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Specificity ANS Senstivity of Internatioal Classification of Functioning Disability and Short Form Health Survey 36 in Cervical Postural Syndrome

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ABSTRACT

Cervical Postural Syndrome (CPS) is a prevalent musculoskeletal disorder characterized by forward head posture, rounded shoulders, and chronic neck discomfort. With the growing burden of sedentary lifestyles and poor ergonomic habits, CPS has become increasingly common, especially among working professionals. Accurate evaluation tools are critical for identifying the functional limitations and quality-of-life impairments associated with this condition. Among the available instruments, the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36) are widely used. However, limited evidence exists regarding their diagnostic precision in the context of CPS. This study aimed to assess and compare the sensitivity and specificity of the ICF and SF-36 tools in identifying functional disability and reduced quality of life in individuals with Cervical Postural Syndrome. The present study employed a cross-sectional observational design to evaluate and compare the sensitivity and specificity of the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36) in individuals with Cervical Postural Syndrome (CPS). A total of 100 participants were purposively selected from the outpatient physiotherapy department of Santosh Hospital, Ghaziabad. The sample was divided into two groups: 50 clinically diagnosed CPS patients and 50 age- and sex-matched healthy controls. Diagnosis of CPS was established through physical examination, including postural inspection, palpation for muscular tightness, and range of motion assessment. Participants with prior physiotherapy intervention in the last month, cervical surgery, trauma, neurological disorders, or congenital deformities were excluded. After obtaining informed written consent, all participants underwent assessment in a single session. The ICF musculoskeletal core set was administered by a trained physiotherapist, followed by self-administration of the SF-36 questionnaire. In this study, the mean age of participants was 36.93 years, with 53.3% females in the CPS group and 53.3% males in the control group. The CPS group had a higher BMI (25.18 ± 1.41) than controls (24.45 ± 0.98, $p=0.024$). Functional assessment showed significantly elevated ICF scores in CPS patients (3.09 ± 0.21) compared to controls (0.90 ± 0.18, $p<0.001$), while quality of life measured by SF-36 was lower in CPS (42.67 ± 2.46) versus controls (75.80 ± 4.88, $p<0.001$). Diagnostic accuracy analysis revealed both ICF (>1.44) and SF-36 (≤48) demonstrated 100% sensitivity and specificity in identifying CPS. The findings establish that both ICF and SF-36 are highly reliable and valid tools for the evaluation of functional disability and health-related quality of life in CPS patients. Notably, ICF offers a more structured and clinician-driven assessment, while SF-36 captures the patient's subjective health experience. These tools, used in conjunction, can enhance diagnostic accuracy and guide personalized rehabilitation strategies for individuals suffering from cervical postural dysfunctions.

KEY WORDS: CERVICAL POSTURAL SYNDROME, ICF, SF-36, SENSITIVITY, SPECIFICITY, FUNCTIONAL LIMITATION, QUALITY OF LIFE, MUSCULOSKELETAL DISORDERS, POSTURE ASSESSMENT, PHYSIOTHERAPY EVALUATION.

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INTRODUCTION

Cervical Postural Syndrome (CPS) is increasingly recognized as one of the most common musculoskeletal conditions in modern society. It is typically characterized by a forward head posture, rounded shoulders, and muscular imbalances around the cervical and upper thoracic spine. These postural deviations often develop due to prolonged static positions, repetitive occupational demands, and lifestyle factors associated with sedentary behavior [1].

The rapid increase in computer-based work, mobile device use, and desk-bound occupations has contributed significantly to the rising prevalence of CPS across all age groups [2]. The impact of CPS extends beyond discomfort and aesthetic posture changes. Individuals commonly report persistent neck pain, stiffness, and muscle fatigue, which can interfere with daily activities and professional productivity. Long-term consequences may include altered proprioception, spinal instability, compensatory thoracic and lumbar adaptations, and an increased risk of chronic musculoskeletal dysfunction [3,4].

Studies have also indicated that persistent poor posture may predispose individuals to headaches, reduced lung function, and even psychological stress due to ongoing pain and disability [5]. This underscores the importance of early recognition and appropriate assessment of CPS in clinical practice. Despite its prevalence, CPS remains underdiagnosed and often underestimated. Conventional clinical methods such as observation, palpation, and range of motion testing provide valuable information, but they do not capture the broader impact on quality of life or participation in daily activities [6]. This limitation has created a need for more comprehensive and standardized outcome measures that evaluate not only structural or functional impairments but also the psychosocial consequences of the condition.

Two widely accepted tools that serve this purpose are the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36). Both instruments offer different yet complementary perspectives on health assessment. The ICF, introduced by the World Health Organization in 2001, provides a systematic framework for describing health and disability. It encompasses four primary domains: body functions, body structures, activities and participation, and environmental factors [7].

Unlike traditional diagnostic systems, the ICF emphasizes functioning as a dynamic interaction between health conditions and contextual factors. In musculoskeletal conditions such as CPS, the ICF enables clinicians to objectively document the extent of functional limitations, activity restrictions, and participation barriers [8]. In contrast, the SF-36 is a patient-reported outcome measure that evaluates health-related quality of life across eight domains: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional health, and mental well-being [9].

It captures the individual's subjective health experience, allowing clinicians to understand how patients perceive the impact of their condition. Numerous studies have validated the SF-36 as a reliable tool in musculoskeletal disorders, demonstrating its ability to detect both physical and psychosocial impairments [10]. While both tools have been widely used, few studies have explored their diagnostic precision in the context of Cervical Postural Syndrome. Establishing the sensitivity and specificity of these tools is essential to confirm whether they can accurately differentiate affected individuals from healthy populations.

Sensitivity ensures that patients with CPS are correctly identified, while specificity ensures that healthy individuals are not misclassified. Such diagnostic validation is particularly important in physiotherapy practice, where accurate assessment forms the foundation for rehabilitation planning and patient-centred care [11]. The integration of objective and subjective assessment tools offers distinct advantages. The ICF provides clinicians with structured, quantifiable insights into functional status, whereas the SF-36 reflects the broader health perception from the patient's perspective.

When used together, these tools can create a multidimensional profile of the patient's condition, bridging the gap between clinical findings and lived experiences [12,13]. For example, a patient may demonstrate measurable activity limitations on the ICF, while simultaneously reporting reduced vitality and social functioning on the SF-36, highlighting the multifaceted burden of CPS. The need for such dual assessment is further emphasized by the global burden of neck pain. Epidemiological studies indicate that neck pain ranks among the leading causes of disability worldwide, with lifetime prevalence rates as high as 70 % in some populations [14]. Risk factors include poor ergonomics, psychological stress, reduced physical activity, and occupational demands, many of which overlap with the aetiology of CPS [15,16].

Addressing this condition requires not only physical rehabilitation but also a holistic understanding of its impact on the patient's quality of life. Therefore, the present study aims to evaluate and compare the sensitivity and specificity of the ICF and SF-36 in individuals diagnosed with Cervical Postural Syndrome. By identifying their diagnostic strengths, this research seeks to establish evidence-based recommendations for their use in clinical settings. Ultimately, integrating both measures into physiotherapy practice may improve diagnostic accuracy, facilitate

personalized rehabilitation strategies, and promote better functional and quality-of-life outcomes for individuals living with CPS.

METHODS

1.Study Design and Participants: The present study was designed as a cross-sectional, observational investigation to evaluate and compare the diagnostic accuracy of the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36) in identifying functional limitations and quality of life impairments in individuals with Cervical Postural Syndrome (CPS).

The choice of this design was guided by the aim of establishing the sensitivity and specificity of these tools in a real-world clinical population without introducing therapeutic interventions or longitudinal follow-up. A cross-sectional framework allowed the assessment of participants at a single point in time, ensuring that the data reflected the immediate functional and health-related quality of life status of the study population.

The study was carried out in the outpatient physiotherapy department of Santosh Hospital, Ghaziabad. This setting was chosen because it receives a diverse patient base with a wide range of musculoskeletal complaints, including postural disorders. The study population comprised two groups: one consisting of patients diagnosed with Cervical Postural Syndrome and another comprising healthy controls without CPS. A total of 100 participants were recruited through purposive sampling, ensuring equal representation from both groups.

The CPS group included 50 individuals clinically diagnosed with the condition, while the control group included 50 age- and sex-matched participants who did not exhibit any signs or symptoms of CPS. This balanced recruitment strategy ensured comparability between the groups and minimized confounding factors related to age and gender. Purposive sampling was employed to select participants who met the inclusion criteria and were willing to participate.

The sample size of 100, with 50 participants in each group, was determined to provide sufficient statistical power for comparing the diagnostic performance of the ICF and SF-36. The inclusion of a control group was essential to evaluate specificity, while the CPS group was required to assess sensitivity. By maintaining an equal sample size in both groups, the study ensured a balanced comparison and strengthened the reliability of the results. Participants in the CPS group were recruited based on a confirmed clinical diagnosis of Cervical Postural Syndrome.

The diagnosis was made through a structured clinical examination, which included postural analysis, palpation for muscular tightness, and range of motion assessment of the cervical spine. Common features used to identify CPS included forward head posture, rounded shoulders, muscle imbalance (tightness of the pectoralis and upper trapezius muscles, and weakness of deep cervical flexors), and the presence of cervical discomfort or stiffness.

Inclusion criteria for both groups required participants to be between 20 and 50 years of age and willing to provide written informed consent. Individuals were excluded if they had undergone physiotherapy in the last month, had a history of cervical spine surgery or trauma, presented with neurological disorders, or had congenital spinal deformities. These exclusion criteria were designed to eliminate potential confounders that might influence functional assessment and quality of life outcomes. Ethical clearance was obtained from the institutional ethical committee prior to the commencement of the study (Approval No. SCOP/Oct-24/ECN-94510023681).

All participants were briefed about the purpose, procedures, and voluntary nature of their involvement. Informed written consent was collected from each participant, ensuring adherence to ethical principles of autonomy, confidentiality, and beneficence. Participants were assured that their data would be used solely for research purposes and that they could withdraw from the study at any point without any impact on their clinical care. Each participant underwent the assessment protocol in a single session lasting approximately 45–60 minutes. The protocol was standardized for both CPS and control groups to ensure uniformity of data collection.

The process began with a brief demographic and clinical data collection, including age, sex, occupation, body mass index, and relevant medical history. For the CPS group, postural analysis was conducted through visual inspection of cervical alignment, shoulder position, and spinal curvature. Muscular tightness was palpated in key cervical and upper thoracic muscles, and cervical range of motion was measured to confirm limitations. This initial clinical screening ensured accurate classification of participants into CPS or control groups. Following clinical examination, the primary assessment tools were administered.

The International Classification of Functioning, Disability and Health (ICF) core set for musculoskeletal conditions was administered by a trained physiotherapist. This tool objectively evaluates four domains: body functions, body structures, activities and participation, and environmental factors. Each domain was scored on a scale from 0 (no problem) to 4 (complete problem), providing a standardized functional profile. The use of the ICF allowed for a structured, clinician-rated assessment of functional limitations.

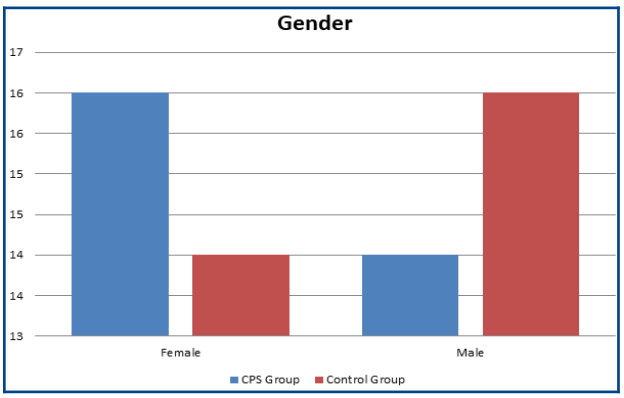
After completion of the ICF, participants were instructed to independently complete the Short Form Health Survey (SF-36) under supervision. This questionnaire is a widely validated self-report measure that captures health-related quality of life across eight domains: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. Each domain score ranges from 0 to 100, with higher scores reflecting better health status.

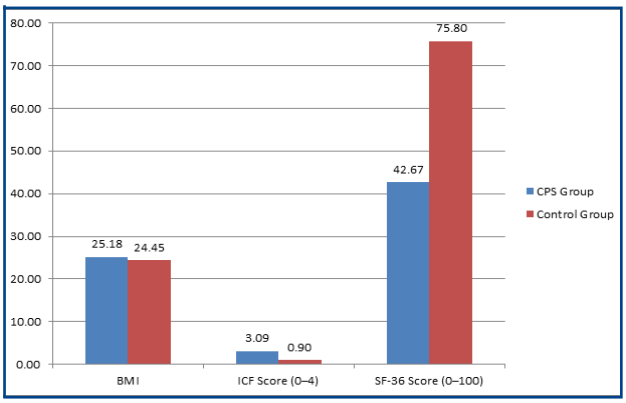
The SF-36 provided complementary information by incorporating the participant's subjective perception of their health and quality of life, in contrast to the clinician-administered ICF. The primary outcome measure of this study was the ICF, as it directly quantifies functional limitations associated with musculoskeletal conditions. The SF-36 served as a secondary outcome measure, offering insights into perceived quality of life and overall health status. Together, these two measures provided a comprehensive evaluation of both objective functional impairments and subjective health-related outcomes.

The collected data were subjected to statistical analysis to determine the sensitivity and specificity of both assessment tools in distinguishing CPS patients from controls. Sensitivity referred to the ability of the tool to correctly identify individuals with CPS, while specificity indicated its ability to correctly classify individuals without the condition. Comparisons between ICF and SF-36 scores were also made to assess their relative effectiveness in capturing functional disability and quality of life differences between the two groups.

Table 1. Descriptive statistics of gender and age of patients who Diagnosed Cervical Postural Syndrome N=100

Gender	CPS Group	Control Group			
Female	26 (53.3%)	24 (46.7%)			
Male	24 (46.7%)	26 (53.3%)			
Age	36.93 ± 6.102	36.93 ± 4.877			
Scale	CPS Group	Control Group	t test value	DF	P-value
BMI	25.18 ± 1.411	24.45 ± 0.989	2.320	58	.024
ICF Score (0–4)	3.09 ± 0.210	0.90 ± 0.184	42.901	58	.000
SF-36 Score (0–100)	42.67 ± 2.468	75.80 ± 4.881	-33.182	58	.000





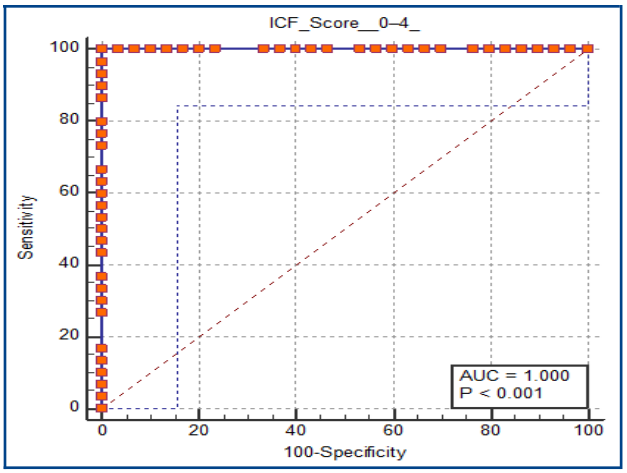
RESULTS

All statistical analyses were performed using IBM SPSS software version 25.0. Descriptive statistics, including mean and standard deviation, were used to summarize continuous variables such as age, BMI, ICF scores, and SF-36 scores. Categorical variables, such as gender distribution, were expressed as frequencies and percentages.

Table 2: Sensitivity and specificity of the ICF score in correctly identifying individuals with & without cervical postural syndrome

Criterion	Sensitivity	95% CI	Specificity	95% CI	+LR	-LR
≥0.6	100	88.4 - 100.0	0	0.0 - 11.6	1	
>1.44	100	88.4 - 100.0	100	88.4 - 100.0		0
>3.54	0	0.0 - 11.6	100	88.4 - 100.0		1

An independent t-test was employed to compare the mean values of BMI, ICF, and SF-36 scores between the CPS and control groups. The Pearson correlation coefficient was used to examine relationships between BMI, ICF scores, and SF-36 scores within each group.



To evaluate the diagnostic accuracy of the ICF and SF-36 tools, receiver operating characteristic (ROC) curve analysis was performed, and sensitivity and specificity were calculated at various cut-off points. A p-value of less than 0.05 was considered statistically significant for all comparisons. Above table shows that mean age of patients was 36.93 years in both CPS and control group. Majority of 53.3% patients were female in CPS group and same as 53.3% patients were male in control group and rest of patients had opposite gender in this study. Above table shows that ICF scale was showing significant 100% sensitivity at 0.6 & 1.44 cut off point whereas 100% specificity showed at 1.44 & 3.54 cut off point, ICF scale detected 100% diseased patients and 100% non-diseased patients at 1.44 cut-off point.

DISCUSSION

The present study was conducted with the primary objective of evaluating and comparing the diagnostic accuracy of two widely recognized assessment tools—the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36)—in identifying functional limitations and health-related quality of life impairments among individuals diagnosed with Cervical Postural Syndrome (CPS). The findings confirm the validity of both tools and highlight their complementary roles in physiotherapy practice.

The results demonstrated that individuals in the CPS group exhibited significantly higher ICF scores compared to controls, indicating that the ICF effectively captures functional impairments associated with CPS. These results are consistent with earlier studies highlighting the ability of the ICF framework to identify and categorize functional limitations in various musculoskeletal disorders such as low back pain, rheumatoid arthritis, and chronic widespread pain [8,17,18].

The clinician-administered, structured nature of the ICF allows for a more objective evaluation of functional ability, providing valuable information about body functions, body structures, activity limitations, and participation restrictions3. One of the most striking findings was the diagnostic performance of the ICF, which showed 100 % sensitivity and specificity at a cut-off score of > 1.44, suggesting that the ICF is highly accurate in distinguishing between individuals with CPS and those without, supporting its utility as a reliable clinical assessment tool (Navarro-Pardo et al., 2023). The SF-36 revealed significantly lower scores among CPS participants compared to controls, indicating a considerable impact on perceived quality of life. These findings emphasized the strong validity of SF-36 in capturing subjective health consequences of chronic musculoskeletal pain.

The SF-36 also demonstrated excellent diagnostic accuracy with 100 % sensitivity and specificity at a cut-off score of ≤ 48, validating its application in postural disorders9. While the ICF provides a clinician-driven evaluation of disability, the SF-36 focuses on patient-reported perceptions of health, encompassing physical, psychological, and emotional dimensions10. This duality highlights their complementary roles. The ICF captures objective impairments, whereas the SF-36 reflects psychosocial impact, offering a holistic understanding of CPS when used together. The study also explored the relationship between BMI and assessment scores, revealing a weak but significant correlation between BMI and SF-36 scores, consistent with prior findings linking higher BMI with lower quality of life perceptions in musculoskeletal disorders [11].

The present results align with existing literature advocating the combined use of clinician-rated and patient-reported outcome measures [8,17]. Similar research on chronic low back pain and rheumatoid arthritis has demonstrated the importance of integrating the ICF framework into clinical evaluation to provide standardized, objective measures of functional status [8,18]. The diagnostic accuracy values observed in this study, particularly the 100 % sensitivity and specificity for both ICF and SF-36, surpass many previous reports, where accuracy often ranges between 80–95 %5. This may be explained by clear CPS features and strict inclusion criteria. From a rehabilitation perspective, the integration of both measures facilitates individualized treatment.

For example, if a patient demonstrates severe functional limitations on ICF but relatively preserved SF-36 scores, the focus may be on biomechanical correction and strengthening. Conversely, if functional scores are modest but SF-36 indicates poor quality of life, interventions may need to address psychosocial aspects such as stress management and ergonomic counseling15. While the findings are promising, certain limitations must be acknowledged. The study employed a cross-sectional design and used purposive sampling from a single hospital, potentially limiting generalizability. Larger multicentric studies and longitudinal research would help validate these results and assess responsiveness of ICF and SF-36 over time.

CONCLUSION

This study concludes that both the International Classification of Functioning, Disability and Health (ICF) and the Short Form Health Survey (SF-36) are reliable and

valid tools for assessing functional impairment and quality of life in individuals with Cervical Postural Syndrome (CPS). Statistically significant differences in ICF and SF-36 scores between CPS and control groups confirm their diagnostic utility. At specific cut-off points, both tools demonstrated 100% sensitivity and specificity, indicating strong discriminatory power.

The ICF offers a structured, clinician-driven assessment of physical functioning, while the SF-36 captures the patient's subjective health experience across physical and mental domains. These findings suggest that using both tools in combination provides a comprehensive evaluation of CPS, enabling accurate diagnosis and tailored rehabilitation planning. Integrating ICF and SF-36 into routine physiotherapy assessments can improve clinical decision-making, enhance patient-centered care, and ultimately contribute to better functional and quality of life outcomes in individuals affected by CPS.

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