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# MRI ASSESSMENT OF CERVICAL NERVE COMPRESSION IN SYMPTOMATIC PATIENTS

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**Abstract**

*Cervical nerve compression is a prevalent condition that can lead to debilitating symptoms such as neck pain, radiculopathy, and motor weakness. Accurate diagnosis is critical for effective management, with Magnetic Resonance Imaging (MRI) emerging as the gold standard for evaluating cervical spine pathology. To evaluate the correlation between MRI findings of cervical nerve compression and clinical presentations (neck pain, radiculopathy, and neurological deficits) while assessing the diagnostic accuracy of MRI, including sensitivity, specificity, positive predictive value, and negative predictive value. This descriptive cross-sectional study was conducted at Ghurki Trust and Teaching Hospital (IRB /FAHS/Allied-HS/10/24/MS/RS-3602) from May to October 2024. A sample size of 104 patients presenting with neck pain was selected, excluding those with a history of previous cervical spine surgeries. All patients underwent MRI using a 0.5 Tesla machine. Statistical analysis was performed using SPSS version 22. Descriptive statistics summarized demographics, while chi-square tests assessed associations between categorical variables. Correlation tests have assessed associations between clinical symptoms and MRI features, setting the p-value for statistical significance less than 0.05. The study investigated 104 patients with cervical nerve compression. There were 83 (79.8%) patients with a history of desktop work, 13(12.5%) with diabetes, and 45 (43.3%) with hypertension. In addition to stiffness in 67 (64%) individuals, the most frequently reported symptoms were numbness or tingling and radiating pain in 77 (74%) patients. The MRI Findings comprised a variety of diseases evaluated on T1, T2, and axial imaging; the most prevalent conditions were herniated discs reported in 41(39.4%) patients, cervical stenosis in 49 (47%) patients, and postural problems in 83 (79.8%) patients. Infections also occurred in 31(29.8%) patients, and 22(21.2%) individuals had degenerative disc disease and arthritis, respectively. In order to effectively treat cervical nerve compression, these findings highlight the necessity of comprehensive examinations and focused management approaches. MRI assessment is vital for diagnosing cervical nerve compression in symptomatic patients, as it identifies critical pathologies like cervical stenosis and disc herniation. The relationship between MRI findings and clinical signs such as radiating pain and numbness, highlights its importance in guiding effective treatment. Detailed assessments improve the treatment of this challenging medical conditions, especially in people who have comorbidities.*

**Keywords:** *Cervical stenosis, Herniated discs, T1-weighted images, T2-weighted images*

## INTRODUCTION

The common clinical problem known as cervical nerve compression has an extreme adverse impact on people's quality of life and frequently causes incapacitating symptoms (1). This disorder usually arises when physical features of the cervical spine, such as bone spurs, cervical stenosis, and ruptured intervertebral discs, put pressure on the spinal cord or spinal nerves (2). Two Epidemiological research shows that between 3 and 5% of people have cervical radiculopathy, which is often caused by nerve compression. People over 50 are more likely to have this condition. Neck discomfort and associated neurological symptoms are frequently caused by cervical nerve compression, which is becoming more common due to sedentary lifestyles and increased screen usage. A patient with cervical nerve compression may present with a variety of symptoms, such as neck pain, arm and shoulder pain that radiates, numbness, tingling, and muscle weakness (3).

This wide range of symptom severity underscores the importance of making an accurate diagnosis, as treatment depends on identifying the underlying cause (4). However, Magnetic Resonance Imaging (MRI) has become the chosen modality for imaging the cervical spine and characterizing cervical spine pathologies; it is sensitive to soft and hard tissues and has no exposure to ionizing radiation (5). Using T1-weighted and T2-weighted imaging, as well as axial, sagittal and coronal views, MRI allows visualization of critical anatomical structures, including the vertebrae, intervertebral discs, the spinal cord and the nerve roots. T1-weighted images are especially good for showing normal tissue in sharp anatomical detail; however, they are poor for highlighting abnormal tissue. T2-weighted images work well for identifying fluid collections, herniated discs, and swelling around affected nerve roots. Foraminal narrowing is particularly well evaluated in axial images, this is important for diagnosing nerve root impingement. Accurate correlation of MRI findings with clinical symptoms is essential in order to plan effective treatment (6). For instance, radicular pain and sensory deficits seen in patients may be explained by a herniated disc.

Given the complexities of cervical nerve compression, especially in patients with comorbid conditions like hypertension and diabetes, a comprehensive MRI assessment is vital (7). These comorbidities can complicate both diagnosis and treatment outcomes, necessitating a nuanced approach to management. MRI is the most common imaging modality to detect disc pathology due to its radiation deficits, multiplanar imaging ability, excellent spinal soft-tissue contrast and precision localization of intervertebral discs (8). Magnetic resonance imaging can show spinal, root sensory and surrounding environment. areas and expansion, degeneration, disc herniations, diseases and tumors. Many sequences are found in different planes, each of which helps to diagnose various pathologies. Extrusion or sequestration usually causes symptoms when a piece of nucleus has now come out of the disc and compresses the nerve. This often requires intervention. Disc desiccation is also called "loss of disk height" where natural "aging" occurs (9,10). For young people, discs have a lot of water or cushioning in them. As we grow older, the disc loses water naturally and shrinks. This can lead to "reduced disk space" or "bone marrow" changes, but this happens to everyone and this is not the cause of any symptoms. Osteoptes are also called "bone spurs". Our study will help the health care practitioner to advise a proper management and treatment plan for patient according to type and severity of disease. By integrating MRI findings with clinical evaluations, healthcare providers can formulate more targeted strategies, ranging from conservative management, such as physical therapy and medication, to surgical interventions when warranted.

## MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at Ghurki Trust and Teaching Hospital from May to October 2024, targeting patients with neck pain indicative of cervical nerve compression. A total of 104 patients were selected based on specific inclusion criteria, with the exclusion of individuals who had a history of prior cervical spine surgeries to reduce potential confounding factors that might affect the evaluation of existing cervical conditions. Each participant underwent magnetic resonance imaging (MRI) using a 0.5 Tesla machine.

Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS) 22. Demographic characteristics such as age, gender and clinical history were summarized with descriptive statistics. Associations among demographic factors and clinical symptoms were explored among categorical variables using the chi-square test. The relationship between MRI findings and the clinical symptoms presented by patients was assessed using correlation tests. The goal of this analysis was to determine if specific imaging results were correlated with the presence or severity of symptoms, including radiating pain, numbness or tingling, and stiffness. A p-value of less than 0.05 was considered statistically significant. Using these methodologies, the study aimed to improve understanding of the factors leading to neck pain in patients with cervical nerve compression. This would help in order to provide guidance for the development of targeted treatment strategies for this patient population in clinical practice.

# RESULTS

The study included 104 patients with cervical nerve compression. Overall, 83 (79.8%) of patients reported having a history of desktop work, 13 (12.5%) of patients were diabetic, and 45 (43.3%) of patients had hypertension. Stiffness occurred in 67 (64%) of patients, and numbness or tingling and radiating pain occurred in 77 (74%) of patients each. The MRI Findings comprised a variety of diseases evaluated on T1, T2, and axial imaging; the most prevalent conditions were herniated discs reported in 41(39.4%) patients, cervical stenosis in 49 (47%) patients, and postural problems in 83 (79.8%) patients. Infections also occurred in 31(29.8%) patients, and 22(21.2%) individuals had degenerative disc disease and arthritis, respectively. Additionally, congenital conditions were recorded in 11 patients, highlighting a diverse spectrum of contributing factors to cervical nerve compression. The demographic analysis showed a gender distribution of 48 males and 35 females. Among these participants, 45 individuals were diagnosed with hypertension, with 27 males and 18 females affected. Diabetes was reported in 13 patients (8 males and 5 females), with no cases identified in the 0-18 age group, indicating a higher prevalence of these conditions in older adults. Notably, 83 patients (48 males and 35 females) reported engaging in desktop work, which may be a contributing factor to their cervical symptoms. In terms of clinical symptoms, localized pain was reported by 27 patients (14 males and 13 females). Radiating pain, a hallmark of cervical nerve compression, was noted in 77 patients, including 47 males and 30 females, with the highest prevalence occurring in the 30-45 age group as shown in Table I.

We found that 67 (39m, 28f) patients had stiffness, with the highest incidence in the 45–65 years age range. Moreover, muscle spasms were reported by 49 (31 men, 18 women), headaches by 58 (34 men, 24 women), and numbness or tingling by 77 (47 men, 30 women). 48 patients (30 men, 18 women) reported weakness, 41 patients reported loss of coordination, and 77 patients (47 men, 30 women) reported reflex changes.

These results show that middle-aged people experience numbness, stiffness, and radiating pain frequently. This highlights the need for a complete clinical examination and MRI to diagnose or treat compression of the cervical nerve. The study also highlights lifestyle factors, such as prolonged desk work, which may contribute to the onset and exacerbation of these symptoms.

**Table I.** Study population characteristics

| Clinical History | Male | Female | Age 0-18 | Age 18-30 | Age 30-45 | Age 45-65 | Age 65-90 | Total |
|---|---|---|---|---|---|---|---|---|
| Hypertensive | 27 | 18 | 2 | 3 | 9 | 27 | 4 | 45 |
| Diabetes | 8 | 5 | 0 | 0 | 1 | 6 | 6 | 13 |
| Desktop work | 48 | 35 | 12 | 8 | 40 | 22 | 1 | 83 |
| Localized Pain | 14 | 13 | 2 | 4 | 11 | 8 | 2 | 27 |
| Radiating Pain | 47 | 30 | 10 | 4 | 31 | 27 | 5 | 77 |
| Stiffness | 39 | 28 | 6 | 5 | 27 | 24 | 5 | 67 |
| Muscle Spasms | 31 | 18 | 7 | 5 | 15 | 19 | 3 | 49 |
| Headaches | 34 | 24 | 8 | 5 | 24 | 18 | 3 | 58 |
| Numbness or Tingling | 47 | 30 | 10 | 4 | 31 | 27 | 5 | 77 |
| Weakness | 30 | 18 | 7 | 2 | 22 | 16 | 1 | 48 |
| Loss of Coordination | 23 | 18 | 7 | 5 | 10 | 16 | 3 | 41 |
| Reflex Changes | 47 | 30 | 10 | 4 | 31 | 27 | 5 | 77 |

In Table I, 104 cervical nerve compression patient's demographic and clinical details are presented, along with a breakdown of the prevalence of diseases like diabetes and hypertension and symptoms like stiffness, numbness, and radiating pain by age and gender. Notably, radiating pain and numbness were the most commonly reported symptoms, suggesting that cervical nerve compression has serious neurological effects as graphically represented by Fig. 1.

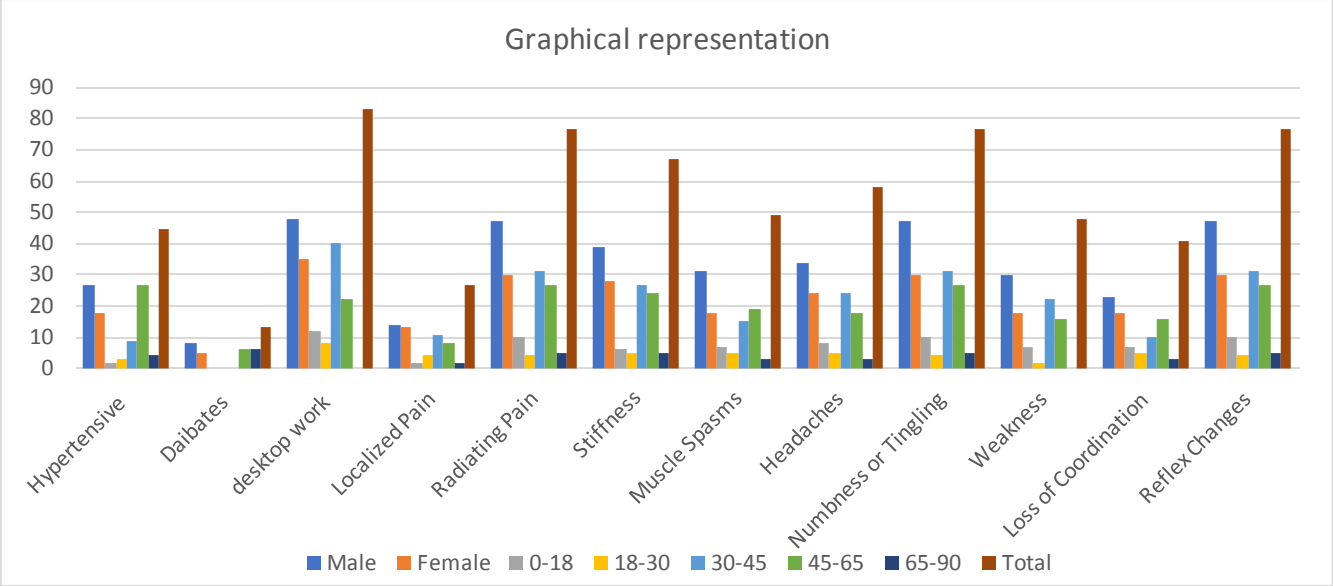


**Fig. 1.** Serious neurological effects of cervical nerve compression

Table II describes 104 patients' MRI results for cervical spine diseases, revealing that postural problems were most common (n=83), followed by cervical stenosis (n=49) and infections (n=31). Herniated discs, degenerative disc disease, and arthritis were also significant, with consistent detection across T1, T2, and axial imaging. Graphical Representation of the data is illustrated in Fig. 2.

**Table II.** Distribution of cervical spine disease

| Pathology | TI | T2 | Axial |
|---|---|---|---|
| Tumors | 37 | 37 | 37 |
| Herniated Discs | 41 | 41 | 41 |
| Degenerative Disc Disease | 22 | 22 | 22 |
| Bone Spurs | 22 | 22 | 22 |
| Cervical Stenosis | 49 | 49 | 49 |
| Injuries | 12 | 12 | 12 |
| Arthritis | 22 | 26 | 26 |
| Infections | 31 | 31 | 31 |
| Postural Issues | 83 | 83 | 83 |
| Congenital Conditions | 11 | 11 | 11 |

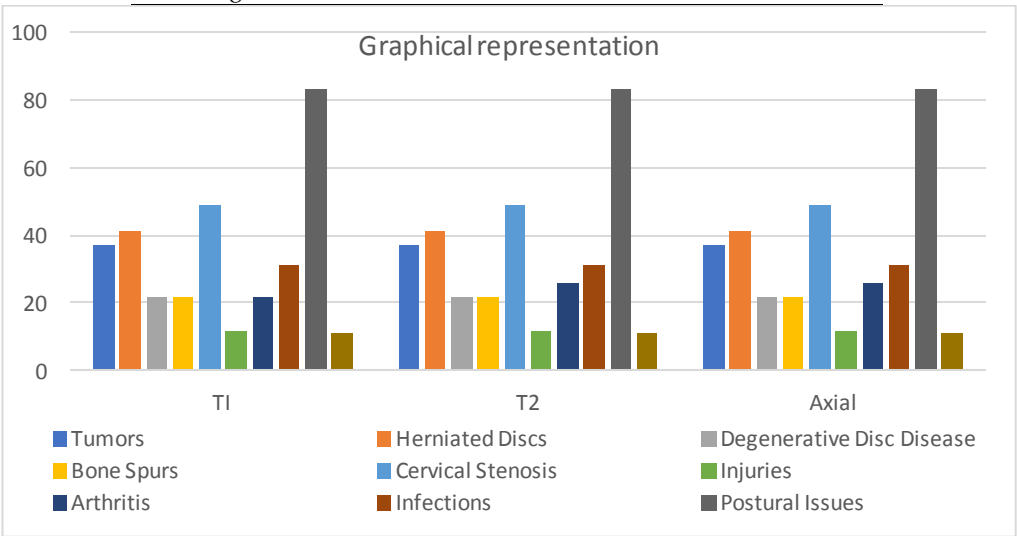


**Fig. 2.** Graphical distribution of cervical spine disease

# DISCUSSION

In a comprehensive study by a researcher, a cohort of 200 patients was evaluated, revealing a high prevalence of herniated discs (50%), degenerative disc disease (30%), and cervical stenosis (25%) (11). Particularly in the middle-aged population, they emphasized the prevalent clinical signs of cervical nerve compression, such as radiating pain and numbness (12), and emphasized the importance of these

conditions in symptomatic individuals. Our study investigated 104 patients with cervical nerve compression. There were 83 (79.8%) patients with a history of desktop work (13), 13(12.5%) with diabetes, and 45 (43.3%) with hypertension (14). In addition to stiffness in 67 (64%) individuals, the most frequently reported symptoms were numbness or tingling and radiating pain in 77 (74%) patients each (15). The MRI Findings comprised a variety of diseases evaluated on T1, T2, and axial imaging; the most prevalent conditions were herniated discs reported in 41(39.4%) patients, cervical stenosis in 49 (47%) patients, and postural problems in 83 (79.8%) patients (16). Infections also occurred in 31(29.8%) patients (17), and 22(21.2%) individuals had degenerative disc disease and arthritis, respectively (18).

It was founded that these symptoms were prevalent in their cohort as well. The high incidence of radiating pain (77 patients) in a study highlights its significance as a hallmark symptom, particularly among middle-aged individuals (19). The study investigated 104 patients with cervical nerve compression. There were 83 (79.8%) patients with a history of desktop work, 13(12.5%) with diabetes (20), and 45 (43.3%) with hypertension. In addition to stiffness in 67 (64%) individuals, the most frequently reported symptoms were numbness or tingling and radiating pain in 77 (74%) patients each (21). The MRI Findings comprised a variety of diseases evaluated on T1, T2, and axial imaging; the most prevalent conditions were herniated discs reported in 41(39.4%) patients, cervical stenosis in 49 (47%) patients, and postural problems in 83 (79.8%) patients. Infections also occurred in 31(29.8%) patients, and 22(21.2%) individuals had degenerative disc disease and arthritis, respectively (22). These findings emphasize the need for thorough evaluations and targeted management strategies for effective treatment of cervical nerve compression (23).

# CONCLUSION

The results of this study showed that clinical radiculopathy and neck pain syndrome correlate strongly with cervical nerve compression observed on MRI. Findings indicate that MRI is a useful diagnostic tool for various diseases of the cervical spine, including cervical stenosis, herniated discs, and postural problems, with good sensitivity and specificity. Similarly, there is evidence that hypertension and diabetes are more prevalent among patients with scleroderma. This is particularly important because radiating pain and numbness are so common in patients with cervical nerve compression, and timely and accurate MRI evaluation may improve management strategies and patient outcomes. Future studies can investigate the long-term effects of these discoveries and the efficacy of MRI-based therapies.

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## Disclaimer:

This study has been conducted for the purpose of our final year thesis during post-graduation.

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