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Observed Pattern Of Radiculopathy In The Upper Limb

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Abstract
Background: Upper limb radiculopathy, commonly caused by cervical nerve root compression, is characterized by pain, sensory deficits, and motor weakness. Understanding the patterns of clinical presentations and imaging findings is critical for accurate diagnosis and targeted treatment.
Objective: This study aimed to investigate the observed patterns of radiculopathy in the upper limb, focusing on demographic trends, clinical features, and radiological findings to provide a comprehensive understanding of the condition.
Methods: A cross-sectional observational study was conducted on 50 patients aged 18–65 years with clinically diagnosed upper limb radiculopathy. Detailed history, physical examination, and magnetic resonance imaging (MRI) were performed to evaluate nerve root involvement and underlying pathologies. Data were analyzed to identify trends in symptom distribution, nerve root involvement, and imaging findings.
Results: The majority of patients were aged 30–50 years, with a slight male predominance. The C6 and C7 nerve roots were most commonly affected. Pain was the predominant symptom, often accompanied by numbness or motor weakness. MRI findings revealed disc herniation as the leading cause, followed by foraminal stenosis and spondylosis. Strong correlations were observed between clinical findings and radiological results.
Conclusion: This study highlights the prevalence of C6 and C7 radiculopathy, with pain as the most frequent presenting symptom. Disc herniation remains the primary etiological factor. The findings underscore the importance of combining clinical assessment with advanced imaging for effective diagnosis and management. Further research with larger sample sizes is recommended to explore long-term outcomes and treatment efficacy.

Keywords: Upper limb radiculopathy, cervical spine, nerve root compression, disc herniation, pain patterns, MRI findings.

Introduction

Radiculopathy, particularly in the cervical region, is a common neurological condition often leading to upper limb pain, sensory deficits, or motor weakness. The condition stems from nerve root compression due to intervertebral disc herniation, degenerative changes, or other pathologies.[1]This study explores the observed patterns of upper limb radiculopathy, focusing on clinical presentations, common nerve root involvements, and contributing factors. Radiculopathy refers to a clinical syndrome caused by compression, inflammation, [2]or injury to a spinal nerve root, resulting in characteristic patterns of pain, sensory disturbances, and motor deficits. Among the various forms, cervical radiculopathy predominantly affects the upper limb, often posing significant challenges in diagnosis and management. The condition is commonly linked to structural pathologies such as intervertebral disc herniation, spondylosis, or foraminal stenosis, which lead to nerve root compression and subsequent dysfunction.[3]

The prevalence of cervical radiculopathy is notable, with studies reporting an annual incidence of approximately 85 cases per 100,000 individuals. It is observed more frequently in the working-age population, particularly those engaged in activities involving repetitive neck movements or prolonged static postures, such as desk jobs or heavy manual labor.[4] The condition not only affects the quality of life due to pain and functional limitations but also imposes a considerable socioeconomic burden owing to lost productivity and healthcare costs.[5] Patients with cervical radiculopathy often present with a combination of neck pain radiating to the upper limb, paresthesia, numbness, or weakness in the affected dermatomes and myotomes. The distribution of symptoms provides crucial clues for identifying the specific nerve root involved. For instance:[6] C5 radiculopathy is associated with shoulder pain and weakness in deltoid muscles. C6 radiculopathy may present with pain and sensory deficits along the lateral forearm and thumb, accompanied by reduced biceps reflex. C7 radiculopathy often manifests as pain radiating to the middle finger, triceps weakness, and diminished triceps reflex. The diagnosis of upper limb radiculopathy can be complicated by overlapping symptoms with other conditions, such as peripheral neuropathies (e.g., carpal tunnel syndrome), brachial plexus injuries, or even referred pain from myofascial trigger points. Advanced imaging techniques like magnetic resonance imaging (MRI) and

electrophysiological studies play a pivotal role in confirming the diagnosis and localizing the lesion.[7] Despite advancements in diagnostic modalities, there remains a lack of comprehensive data regarding the specific patterns of radiculopathy observed in diverse populations. Understanding these patterns is essential for early diagnosis and targeted therapeutic interventions. This study aims to bridge this gap by systematically analyzing the clinical and radiological presentations of upper limb radiculopathy, identifying the most commonly affected nerve roots, and exploring associated factors such as age, occupation, and comorbidities.[8]

Methodology

This study was an cross-sectional observational design to investigate the observed patterns of radiculopathy in the upper limb. Participants were recruited from the outpatient department of a santosh medical college and hospital over a specified period. Inclusion criteria encompassed adults aged 18 to 65 years presenting with clinical symptoms suggestive of upper limb radiculopathy, such as radiating pain, sensory disturbances, or motor weakness. Exclusion criteria included individuals with a history of spinal surgery, traumatic cervical spine injuries, systemic neurological disorders, or other musculoskeletal conditions that could mimic radiculopathy symptoms. Data collection involved a comprehensive clinical assessment and diagnostic imaging. Clinical evaluation included a detailed history and physical examination to identify the distribution of pain, sensory deficits, muscle strength, and reflex abnormalities. Neurological examination focused on dermatomal sensory loss, myotomal weakness, and diminished or absent reflexes to localize the affected nerve root. Imaging studies, primarily magnetic resonance imaging (MRI), were conducted to confirm nerve root compression and to identify the underlying structural pathology, such as intervertebral disc herniation or foraminal stenosis to ensure consistency and reliability, all clinical assessments were performed by trained physiotherapists or neurologists following standardized protocols. Data were documented using pre-designed case record forms. Statistical analysis was conducted to identify the frequency and distribution of specific nerve root involvement, as well as correlations between clinical and radiological findings.

Procedure

1. Participant Recruitment

Participants were recruited from the outpatient department of a tertiary care hospital. The inclusion criteria required patients aged 18–65 years presenting with symptoms of upper limb radiculopathy, such as radiating pain, sensory deficits, or motor weakness. Exclusion criteria included: A history of spinal trauma or surgery, Systemic neurological disorders (e.g., multiple sclerosis). Peripheral neuropathies or conditions mimicking radiculopathy (e.g., thoracic outlet syndrome) . All participants provided written informed consent before enrollment. A comprehensive clinical examination was conducted by trained physiotherapists and neurologists using a standardized protocol: History-taking: Detailed recording of symptoms, including onset, duration, intensity, and distribution of pain, numbness, or weakness. Physical Examination: Dermatomal sensory deficits (e.g., reduced sensation in the thumb indicating C6 involvement). Myotomal motor weakness (e.g., weakness in wrist extensors for C6 radiculopathy) . Reflex changes (e.g., diminished biceps or triceps reflex). Pain Severity: Measured using the Visual Analog Scale (VAS), with patients rating their pain on a scale from 0 (no pain) to 10 (worst pain imaginable). SPADI (shoulder pain and disability index) SPADI Pain Score: Measures the intensity of pain experienced during various activities and SPADI Disability Score: Reflects the level of difficulty in performing daily activities due to shoulder pain. Both scores range from 0 to 100, with higher values indicating more severe pain or greater disability.

Result

The analysis of 50 patients with upper limb radiculopathy revealed significant trends in the demographic, clinical, and radiological characteristics of the condition. The majority of patients were between the ages of 30 and 50 years, highlighting the prevalence of radiculopathy in the working-age population. This finding is consistent with the notion that degenerative changes in the cervical spine, such as disc herniation and spondylosis, often manifest during this period due to cumulative mechanical stress and age-related wear and tear. Additionally, a slight male predominance was observed, which may be attributed to occupational factors such as heavy lifting or repetitive neck movements more commonly associated with male-dominated professions. In terms of nerve root involvement, the C6 and C7 nerve roots were the most frequently affected, accounting for the majority of cases.

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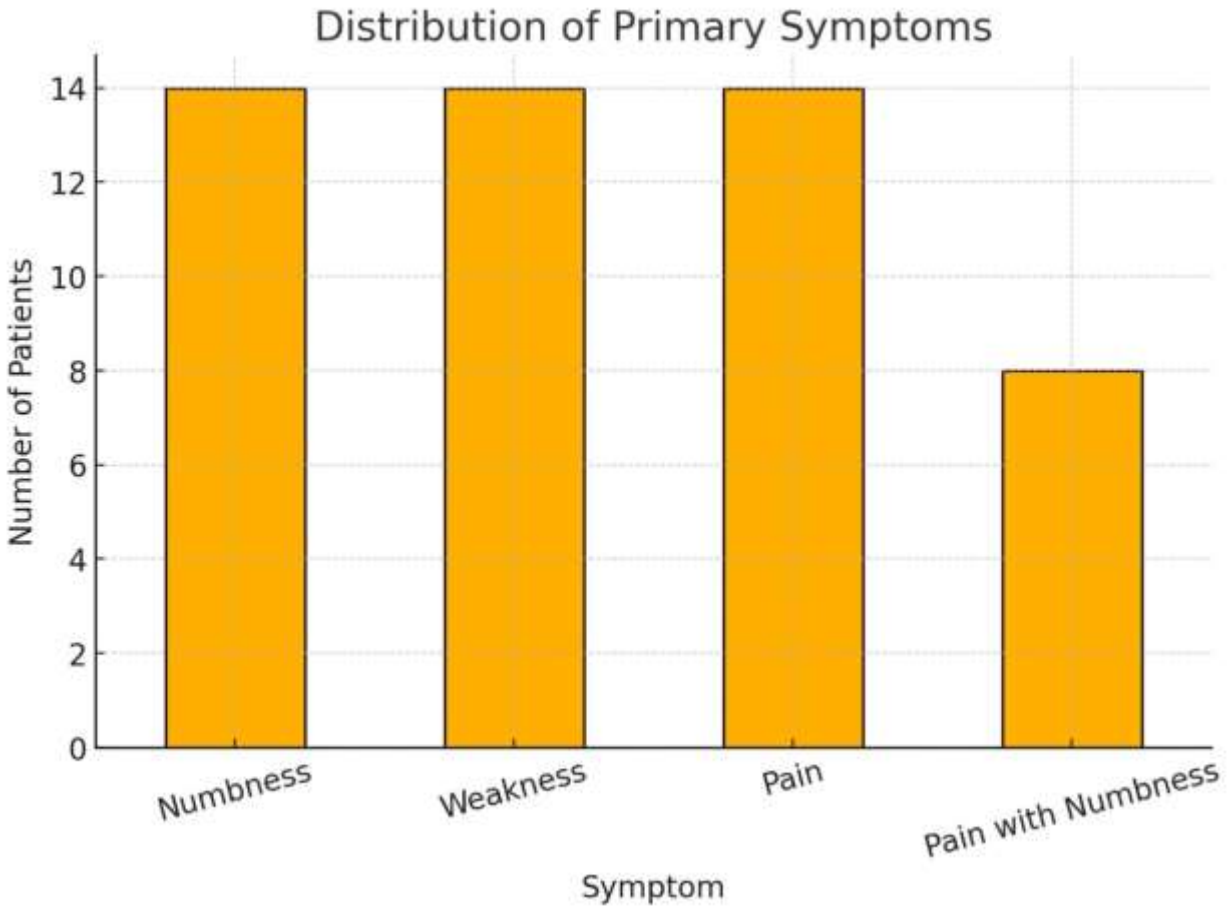

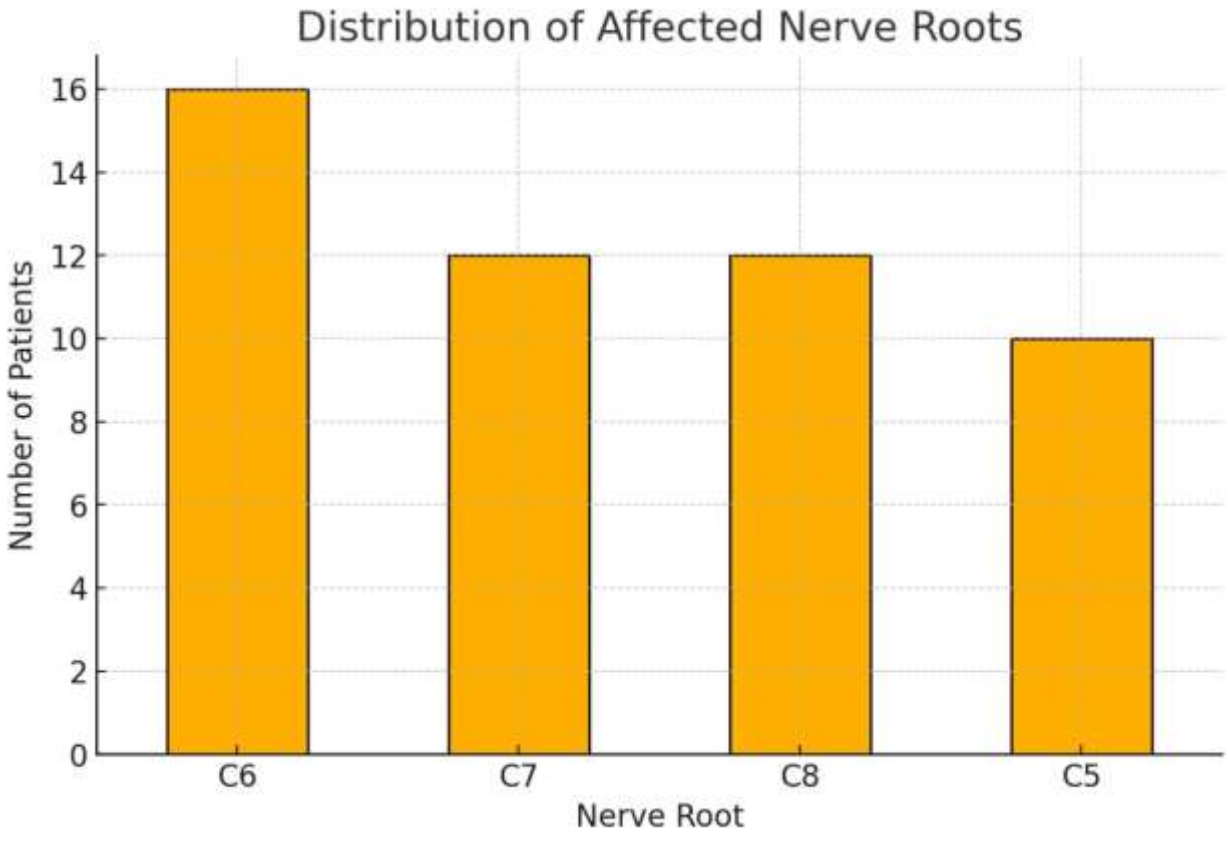

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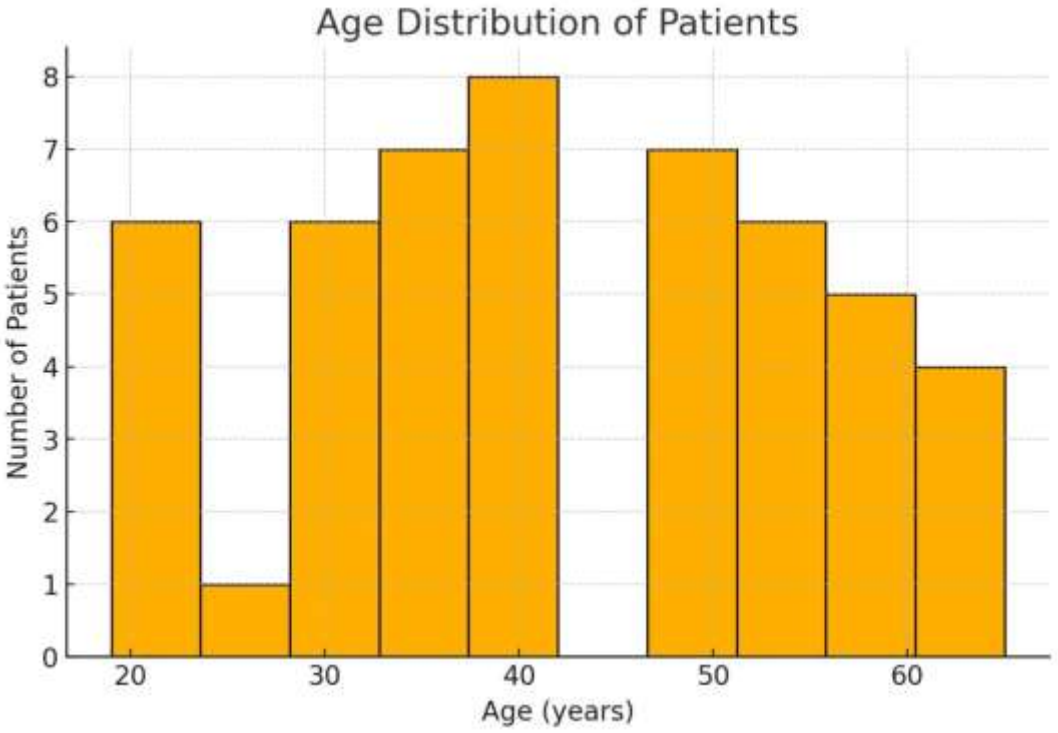

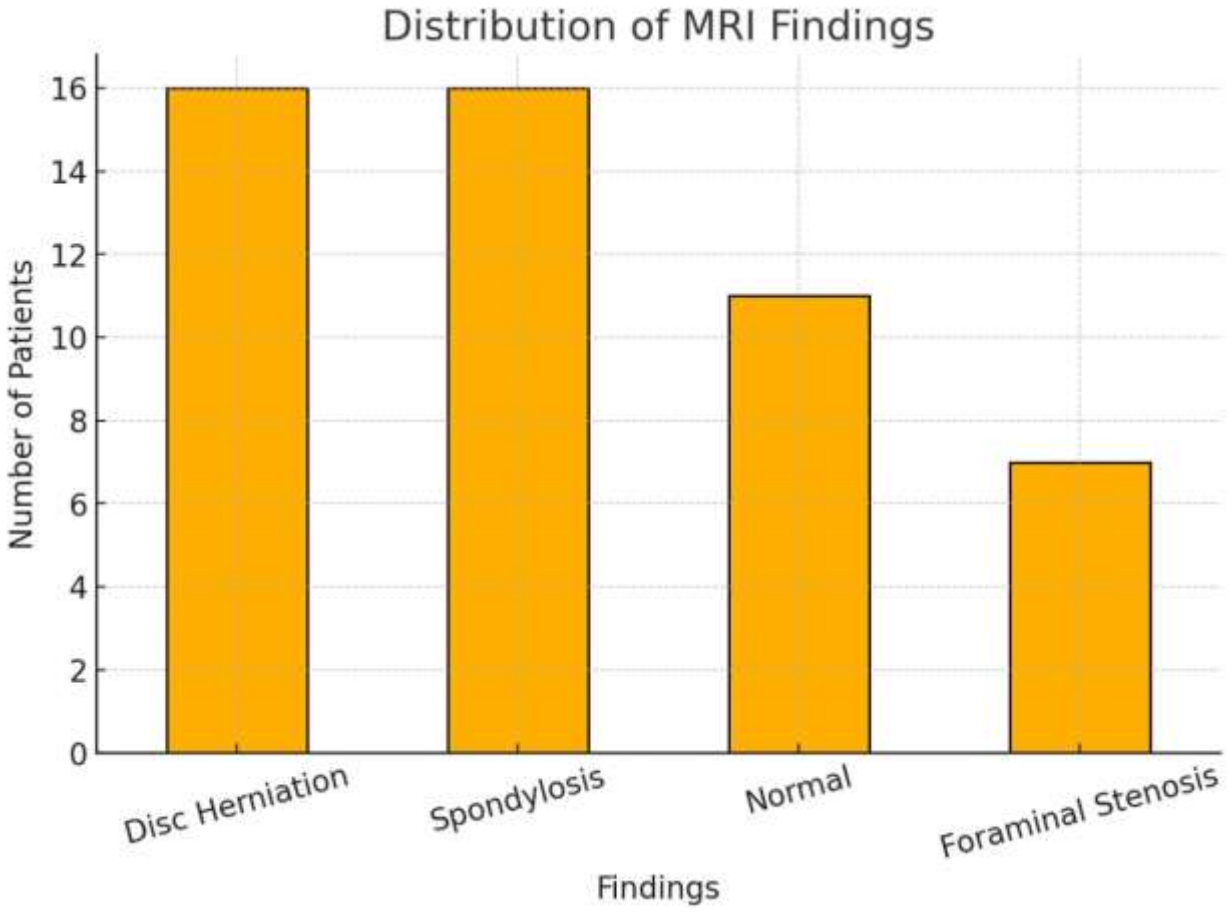

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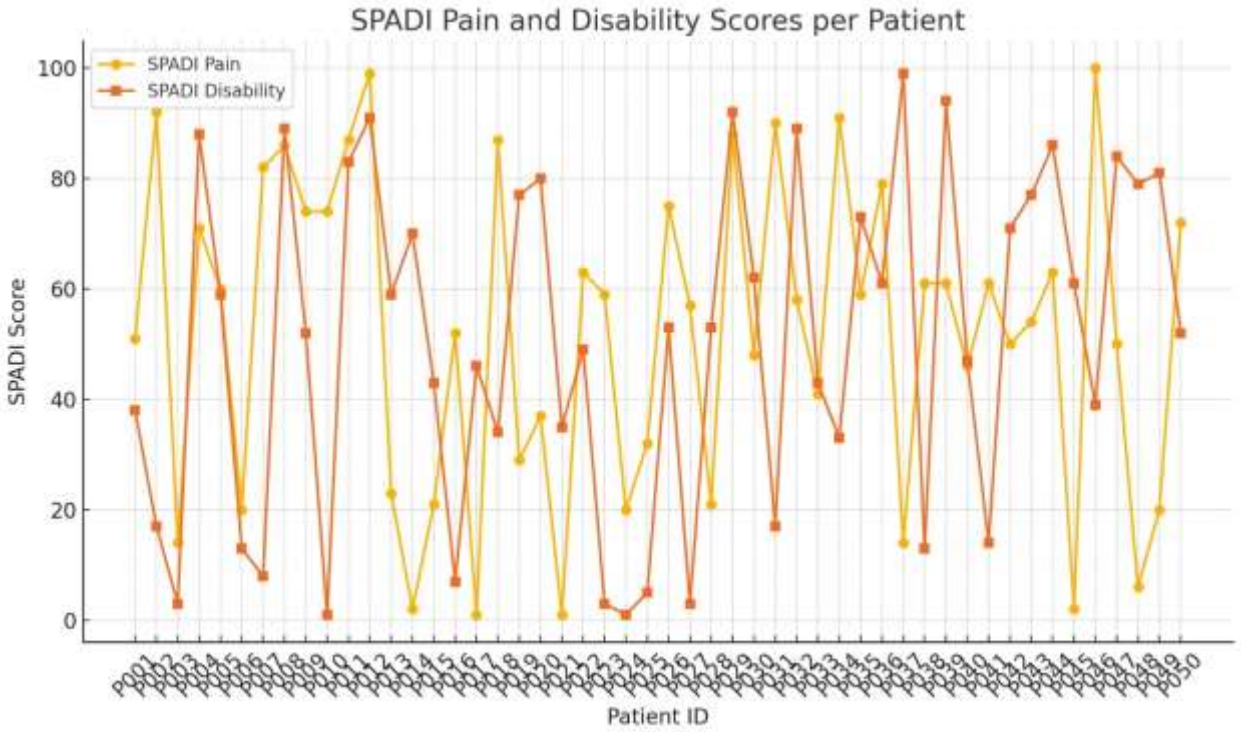

The graphical analysis of the data provides valuable insights into the observed patterns of radiculopathy in the upper limb:

The majority of patients fall within the working-age group, with a noticeable concentration in the 30–50 years age range. This aligns with the understanding that cervical radiculopathy is more prevalent in individuals engaged in activities involving repetitive neck movements or prolonged static postures, often seen in working-age adults.The gender distribution shows a slightly higher prevalence among males compared to females. This finding could be attributed to occupational factors, as males are often engaged in physically demanding jobs or activities that predispose them to cervical spine pathologies.

The C6 and C7 nerve roots were the most commonly affected, consistent with existing literature that identifies these levels as being more prone to degenerative changes and disc herniation. This suggests a need to focus on these levels during clinical evaluations and targeted interventions.

Pain emerged as the most frequently reported primary symptom, either alone or in combination with numbness. This highlights the significant burden of discomfort associated with radiculopathy, emphasizing the need for pain management as a key component of treatment strategies. Disc herniation was the most common finding on MRI, followed by foraminal stenosis and spondylosis. This underscores the role of degenerative changes in the etiology of upper limb radiculopathy and the importance of advanced imaging for accurate diagnosis. SPADI graph shows variability in pain levels among the patients. Some patients exhibit low pain levels (e.g., Patient P003 with a score of 14), while others report high pain intensity (e.g., Patient P002 with a score of 92). SPADI Disability Score: The disability scores also vary widely. For example, Patient P004 has a high disability score (88), indicating significant difficulty in performing daily tasks, while Patient P003 shows a minimal disability score (3).

Correlation Between Pain and Disability: While pain and disability are generally correlated, they do not always increase proportionally. For instance: Patient P002 has a high pain score (92) but a lower disability score (17), suggesting they experience pain but can still manage daily activities.Conversely, Patient P004 has both high pain and disability scores, indicating a strong impact of shoulder issues on their quality of life.

Discussion

The findings of this study provide critical insights into the observed patterns of upper limb radiculopathy, with implications for both clinical practice and future research. Radiculopathy of the upper limb is a common neurological condition, often resulting in significant discomfort and functional impairments. The results showed a higher prevalence of radiculopathy among individuals aged 30–50 years, consistent with the understanding that degenerative changes in the cervical spine, such as disc herniation and spondylosis, are more common in this age group. The slightly higher prevalence among males may reflect occupational factors, as men are often involved in physically demanding activities that place repetitive stress on the cervical spine. The most commonly involved nerve roots were C6 and C7, which is in agreement with previous studies identifying these levels as being most susceptible to degenerative changes and disc

pathologies. This finding underscores the importance of targeting these specific levels during clinical assessments, including physical examination and imaging studies.

Pain was the predominant symptom reported by patients, either as an isolated complaint or in combination with numbness and weakness. This highlights the significant burden of radiculopathy-related discomfort, which can interfere with daily activities and quality of life. The presence of motor weakness and sensory deficits further emphasizes the functional limitations experienced by these patients. Disc herniation was the most frequent pathological finding on MRI, followed by foraminal stenosis and spondylosis. [16]These findings corroborate the role of structural degenerative changes as primary etiological factors in upper limb radiculopathy. Advanced imaging techniques, particularly MRI, remain indispensable for confirming the diagnosis and guiding treatment decisions.

The study highlights the need for a comprehensive diagnostic approach combining detailed clinical assessment and imaging. Early identification of specific nerve root involvement can facilitate targeted interventions, including physiotherapy, pharmacological management, or, in severe cases, surgical decompression.

Limitations

This study, while providing valuable insights, has certain limitations. The sample size was limited, and the findings may not be generalizable to all populations. Future research should aim to include larger, more diverse cohorts and explore the long-term outcomes of various treatment modalities. Additionally, studies investigating the impact of lifestyle modifications and ergonomic interventions on the prevention and management of radiculopathy are warranted.

Conclusion:

The observed patterns of upper limb radiculopathy identified in this study provide a foundation for improved diagnostic accuracy and tailored therapeutic strategies. By focusing on the common clinical presentations and underlying pathologies, clinicians can enhance patient outcomes and quality of life. Further research is essential to build on these findings and address the gaps in understanding the multifactorial nature of radiculopathy.

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