

Identifying Clinical Domains of Functional Disability Scale for Upper Cross Syndrome: A Longitudinal Study

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ABSTRACT

Introduction: Upper Cross Syndrome (UCS) represents a musculoskeletal condition originating from postural deviations caused by muscle imbalances, resulting in pain symptoms along with reduced mobility and functional restrictions. A standardised functional disability scale specific to UCS does not currently exist; therefore, researchers need to identify essential clinical domains for evaluation purposes. The present research investigated vital clinical domains for functional disability assessment in UCS so that clinicians can develop improved diagnostic and therapeutic rehabilitation approaches.

Aim: To identify and categorise the essential clinical domains contributing to functional disability in individuals with UCS.

Materials and Methods: The present prospective cross-sectional study was conducted at the Department of Physiotherapy of a deemed university located in Haryana, Northern India from November 2024 to February 2025. A research framework consisting of three distinct phases was designed to determine UCS related disabilities. Phase one involved the evaluation of ten clinically diagnosed UCS patients to document their reported disabilities. Phase two consisted of a systematic review of the literature related to functional disability domains associated

with UCS. Phase three included expert surveys involving nine musculoskeletal physiotherapists to review, validate, and refine the identified domains. Descriptive statistics were used to classify and organise the identified clinical domain areas.

Results: The assessment identified three vital functional disability domains in UCS: (1) Pain, (2) Activity limitation, and (3) Social and functional performance limitation. Patient assessments revealed pain predominantly in the neck, shoulders, and jaw, which intensified during prolonged sitting and repetitive movements. Limitations in overhead activities and sustained sitting were observed due to restricted cervical and shoulder mobility. Additionally, patients reported sleep disturbances and reduced social involvement. All experts unanimously endorsed pain and postural dysfunction as defining components of UCS.

Conclusion: The evaluation of disability related to UCS primarily relies on the assessment of pain, activity limitation, and social and functional performance limitations. Future research should focus on developing a standardised, UCS specific functional disability scale that integrates these domains to assist clinicians in improved decision making and to enhance patient results.

Keywords: Disability evaluation, Humans, Muscles, Musculoskeletal diseases, Pain, Sleep

INTRODUCTION

Upper Cross Syndrome (UCS) is a prevalent musculoskeletal condition characterised by postural deviations such as forward head posture, rounded shoulders, and thoracic hyperkyphosis. These deviations arise due to muscular imbalances caused by abnormal muscle activation and dysfunctional movement patterns in the cervical and upper thoracic spine. UCS commonly results from prolonged poor posture, repetitive movements, and sedentary lifestyle factors, particularly in occupations involving prolonged sitting or static postures, such as office based and academic work [1]. Its reported prevalence ranges from 11% to 67% across different populations, highlighting its widespread impact on musculoskeletal health [2,3].

The pathophysiology of UCS involves tightness and overactivity of muscles such as the upper trapezius, levator scapulae, and pectoralis major and minor, accompanied by weakness and elongation of antagonist muscles like the deep cervical flexors, rhomboids, and lower trapezius. These muscular imbalances are associated with abnormal cervical and upper limb movement patterns, pain syndromes, impaired mobility, and an increased risk of secondary musculoskeletal conditions such as cervicogenic headache and shoulder joint dysfunction [4].

UCS is primarily diagnosed through clinical evaluation, which includes postural inspection to identify misalignments, assessment of cervical spine range of motion to detect restrictions, muscle length testing to assess flexibility, and muscle strength testing to identify weaknesses [5]. Corrective interventions such as structured

exercise programmes targeting specific deficits, ergonomic adaptations, and manual therapy have been explored for UCS symptom management [6]. Several studies have demonstrated the effectiveness of corrective exercise protocols, particularly those based on the National Academy of Sports Medicine model, Janda's approach, and Scheuermann's approach, which involves selective inhibition or lengthening of tight muscles and activation or integration of weak muscles [7]. These interventions have been shown to significantly improve posture, reduce pain, and restore muscle balance in patients with UCS [6,8].

Despite these advancements, a knowledge gap remains regarding the association between specific clinical areas of functional disability and therapeutic outcomes. UCS-related functional disability significantly affects activities of daily living, overall quality of life, and work performance [9,10]. It not only limits daily activities but also negatively impacts professional productivity, leading to economic consequences at both individual and societal levels.

A functional disability scale could serve as a valuable tool for assessing the severity of impairment associated with UCS, aiding in diagnosis, treatment planning, and monitoring rehabilitation progress. However, no standardised, valid, and reliable UCS specific functional disability scale currently exists that comprehensively captures the impact of clinical domains such as pain, mobility, posture, and muscle function on daily activity limitations [11,12]. There is therefore a need to bridge the gap between patient reported disability and objective clinical evaluation.

Accordingly, the present study aimed to identify and categorise the clinical domains relevant to a functional disability scale for UCS. By establishing these domains, the present study seeks to enhance clinical decision-making, facilitate targeted treatment strategies, and improve patient outcomes.

MATERIALS AND METHODS

The present observational study was conducted at the Orthopaedic Physiotherapy Laboratory, Department of Physiotherapy, of a deemed university located in Haryana, Northern India. The research was carried out between November 2024 and February 2025 to determine the origins of functional disability arising from clinical domains of UCS. Ethical approval for the study was obtained from the Institutional Ethics Committee under project number IEC-3471.

Study Procedure

The current study approach comprised three phases, including interviews with affected individuals, followed by a systematic literature review and expert surveys, which collectively led to the development of a standardised functional disability assessment framework for UCS.

Phase 1: The initial phase involved the assessment of patients attending the Outpatient Physiotherapy Department of the tertiary care hospital affiliated with the deemed university. The primary researcher recruited 10 patients diagnosed with UCS after confirming their condition through medical tests and postural evaluation, based on the criteria described by Page et al., while explaining Janda's approach [13]. Patients were evaluated using a structured evaluation form that collected demographic details, occupational background, reported pain intensity, movement restrictions, postural abnormalities, and muscle performance deficits. Participants also reported their subjective experiences of UCS-related disability in terms of functional activities and overall quality of life.

Phase 2: The second phase consisted of a systematic literature review conducted through database searches of PubMed, Cochrane Library, and PEDro on peer-reviewed studies from 2015 and 2025 were included. The search keywords used were "UCS," "postural dysfunction," "musculoskeletal impairment," and "functional disability." The reviewed studies primarily focused on postural abnormalities, mobility restrictions, pain-related disability, and muscle imbalances associated with UCS. Only full-text, English-language, non-experimental studies that specifically addressed functional disability domains in UCS were included. Data extracted from the selected literature were used to generate an initial list of functional disability domains.

Phase 3: In the third phase, an expert opinion survey was conducted involving nine specialised musculoskeletal physiotherapists. The survey was administered via the Google Forms platform and included Likert-scale questions rated from 1 (strongly disagree) to 5 (strongly agree), along with open-ended questions. The experts evaluated the relevance and importance of the identified domains and suggested additional domains where necessary. The phase three aimed to verify and refine the proposed evaluation domains for UCS [Annexure].

STATISTICAL ANALYSIS

A systematic analysis of data collected across all three phases led to the selection of the primary clinical domains for assessing UCS-related functional disability. The identified domains were further organised into specific subcategories. In cases where expert opinions differed, the second author's review was considered to determine domain inclusion. Descriptive analysis was performed using Microsoft Excel for data processing and presentation.

RESULTS

Phase 1: A total of ten patients diagnosed with UCS participated in the assessment phase, including both male and female subjects from various occupational backgrounds: five students (50%), one nurse (10%), and four desk workers (40%). Regarding pain associated with UCS, 80% of participants reported experiencing pain, while 20% reported no pain. Among those reporting pain, the most common locations were the cervical region (60%) and the shoulder girdle (40%). In terms of pain severity, three patients (37.5%) rated their pain as mild, four patients (50%) as moderate, and one patient (12.5%) as severe.

All patients (100%) demonstrated postural abnormalities during clinical examination, including forward head posture (90%), rounded shoulders (70%), and abnormal thoracic curvature (70%). Cervical and shoulder mobility restrictions were observed in all participants (100%). The most frequently identified muscle performance deficits included upper trapezius tightness (100%), followed by tightness of the pectoralis major and minor muscles (70%). Functional disability varied among participants, with 60% reporting mild difficulty and 40% reporting significant limitations in performing daily activities, thereby affecting their overall quality of life. Demographic characteristics and clinical findings are summarised in [Table/Fig-1].

Variables	Values (Mean±SD / n, %)
Age (years)	25.2±3.4
Gender	Male: 4 (40%)
	Female: 6 (60%)
Height (cm)	166.4±7.1
Weight (kg)	64.8±8.5
BMI (kg/m ²)	23.4±2.6
Craniovertebral Angle (CVA, °)	38.7±5.4
Shoulder Angle (°)	41.2±4.6
Occiput-to-Wall Distance (cm)	7.2±1.1

[Table/Fig-1]: Demographic characteristics and clinical characteristics of patients with UCS (n=10).
BMI: Body mass index

Phase 2: The literature review identified three essential domains of UCS related functional disability: pain, activity limitation, and social and functional performance limitation. Synthesis of the evidence indicated that UCS is multifactorial in nature, with postural dysfunction, movement restrictions, muscle imbalances, and pain collectively contributing to functional limitations.

The parameters identified across studies included demographic factors such as age between 25 and 50 years; anthropometric factors such as body mass index (>25 kg/m²); aggravating factors including reduced craniovertebral angle and forward head posture; clinical features such as dull aching pain in the neck, shoulder, or jaw that worsens with prolonged sitting, prolonged screen use, driving, overhead activities, and neck movements; reduced chest mobility during deep breathing; limited trunk flexion; and impaired social and functional performance manifested as social withdrawal and reduced sleep quality.

Phase 3: All nine physiotherapists (100%) endorsed the identified domains as essential for UCS assessment based on their clinical relevance. Most experts agreed that postural dysfunction, particularly a reduced CVA (78%) and forward head posture (100%), had the greatest impact on patient outcomes. Reduced quality of sleep (100%) and age (78%) also showed high consensus among experts.

Dull aching pain, pain during neck movement, and activity limitation received 67% agreement. Additionally, some experts identified social withdrawal (56%) and body mass index (34%) as important contributing clinical domains. The integrated analysis of findings from all three phases validated the selected clinical domains as stable and appropriate for assessing functional disability in UCS. The three

core categories-pain, activity limitation, and social and functional performance limitation-provide a structured and comprehensive framework for UCS functional disability assessment.

DISCUSSION

The present study aimed to identify and categorise the clinical domains of functional disability in patients with UCS. The findings highlighted that functional disability primarily arises from three core clinical domains: pain, activity limitation, and social and functional performance limitation. Together, these domains provide a comprehensive framework for assessing UCS-related disability. The domains were identified through the integration of patient-reported assessments, a systematic review of the literature, and expert consensus, ensuring a thorough and clinically relevant evaluation of UCS-related disability.

Pain

Pain emerged as the most consistent and debilitating feature, reported by 80% of patients in the current study, with predominant involvement of the cervical and shoulder regions. Additionally, pain received 67% agreement among experts as a key contributor to functional disability. Because pain significantly interfered with daily activities, it was categorised as a fundamental domain of UCS-related disability. Patients commonly described a dull, aching discomfort radiating from the neck to the shoulders and jaw. This pain was exacerbated by prolonged screen use, sustained sitting, and repetitive neck flexion, confirming a strong association between muscular discomfort and abnormal postural alignment. Previous studies support the inclusion of pain as a central domain in disability assessment, as pain plays a pivotal role in UCS-related functional impairment and reduced quality of life [14-16].

Activity Limitation

Activity limitation was identified as another prominent domain, with most patients demonstrating reduced cervical and shoulder mobility that interfered with overhead reaching, prolonged sitting, and driving. Expert survey findings further emphasised the importance of pain-related movement restrictions, with 67% of respondents agreeing on its role in functional impairment.

Assessing activity limitation is essential, as the majority of patients experienced mobility restrictions in the cervical and shoulder regions, limiting their ability to perform overhead and sustained postural activities. These findings align with previous research identifying UCS as a condition that adversely affects functional movement patterns. Postural deviations, restricted mobility, and muscle imbalance collectively contribute to functional limitations. Limited mobility also has ergonomic and occupational implications, particularly in modern sedentary lifestyles, which further exacerbate functional decline-a trend consistently highlighted in recent meta-analyses. Including activity limitation in UCS disability assessment enhances the evaluation of movement dysfunction severity and supports the development of targeted treatment strategies [17, 18].

Social and Functional Limitation

The addition of social and functional performance limitation as the third domain was warranted due to its significant impact on patients' overall well-being. Individuals with UCS commonly experience social withdrawal [19,20] and sleep disturbances [21,22], along with reduced participation in group and recreational activities, primarily due to chronic discomfort. The findings demonstrate that UCS extends beyond physical impairment, contributing to psychological distress associated with persistent postural dysfunction and challenges in maintaining social relationships. Poor sleep quality has cumulative effects, including increased pain sensitivity, delayed tissue healing, and impaired daytime functioning, thereby perpetuating the cycle of disability. These observations are consistent with earlier research linking poor postural habits and

excessive technology use to sleep deterioration and musculoskeletal symptoms, as well as studies documenting the interaction between cervical dysfunction, impaired proprioception, and disrupted sleep regulation [21,22].

Importantly, the psychosocial impact of UCS extends beyond direct health consequences. Social isolation and reduced participation in occupational or group activities can lead to emotional distress, decreased self-esteem, and potentially anxiety or depressive symptoms. These broader implications highlight that UCS is not merely a mechanical or structural condition but a multidimensional health issue encompassing physical, psychological, and social components [21,22]. All expert participants unanimously agreed sleep disturbances and social isolation needed inclusion after evaluating their significance in the UCS domain thus demonstrating the necessity for creating assessments rooted in comprehensive physical and psychological evaluations.

Study Limitations

The present study included only ten patients recruited from a single tertiary care physiotherapy setting in Haryana, India which limits statistical power and restricts the generalizability of findings to broader and more diverse populations.

Future Implications

Future research should focus on the development of a standardised, UCS-specific functional disability scale incorporating the domains identified in this study. Such an assessment tool would provide clinicians with an objective measure of functional impairment, facilitating the monitoring of patient progress and evaluation of treatment outcomes. The present longitudinal study establishes foundational groundwork for UCS disability assessment by bridging patient-reported outcomes with objective clinical evaluation criteria. The findings propose a structured framework encompassing three key domains of UCS-related disability, thereby enabling more accurate diagnosis and informed selection of targeted therapeutic interventions.

CONCLUSION(S)

The present study identified pain, activity limitation, and social and functional performance limitation as the fundamental domains for assessing functional disability in patients with UCS. These domains were systematically derived through patient assessments, comprehensive literature review, and expert consensus, ensuring a holistic evaluation of UCS-related impairment. The evidence indicates that UCS produces multidimensional effects, wherein pain influences posture, movement, and daily activities, while social and functional limitations contribute to diminished quality of life. Future research should prioritise the development of a validated UCS-specific functional disability scale that incorporates all identified domains to enhance clinical decision-making, optimise treatment planning, and improve rehabilitation outcomes.

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