

Evaluation of Neck-Related Disability in Patients with Cervical Spondylosis Using the Neck Disability Index

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ABSTRACT

Background: Cervical spondylosis is a common degenerative disorder of the cervical spine associated with chronic neck pain, reduced mobility, and impaired quality of life. The Neck Disability Index (NDI) is a validated tool used to assess functional disability related to neck pain. This study aimed to evaluate neck-specific disability using the NDI in patients with cervical spondylosis and to examine its association with demographic and clinical characteristics.

Methods: This research was conducted at Malla Reddy Institute of Medical Sciences during the period April 2023-October 2024. Around 130 patients diagnosed with cervical spondylosis participated in this study. Participant demographic details, including age, gender and symptom duration, were recorded. Moreover, the NDI was implemented to assess the functional disability of the participants. Statistical methods were used to analyze the data, including descriptive and inferential.

Results: The participants had a mean age of 52.4 ± 10.6 years and most of them were men. It was determined that 46.2% of patients had moderate levels of functional disability, followed by mild and severe levels of functional disability, i.e., 30.8% and 23.0%, respectively. NDI scores appeared to be substantially correlated with age and the duration of symptoms. A P value of <0.05 was considered statistically significant.

Conclusion: NDI is a simple, reliable, and effective tool to evaluate functional disability in cervical spondylosis. It provides important information in the form of NDI scores, which can be helpful in managing cervical spondylosis patients effectively.

Keywords: Cervical spondylosis, Neck Disability Index, Functional disability, Neck pain.

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INTRODUCTION

Cervical spondylosis is a degenerative disorder that affects the cervical spine in humans. It represents one of the leading causes of chronic neck discomfort in the adult population [1]. The degenerative process includes changes in the intervertebral discs, osteophytes, and ligaments that can produce various clinical manifestations, such as neck pain and stiffness. The condition is highly prevalent in the middle and older age groups; however, in recent times, cervical spondylosis has been increasingly reported in younger populations due to a sedentary lifestyle, increased use of computers, and poor working ergonomics [2].

Neck discomfort is a major global health problem and is among the primary causes of disability worldwide [3, 4]. Neck pain has a substantial impact on an individual's functional ability to complete daily activities, as well as on his or her overall quality of life. Although imaging techniques such as MRI have significantly improved, the correlation between radiological findings and clinical presentation in cervical spondylosis remains limited [5]. Thus, relying solely on imaging investigations may not accurately reflect the patient's functional status.

Functional assessment tools play a substantial role on evaluating the level of disability

of patients with cervical spondylosis. Among the available functional tools, the Neck Disability Index (NDI) proposed by Vernon and Mior remains one of the commonly used and dependable tool for assessing cervical spondylotic patients [6]. The NDI evaluates ten aspects of functional disability in cervical spondylotic patients, including pain intensity and limitations in personal care, hefting, reading, working, and recreational activities; these are all factors to consider.

Multiple studies have explored the link between cervical spondylotic changes and clinical manifestation; however, the results are inconsistent [7, 8]. At times, patients with minimal structural abnormalities exhibit significant functional disability, while others with marked abnormalities exhibit minimal functional disability.

This study aimed to assess neck-related disability in cervical spondylosis through the NDI and to analyze its relationship with demographic factors (age and sex) and clinical aspects, including symptom duration

MATERIALS AND METHODS

Study Design

A hospital-based cross-sectional observational study that was conducted.

Study Setting

This research took place at Malla Reddy Institute of Medical Sciences for a duration of 18 months from April 2023 to October 2024.

Ethical Approval

The Institutional Ethics Committee approved the study (IEC No. MRIMS/DHR-IEC-88/2022), and all subjects gave written informed consent

Participants

Patients aged between 25 and 75 years with neck pain, stiffness, and reduced cervical range of motion were presented during the study period. To ensure a homogeneous sample, individuals with cervical tumours, previous surgery, trauma, infections, or neurological conditions were not included.

Study Size

Sample size calculation was conducted utilizing data from previous studies that evaluated disability using the NDI in patients with cervical spondylosis. Based on a moderate effect size, with a significance level (α) of 0.05 and a statistical power of 90%, a total of 112 participants were required based on the sample size calculation. To account for potential dropouts and insufficient data, the study's sample size was extended to 130 individuals. The study comprised all participants.

Variables

This was classified as independent and dependent variables.

Independent variables: Demographic variables, such as gender and age; clinical variables, such as duration of symptoms.

Dependent variable: Functional disability.

Data Sources/Measurement

Functional impairment was assessed using the NDI, an established and reliable instrument. The NDI is composed of ten items, each of which is rated on a scale of 0 to 5, for a total score of 0 to 50. The overall score was used to classify disabilities as mild, moderate, or severe.

Bias

To reduce measuring bias, a validated tool, NDI, was used for standardized assessment, ensuring that the evaluation of disabilities was consistent and reliable across different subjects.

Quantitative Variables

Continuous data, such as age, was summarized using mean and standard deviation. Variables were grouped as needed for analysis.

Statistical Methods

Data were analyzed using IBM Corp.'s SPSS software version 26 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ SD, whereas categorical data were presented as frequencies and percentages. Associations between categorical variables were evaluated using the chi-square test, while differences between two independent groups were assessed with the independent t-test. Correlation between continuous variables was determined using either Pearson's or Spearman's correlation test based on data distribution. test based on the nature of the data. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In total, 130 patients met the eligibility criteria were included and analyzed. Tables 1–4 show participant demographics and relevant clinical findings. The mean age of the study population was 52.4 ± 10.6 years, indicating a predominance of middle-aged and older individuals. Most participants were in the 41–60 years age category (49.2%), followed by patients >60 years of age (29.3%), while patients between 25–40 years of age comprised 21.5% of the total study population.

Regarding the gender of the patients, a majority of 60% ($n = 78$) were from the male category, while 40% ($n = 52$) were part of the female category, indicating a male preponderance in the population.

Table 1: Baseline demographic characteristics of the study participants ($n = 130$)

Variable	Number (n)	Percentage (%)
Age group(years)		
25–40	28	21.5
41–60	64	49.2

>60	38	29.3
Gender		
Male	78	60
Female	52	40

While assessing the extent of functional disabilities in participants using NDI, a varied level of disability was noted among the patients. Most patients had moderate disability (46.2%), followed by mild and severe disability, which accounted for 30.8% and 23.0%, respectively. Prior studies have yielded comparable outcomes [9,10], which found that moderate impairment was predominant in cervical spondylosis patients.

Table 2: Distribution of Neck Disability Index (NDI) Scores

Disability Level	Number (n)	Percentage (%)
Mild	40	30.8
Moderate	60	46.2
Severe	30	23

The data also showed that age was substantially linked with functional impairment in cervical spondylosis patients. In cervical spondylosis patients, mean NDI scores increased gradually with age. Patients aged 25-40 had a mean score of 12.5 ± 3.2 , and those aged 41-60 had a mean score of 18.4 ± 4.1 . Patients over 60 years of age got a significantly higher mean score (24.6 ± 5.3), and this demonstrated statistical significance ($p < 0.05$).

Table 3: Association Between Mean NDI Score and Age

Age Group (years)	Mean NDI Score (Mean $\pm$ SD)
25-40	12.5 ± 3.2
41-60	18.4 ± 4.1
>60	24.6 ± 5.3

Similarly, the total duration of symptoms showed a significant statistical relationship with the level of disability. Patients with symptoms lasting <6 months showed an average NDI score of 13.2 ± 3.5 . Similarly, those with symptom duration for 6-12 months had a mean NDI score of 19.5 ± 4.2 . Individuals with duration of symptoms greater than 12 months had comparatively higher mean NDI scores (25.1 ± 5.0). The increasing pattern of disability with the duration of symptoms was statistically significant at $p < 0.05$.

Table 4: Association Between Symptoms Duration and Mean NDI Score

Symptoms Duration	Mean NDI Score (Mean $\pm$ SD)
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	SD)
<6 months	13.2 ± 3.5
6-12 months	19.5 ± 4.2
>12 months	25.1 ± 5.0

The findings indicated that higher age and lasting symptoms were associated with high functional disability. Cervical spondylosis was observed with the increased frequency of moderate and severe disability.

Moreover, the distribution of NDI scores also indicated that cervical spondylosis not only caused pain but also affected many aspects of daily life. The significant statistical correlations derived from the study also highlighted the necessity of early intervention in preventing disability progression.

DISCUSSION

Cervical spondylosis is a degenerative spine disorder characterized by neck pain, stiffness, and limited movement [11]. In structural alterations, it has a substantial impact on functional abilities and quality of life [12]. Functional impairment assessment using patient-reported outcome measures like the NDI helps to understand the disease's clinical burden. This investigation aimed to assess functional disability in cervical spondylosis patients and analyze its correlation with demographic and clinical parameters. Data suggested that many patients had moderate to severe impairment. Higher disability scores were substantially linked to increasing age along with symptom duration.

The functional impairment of patients with cervical spondylosis was measured using the NDI. A high proportion of patients showed moderate-to-severe disability, emphasizing the functional limitations caused by the disease. These findings further emphasize the fact that cervical spondylosis is not merely a structural condition but a clinically significant disorder affecting daily functioning [12].

The demographic features of the participants, revealed that most of them were middle-aged and elderly, demonstrating the highest percentage falling between the ages of 41 and 60. These results align with the well-established fact that cervical spondylosis is an age-related disorder [2,13,14]. As the individual ages, mechanical stress, biochemical alterations in the discs, and degenerative alterations in the spine are known to cause the condition [11,15]. Degenerative alterations in the discs, including disc dehydration, annular tears, osteophytes, and facet hypertrophy, cause alterations in the biomechanics of the cervical spine, leading to pain and stiffness [11,15].

The study notably found the significant association observed between advancing age and higher NDI scores. Functional disability increases

with age. The findings are similar to those of past studies [16]. Factors contributing to a greater risk for functional disability include decreased muscle mass and muscular strength with increasing age. Decreased muscular flexibility and neuromuscular coordination also occur as patients' ages increase. Additionally, advancing age is often due to a higher prevalence of comorbid conditions such as osteoporosis, diabetes mellitus, and vascular disorders, which may negatively influence spinal health and increase the degree of functional impairment. Another major finding of this study was the high correlation between how long the patient had been experiencing their symptoms and the amount of their functional disability. Patients with a longer duration of symptoms, especially those with a duration of more than 12 months, had a higher level of disability than those with a shorter period of symptoms. This finding highlights the influence of symptom duration on the degree of functional impairment. The result emphasizes the necessity of early intervention in preventing the advancement of impairment and is consistent with the progressive nature of cervical spondylosis [14].

Chronic neck pain is associated with variables, including restricted movement range and biomechanical dysfunction caused by postural adjustments. Additionally, there is also the potential risk that the patient's protracted pain will have a psychological effect, causing worry, depression, and dread of movement, all of which will contribute to their level of functional handicap [17,18]

The NDI served as a reliable assessment tool at capturing the multidimensional effects of cervical spondylosis. The NDI evaluates numerous aspects of daily life, such as pain severity, personal care, focus, job, and recreational activities, to provide a complete picture of functional impairment. Its general acceptance and convenience of administration make it an essential tool in clinical and research contexts [10, 19, 20]

Importantly, the NDI provides a patient-centered approach, which helps clinicians to understand the patient's subjective experience of disability, which is sometimes not evident in objective measures. One of the challenges in managing cervical spondylosis is the disparity between radiological and clinical findings. Previous research reported a weak correlation with radiological findings and clinical symptoms in cervical spondylosis [7, 8]. Although radiological assessment techniques such as MRI are useful for evaluating structural abnormalities, imaging findings may not always reflect the degree of disability experienced by patients [7,8,21].

The results obtained of this study emphasizes the necessity of early identification and development of a treatment plan since moderately to severely disabled individuals demonstrate a

significant need for early intervention. Conservative management strategies (i.e., exercise, pain control medications, and physical therapy) have been demonstrated to provide symptomatic relief from cervical spondylosis [15,22]. By reducing the level of discomfort experienced due to cervical spondylosis through conservative management techniques, these strategies could enhance a patient's quality of life and increase the effectiveness of rehabilitation programs. Strengthening, stretching, and educating individuals on proper posture are all rehabilitation techniques which can reduce the symptoms associated with cervical spondylosis. Improved functioning and decreased disability can be from such interventions [22]. Improved functioning and decreased disability can result from such interventions. Previous studies have also demonstrated improvement in disability following appropriate treatment interventions [23].

Further examination and management by a physician may be required, and referral to a specialist may be necessary if conservative management is ineffective or other therapies are required [11,24]. This study implies that more research into the influence of conservative management could aid in the development of more effective cervical spondylosis treatments. Additionally, these results support the idea that rehabilitation programs developed according to individual needs will result in greater success. The utilization of the NDI as a tool for measuring disease progression and evaluating the therapy efficacy in cervical spondylosis patients is also useful in the clinical assessment process [20].

A patient-reported outcome measure, such as the NDI, will allow clinicians to quantify the extent of the functional limitations of a patient and to assess whether treatment has resulted in changes in their functional status, therefore providing clinicians with reports that they can apply in making decisions about modifying treatment based upon an individual's unique requirements. Additionally, using the NDI allows effective communication between the clinician and the patient regarding treatment objectives and anticipated outcomes [20]. This is particularly relevant in patients with chronic neck pain, where functional limitations may significantly affect quality of life and daily activities [25].

LIMITATIONS

There are various possible limitations to this research, all of which must be considered when evaluating the findings. As it was a hospital-based cross-sectional study, these findings cannot necessarily be generalized to a wider group of people and do not allow researchers to determine if one factor causes another. The site of this study was carried out in a single hospital. Thus, the

internal validity of this research would likely impact the external validity.

The functional disability of patients assessed in this study depended exclusively on their responses to questions regarding their functional ability as determined by use of the NDI; as it is a subjective measurement tool, it can therefore be impacted by perceptions together with psychological variables associated with each patient. Potential interfering variables, including but not limited to work status, level of physical activity, and other psychological concerns, were not evaluated in this research. Additionally, this research was performed in a short timeframe; there was no opportunity to evaluate changes in impairment over time or how these patients responded to treatment.

CONCLUSION

Functional loss from cervical spondylosis has a higher incidence in older adults and individuals that have had chronic problems. The NDI has been a useful instrument in quantifying the degree of functional impairment in patients suffering from cervical spondylosis. Because it is effortless to use and provides an accurate measure of functional capacity, it can be employed on a regular basis in the treatment of cervical spondylosis patients.

DECLARATIONS

Ethical Approval

The Institutional Ethics Committee accepted the study (IEC no. MRIMS/DHR-IEC-88/2022).

Informed Consent

All subjects had provided written informed consent before being enrolled in the research.

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Conflict of Interest

No conflicts of interest were disclosed by the authors.

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Author Contributions

All authors contributed equally to the study design, data collection, data analysis, manuscript drafting, and critical revision. All authors have read and approved the final version of the manuscript.

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