to reduce recall while limiting the likelihood of meaningful clinical change. Completed questionnaires were reviewed for completeness at the time of collection, and data were entered using a structured coding sheet to reduce entry errors.

Data were analyzed using SPSS version 22. Continuous variables were summarized using means and standard deviations, while categorical variables were summarized using frequencies and percentages. Internal consistency of the Urdu Copenhagen Neck Functional Disability Scale was assessed using Cronbach's alpha, with values of 0.70 or higher considered acceptable, values above 0.80 considered good, and values above 0.90 considered excellent. Test–retest reliability and inter-rater reliability were assessed using intraclass correlation coefficients with 95% confidence intervals. Construct validity was examined by calculating correlation coefficients between Urdu Copenhagen Neck Functional Disability Scale scores and scores on the Neck Disability Index, Neck Pain and Disability Scale, and SF-36. Positive correlations were expected with the Neck Disability Index and Neck Pain and Disability Scale, while a negative correlation was expected with SF-36 because greater disability should correspond to poorer health-related quality of life. Statistical significance was set at $p < 0.05$.

Ethical principles for human participant research were followed throughout the study. Participants were informed about the purpose of the research, voluntary participation, confidentiality of information, and their right to withdraw at any time without penalty. Written informed consent was obtained before data collection. Participant identity was kept confidential, and collected data were used only for research purposes. The study was conducted under the academic supervision and institutional requirements of Riphah International University.

RESULTS

A total of 120 participants with chronic neck pain were included in this psychometric validity and reliability study. The mean age of the participants was 39.8 ± 10.2 years. Females represented a slightly larger proportion of the sample than males, with 68 participants (56.7%) being female and 52 participants (43.3%) being male. The largest age subgroup was 31–40 years, comprising 39 participants (32.5%), followed by 41–50 years with 31 participants (25.8%), 20–30 years with 28 participants (23.3%), and 51–60 years with 22 participants (18.4%). Most participants were married, accounting for 81 participants (67.5%), while 39 participants (32.5%) were unmarried. The demographic distribution is presented in Table 1.

The Urdu version of the Copenhagen Neck Functional Disability Scale demonstrated excellent internal consistency. The total 15-item scale produced a Cronbach's alpha value of 0.92, indicating a high degree of inter-item homogeneity and suggesting that the Urdu CNFDS items consistently measured the underlying construct of neck pain-related functional disability. The internal consistency findings are presented in Table 2.

The reliability analysis showed excellent stability of the Urdu CNFDS across repeated measurements. Test–retest reliability was excellent, with an intraclass correlation coefficient of 0.95 and a 95% confidence interval ranging from 0.93 to 0.97. Inter-rater reliability was also excellent, with an intraclass correlation coefficient of 0.93 and a 95% confidence interval ranging from 0.90 to 0.96. Both reliability

estimates were statistically significant at $p < 0.001$, supporting the reproducibility of the Urdu CNFDS when administered across time and between assessors. These findings are presented in Table 3.

Table 1. Demographic Characteristics of Participants With Chronic Neck Pain (N = 120)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	52	43.3
	Female	68	56.7
Age group	20–30 years	28	23.3
	31–40 years	39	32.5
	41–50 years	31	25.8
	51–60 years	22	18.4
Marital status	Married	81	67.5
	Unmarried	39	32.5
Age	Mean ± SD	39.8 ± 10.2 years	—

Table 2. Internal Consistency of the Urdu Copenhagen Neck Functional Disability Scale

Scale	Number of Items	Reliability Statistic	Value	Interpretation
Urdu CNFDS total score	15	Cronbach's alpha	0.92	Excellent internal consistency

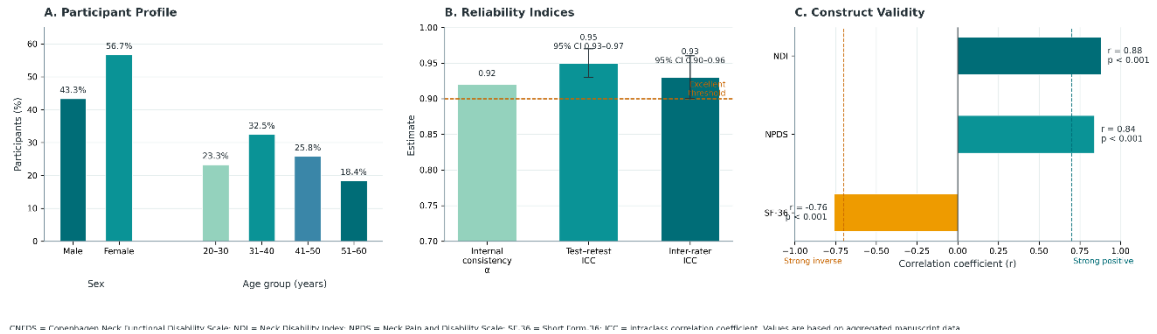
Table 3. Reliability Analysis of the Urdu Copenhagen Neck Functional Disability Scale

Reliability Domain	Statistic	Estimate	95% CI	p-value
Test–retest reliability	ICC	0.95	0.93–0.97	<0.001
Inter-rater reliability	ICC	0.93	0.90–0.96	<0.001

Construct validity was assessed by examining the relationship of Urdu CNFDS scores with established measures of neck disability and general health-related quality of life. The Urdu CNFDS showed a strong positive correlation with the Neck Disability Index ($r = 0.88$, $p < 0.001$) and a strong positive correlation with the Neck Pain and Disability Scale ($r = 0.84$, $p < 0.001$), indicating that higher CNFDS scores were strongly associated with greater neck-related disability on established neck-specific outcome measures. The Urdu CNFDS also demonstrated a strong negative correlation with SF-36 scores ($r = -0.76$, $p < 0.001$), indicating that greater neck-related functional disability was associated with poorer general health-related quality of life. These correlation patterns were directionally consistent with the expected construct validity hypotheses and are presented in Table 4.

Table 4. Construct Validity of the Urdu Copenhagen Neck Functional Disability Scale

Comparator Measure	Construct Assessed	Expected Direction	Correlation Coefficient (r)	p-value
Neck Disability Index	Neck-related disability	Positive	0.88	<0.001
Neck Pain and Disability Scale	Neck pain-related disability	Positive	0.84	<0.001
SF-36	General health-related quality of life	Negative	−0.76	<0.001



CNFDS = Copenhagen Neck Functional Disability Scale; NDI = Neck Disability Index; NPDS = Neck Pain and Disability Scale; SF-36 = Short Form 36; ICC = intraclass correlation coefficient. Values are based on aggregated manuscript data.

Figure 1 Construct Validity Profile of the Urdu Copenhagen Neck Functional Disability Scale

The figure summarizes the psychometric performance of the Urdu CNFDS in 120 patients with chronic neck pain, showing a predominantly female sample (56.7%) and the highest age representation in the 31–40-year group (32.5%). The scale demonstrated excellent internal consistency (Cronbach's $\alpha = 0.92$), test–retest reliability (ICC = 0.95, 95% CI: 0.93–0.97), and inter-rater reliability (ICC = 0.93, 95% CI: 0.90–

0.96). Construct validity was supported by strong positive correlations with NDI (r = 0.88) and NPDS (r = 0.84), and a strong negative correlation with SF-36 (r = −0.76), with all associations statistically significant at $p < 0.001$.

Overall, the Urdu version of the Copenhagen Neck Functional Disability Scale demonstrated strong psychometric performance in participants with chronic neck pain. The scale showed excellent internal consistency with a Cronbach's alpha of 0.92, excellent test–retest reliability with an ICC of 0.95, and excellent inter-rater reliability with an ICC of 0.93. The construct validity findings further supported the instrument, as Urdu CNFDS scores correlated strongly and positively with NDI and NPDS scores and strongly and negatively with SF-36 scores. These findings indicate that the Urdu CNFDS is a reliable and valid patient-reported outcome measure for assessing neck pain-related functional disability among Urdu-speaking patients with chronic neck pain.

DISCUSSION

The present study translated, culturally adapted, and evaluated the psychometric properties of the Urdu version of the Copenhagen Neck Functional Disability Scale in patients with chronic neck pain. The findings support the Urdu CNFDS as a reliable and valid patient-reported outcome measure for assessing neck pain-related functional disability in Urdu-speaking Pakistani patients. The study included 120 participants with a mean age of 39.8 ± 10.2 years, with females representing 56.7% of the sample. This demographic distribution is clinically relevant because chronic neck pain frequently affects adults during productive working age and may influence daily activities, occupational function, and quality of life. By focusing on a neck-specific disability instrument rather than a generic pain or musculoskeletal tool, the study addresses an important measurement gap in local rehabilitation and clinical research practice.

The Urdu CNFDS demonstrated excellent internal consistency, with a Cronbach's alpha value of 0.92 for the 15-item total scale. This finding indicates that the translated items measured a coherent underlying construct of neck pain-related functional disability. A high alpha value is desirable in patient-reported outcome measures because it suggests that the items are sufficiently related to represent the same clinical domain; however, values above 0.90 should also be interpreted carefully because they may indicate some overlap among items. In the present study, the alpha value supports scale homogeneity, but future work may strengthen this finding by reporting item-total correlations and alpha-if-item-deleted values to determine whether all items contribute independently to the total score. The observed internal consistency is consistent with the intended use of the CNFDS as a functional disability measure and supports its use for group-level clinical and research assessment (2,8,9).

The reliability findings were strong. Test–retest reliability was excellent, with an ICC of 0.95 and a 95% confidence interval of 0.93–0.97, indicating that the Urdu CNFDS produced stable scores when administered repeatedly to clinically stable participants. Inter-rater reliability was also excellent, with an ICC of 0.93 and a 95% confidence interval of 0.90–0.96, suggesting that the instrument can be administered consistently across trained assessors. These results are particularly important for rehabilitation settings, where patient-reported measures may be collected by different clinicians or researchers across visits. The use of a one-week retest interval helped reduce immediate recall while limiting the likelihood of genuine clinical change, although future studies should explicitly report the ICC model, agreement type, and measurement error indices such as standard error of measurement and minimal detectable change to improve interpretability for individual patient monitoring (7–9).

Construct validity was supported by the expected pattern and direction of correlations with established measures. The Urdu CNFDS showed strong positive correlations with the Neck Disability Index ($r = 0.88$, $p < 0.001$) and the Neck Pain and Disability Scale ($r = 0.84$, $p < 0.001$). These findings indicate that higher Urdu CNFDS scores were strongly associated with greater neck-related pain and disability measured by existing neck-specific instruments. The strength of these associations supports convergent validity

because CNFDS, NDI, and NPDS assess related but not identical dimensions of neck pain-related functional limitation. The correlation with NDI was slightly stronger than the correlation with NPDS, which may reflect closer overlap in functional disability constructs, although this interpretation should be confirmed in future studies with item-level and domain-level analyses (3,4).

The negative correlation between Urdu CNFDS and SF-36 scores ($r = -0.76$, $p < 0.001$) further supports construct validity. This inverse association was theoretically expected because greater neck-related functional disability should correspond to poorer general health-related quality of life. The magnitude of this correlation suggests that neck pain-related disability has a meaningful relationship with broader physical and psychosocial health status. At the same time, the correlation was not so high as to suggest redundancy between the instruments, which is appropriate because SF-36 is a generic health-status measure, while CNFDS is condition-specific. This distinction supports the use of CNFDS when the primary objective is to assess neck-specific functional disability and SF-36 when broader quality-of-life impact is also relevant (5).

The results have practical implications for physiotherapy, rehabilitation, and musculoskeletal research in Pakistan. A validated Urdu CNFDS can help clinicians quantify baseline disability, document change over treatment, compare outcomes across patients, and improve communication in Urdu-speaking populations. In research settings, it provides a standardized measure for evaluating neck pain-related disability in observational studies, clinical trials, and outcome audits. The availability of a culturally adapted Urdu version may also improve patient comprehension and reduce measurement error among participants who are more comfortable responding in Urdu than in English.

This study has several limitations. The sampling method was non-probability convenience sampling, which may limit representativeness and generalizability to all Pakistani patients with chronic neck pain. Recruitment from community and rehabilitation settings may not fully capture patients with different severity levels, occupational exposures, education levels, or clinical diagnoses. The study reported internal consistency, test–retest reliability, inter-rater reliability, and construct validity, but did not report item-level performance, factor structure, floor and ceiling effects, standard error of measurement, minimal detectable change, or responsiveness. These additional analyses would be valuable for determining whether the Urdu CNFDS can detect clinically meaningful change over time and whether it performs equally well across subgroups. The study also relied on correlations with established instruments for construct validity; therefore, future research should examine known-groups validity, confirmatory factor analysis, responsiveness after rehabilitation, and clinically important difference thresholds.

Despite these limitations, the findings provide strong preliminary evidence that the Urdu CNFDS is a psychometrically sound instrument for assessing functional disability among patients with chronic neck pain. The excellent reliability estimates and strong construct validity correlations indicate that the translated scale retained the intended measurement properties of the original instrument. With further testing in larger and more diverse clinical samples, including responsiveness and measurement error analysis, the Urdu CNFDS may become a useful standard outcome measure for neck pain assessment in Urdu-speaking rehabilitation and research contexts.

CONCLUSION

The Urdu version of the Copenhagen Neck Functional Disability Scale demonstrated excellent internal consistency, excellent test–retest reliability, excellent inter-rater reliability, and strong construct validity among patients with chronic neck pain. The scale showed strong positive correlations with the Neck Disability Index and Neck Pain and Disability Scale and a strong negative correlation with SF-36, confirming that higher CNFDS scores reflect greater neck-related disability and poorer health-related quality of life. These findings support the Urdu CNFDS as a reliable and valid patient-reported outcome measure for assessing functional disability in Urdu-speaking patients with chronic neck pain. Further

studies should examine item-level performance, measurement error, responsiveness, and clinically important change thresholds in larger and more diverse clinical populations.

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