PREVALENCE AND DISTRIBUTION OF MEDIAN, RADIAL, AND ULNAR NERVE INVOLVEMENT AMONG ADULTS WITH NEUROGENIC CERVICOBRACHIAL PAIN: A CROSS-SECTIONAL OBSERVATIONAL STUDY

Ganesh Mayilvaganan Subbiah[1], Dr. Mukesh Tiwari[2], Dr. Bhagwat Vaman Shinde[3]

[1]PhD Scholar, NIMS UNIVERSITY, NIMS College of PT&OT, JAIPUR.
[2]Professor and Unit Head, Department of Orthopaedics2, NIMS Medical College, JAIPUR.
[3]Associate Professor, Dr. Vasantrao Pawar Medical College, Hospital & Research Centre.

ABSTRACT

Background: Neurogenic cervicobrachial pain (NCBP) is a common musculoskeletal condition characterized by neck pain radiating to the upper limb due to involvement of cervical nerve roots and peripheral nerves. Accurate identification of the affected peripheral nerve is essential for appropriate diagnosis and targeted physiotherapy management. However, limited literature is available regarding the prevalence of median, radial, and ulnar nerve involvement in adults with neurogenic cervicobrachial pain. Therefore, the present study aimed to determine the prevalence of median, radial, and ulnar nerve involvement among adults aged 25–45 years with neurogenic cervicobrachial pain.

Materials And Methods: An observational prevalence study was conducted over a period of six months in Nashik and the surrounding region. A total of 227 participants aged 25–45 years diagnosed with neurogenic cervicobrachial pain were recruited using systematic probability sampling. Participants underwent a standardized clinical assessment that included active and passive cervical movement testing, Spurling's test, palpation of cervical transverse processes, Upper Limb Neurodynamic Tests (ULTTs) for the median, radial, and ulnar nerves, and palpation of peripheral nerve trunks. Descriptive statistics were used to determine the prevalence of nerve involvement and to analyze gender- and side-wise distribution.

Results: Among the 227 participants, the median nerve demonstrated the highest prevalence of involvement, affecting 140 participants (61.67%), followed by the radial nerve in 70 participants (30.84%) and the ulnar nerve in 17 participants (7.49%). Females constituted the majority of the study population (56.39%, n = 128), while males accounted for 43.61% (n = 99). Right-sided symptoms were observed in 122 participants (53.74%), whereas left-sided involvement was noted in 105 participants (46.26%).

Conclusion: This study concludes that the median nerve is the most commonly involved peripheral nerve in adults aged 25–45 years with neurogenic cervicobrachial pain followed by the radial and ulnar nerves. A slightly higher prevalence was observed among females and in right-sided involvement. These findings emphasize the importance of comprehensive neurodynamic assessment, particularly of the median nerve to facilitate accurate diagnosis and guide targeted physiotherapy interventions for individuals with neurogenic cervicobrachial pain.

KEYWORDS: Neurogenic cervicobrachial pain, Median nerve, Radial nerve, Ulnar nerve, neurodynamic test.

INTRODUCTION

Neck pain is one of the leading causes of disability worldwide and frequently presents with pain radiating into the upper limb. Cervicobrachial pain syndrome (CBPS) represents a common clinical presentation encountered in primary care and physiotherapy settings and is associated with reduced functional ability, work absenteeism, and impaired quality of life. Neck pain associated with tingling, numbness or discomfort in the arm, upper back and upper chest with or without an associated headache is considered as cervicobrachial pain syndrome (CBPS). This complaint is common among the patients seeking physiotherapy interventions for neck and arm pain. Cervical radiculopathy can be a diagnosis of choice for this presentation in presence of frank sensorimotor deficits in the related nerve root territory (dermatome and myotome)1 It is either due to neurogenic or non-neurogenic origin. Cervicobrachial pain syndrome is a condition with heightened mechanosensitivity of the neural structure as the primary pathology of symptoms of neck and upper extremity pain. In cervicobrachial pain syndrome, the intervertebral foramen may be narrowed by osteophytes slipping of facet or concovertebral joints by central disc herniation by thickening of ligamentum flavum or even from local cervical vertebral subluxation associated with ligamentum laxity.

Via a proper history, physical examination and medical investigations, the presence of various causes of cervical pain may be identified. The most likely diagnoses include visceral disorders, neuromusculoskeletal, psychosocial and occupation oriented disorder. It is essential to rule out other possible causes like cardiovascular diseases, gastrointestinal and pulmonary diseases prior to initiation of therapeutic interventions. Specific joint dysfunctions, myofascial imbalances, trigger points, neural tissues and disc derangements are also other possible sources which contribute to cervicobrachial pain. Perpetuating factors such as cervical core muscle dysfunction, dynamic instabilities, altered movement patterns, oculomotor, proprioceptive dysfunctions, central pain hypersensitivity and psychosocial aspects need to be explored. More than a single symptom may present itself at a time or there may also be a substantial overlap in the presentation of patterns. However, rigorous physical examination and clinical reasoning for the primary cause of the symptom can be assessed.2

It is often mistaken as cervical radiculopathy. Cervical radiculopathy involves objective symptoms presenting in a segmental distribution with a combination of sensory and motor dysfunction. Moreover, a complete evaluation of the neuro musculoskeletal system usually points to the absence of frank deficits in peripheral nervous system among patients with cervicobrachial pain presentations thus ruling out radiculopathy. Possible sources for cervicobrachial pain are: referred or radiating pain from dysfunctional tissue structures (non somatic or somatic) such as visceral organs, facet joints, cervical discs, tender points and inflamed neural tissues or upper quarter muscular imbalances with the associated trigger factors. Neural tissue irritation may result from mechanical compression, inflammation, ischemia, or altered neural mobility secondary to cervical degenerative changes, disc herniation, foraminal narrowing, or soft tissue dysfunction.

Less frequent than lumbar radiculopathies, cervical radiculopathies occur at an incidence rate of approximately 85 persons per 100,000 globally. The C7 nerve root is most frequently impacted, with more than half of all cases affecting this level. Roughly a quarter of cases involve the C6 nerve root. Nerve roots C5 and C8 are less impacted. Risk factors for developing radicular disease include manual labor with heavy lifting, driving, or operating vibrating equipment.3

In nearly all cases of cervical radiculopathy, the key pathophysiologic feature is inflammation. That inflammation can result from acute herniation of an adjacent cervical disc impinging on the nerve root. The inflammation can also exacerbate degenerative changes so that osteophytes or changes associated with disc degeneration can affect the nerve root. The direct compression of the nerve root leads to pain, numbness, tingling, and weakness.4

When the condition is chronic, it is likely to become a persistent or recurring problem that collision inauspiciously on an individual's psychological as well as physical health. The most current study for the natural history of the condition reported reoccurrence rate to be as high as 32%. In addition to the effect on individuals, persistent disablement could lead to high costs for health care systems and society. Regardless of its collision, there are refusal obvious strategies for the executive of cervicobrachial pain. In cervicobrachial pain can be referred to the arm from somatic structures or radiate to the upper limb from end to end neuropathic mechanism. Abundant classifications have been made, together with cervicobrachial pain syndrome, cervical radiculopathy and neck and arm pain. For the purpose of this study, cervicobrachial pain is defined as the presence of arm pain associated with cervical spine pain.5

No population based study could be identified in the literature regarding prevalence of neurogenic cervicobrachial pain syndrome. However, prevalence of cervicobrachial pain was estimated to be 16.2% in risk group and 10.2% in referent groups of workers from a fertilizer plant.

Neurodynamic tests assess the mechanical and physiological responses of peripheral nerves to movement. Upper Limb Neurodynamic Tests (ULNT1, ULNT2a, ULNT2b and ULNT3) selectively bias the median, radial and ulnar nerves and are widely used in clinical practice to identify increased neural mechanosensitivity. Active movements of cervical spine (extension, lateral flexion to either side and ipsilateral rotations) and arm movements reproducing pain. Symptom reproduction on passive movements in the same pattern as with active movements. Elicitation of adverse response (in terms of range of movement and reproduction of symptoms) to neural tissue provocation testing of median, ulnar and radial nerves and subsequent symptom alteration with neural tissue differentiating maneuvers. Tenderness at transverse processes of cervical spine (nerve roots), nerve trunks of median, ulnar and radial nerves at different anatomical locations in the course of respective neural tissue. Hyperalgesia related cutaneous tissues on palpation (tender points). Positive spurling's test or radiological evidence of cervical disc pathology. The prevalence of neurogenic cervicobrachial pain involving the median, radial and ulnar nerves in subjects of the age 25 to 45 years is underexplored despite its significant impact on functional.6

In the literature there are 3 stages: the irritative stage which appears transient with little chance of recurrence, the compressive stage which can last up to 20 weeks and the paretic stage. The aetiology of these disorders is multifactorial, which requires a rapid and correct diagnosis and a rigorous management of treatment in order to improve symptoms.

Epidemiological evidence regarding neurogenic cervicobrachial pain remains limited. A systematic review of cervical radiculopathy reported prevalence estimates ranging from approximately 1.2 to 5.8 cases per 1,000 adults, although considerable variability exists due to differences in diagnostic criteria and study populations. Furthermore, Gangavelli et al. (2016) demonstrated that only 19.9% of individuals presenting with cervicobrachial pain had a neurogenic origin after comprehensive clinical screening. Within this neurogenic subgroup, the median nerve showed the highest frequency of involvement (68.06%), followed by the radial nerve (15.28%) and the ulnar nerve (11.11%), while a small proportion exhibited bilateral neurological involvement. These findings highlight that not all cervicobrachial pain is neurogenic and that the distribution of peripheral nerve involvement is unequal.7

Accurate identification of the involved peripheral nerve has important clinical implications. Nerve-specific assessment facilitates individualized physiotherapy interventions, including neural mobilization, movement re-education, ergonomic advice, and exercise prescription. Recent systematic reviews have demonstrated that neural mobilization can reduce pain and disability in carefully selected patients with nerve-related cervicobrachial pain, emphasizing the need for precise clinical classification before treatment initiation.

Despite growing interest in neurodynamic assessment, there remains a scarcity of cross-sectional studies evaluating the prevalence and distribution of median, radial, and ulnar nerve involvement among adults with neurogenic cervicobrachial pain, particularly in Indian clinical settings. Most available studies have focused on cervical radiculopathy or treatment outcomes rather than describing the relative frequency of individual peripheral nerve involvement. Establishing these prevalence patterns may enhance diagnostic accuracy, improve clinical decision-making, and support the development of evidence-based rehabilitation protocols.

Therefore, the present cross-sectional observational study aims to determine the prevalence and distribution of median, radial, and ulnar nerve involvement among adults with neurogenic cervicobrachial pain using standardized clinical neurodynamic assessment.

MATERIALS AND METHODS:

Study Design: This was a cross-sectional observational prevalence study conducted according to the STROBE guidelines.

Study Setting: Dr. Vasantrao Pawar medical college and Research Centre- Physiotherapy OPD
The study aimed to determine the prevalence and pattern of neural involvement among adults diagnosed with neurogenic cervicobrachial pain. Participants were recruited using a systematic probability sampling method. The study protocol was approved by the Institutional Ethics Committee, the protocol number is
IEC/P-586/2024 and written informed consent was obtained from all participants before enrolment. It was conducted over a period of six months in Nashik city.

Sample Size Calculation:
The sample size was calculated using the formula for prevalence studies:
$N = Z^2P(1-P)/d^2$
Where Z = 1.96 at 95% confidence interval, P = expected prevalence based on previous literature, and d = allowable error of 5%. The calculated sample size was adequate, and finally 227 participants fulfilling the eligibility criteria were included in the study.
The study included 227 participants aged between 25 and 45 years who presented with cervicobrachial pain and fulfilled the clinical diagnostic criteria for neurogenic cervicobrachial pain. Both male and female participants were included. Participants were excluded if they had: age below 25 years or above 45 years, non-neurogenic cervicobrachial pain, history of peripheral nerve injury, recent cervical or thoracic spine surgery, brachial plexus injury, thoracic outlet syndrome, red flag signs suggestive of serious spinal pathology (e.g., fracture, infection, tumour, or myelopathy), history of chronic alcoholism.
Eligible participants presenting with cervicobrachial pain were screened according to the inclusion and exclusion criteria. A detailed medical history was obtained, followed by a comprehensive physical examination to exclude non-neurogenic causes of cervicobrachial pain, including vascular, inflammatory, and musculoskeletal conditions.
Participants who met the diagnostic criteria for neurogenic cervicobrachial pain underwent a standardized clinical examination performed by the investigator.

Diagnostic Criteria
Participants were diagnosed with neurogenic cervicobrachial pain based on:

- Neck pain radiating to the upper limb.
- Positive Spurling’s test.
- Positive Upper Limb Neurodynamic Test with symptom reproduction and structural differentiation.
- Tenderness over the involved peripheral nerve.
- Exclusion of non-neurogenic causes

Active cervical spine movements including flexion, extension, right and left lateral flexion, and right and left rotation were assessed. Upper limb movements were also evaluated. Reproduction of the participant's symptoms during movement was documented (Figure).

Passive Movement Testing
Passive cervical spine and upper limb movements were performed in the same movement planes as the active assessment. Symptom reproduction and movement limitations were recorded (Figure).

Figure 1: Active Cervical Lateral Flexion

Figure 2: Passive Cervical Lateral Flexion

Figure 3: Spurling's Test

Spurling's Test

Spurling's test was performed by placing the cervical spine in extension and ipsilateral lateral flexion followed by the application of gentle axial compression. Reproduction of the participant's arm symptoms was considered a positive test indicating cervical nerve root irritation (Figure 2.3).

Palpation of Cervical Transverse Processes

The transverse processes of the cervical vertebrae were palpated bilaterally to identify localized tenderness associated with the affected cervical segment (Figure 2.4).

Figure 4: Transverse Process Palpation

Upper Limb Neural Tissue Provocation Tests (ULTTs)

Neural tissue mechanosensitivity was evaluated using Upper Limb Neurodynamic Tests.

- Median nerve (ULTT1): Shoulder abduction, forearm supination, wrist and finger extension, shoulder external rotation, followed by elbow extension (Figure 5).
- Radial nerve (ULTT2b): Shoulder depression, elbow extension, shoulder internal rotation, forearm pronation, wrist flexion, and ulnar deviation (Figure 6).
- Ulnar nerve (ULTT3): Shoulder abduction, external rotation, elbow flexion, forearm pronation, wrist extension, and finger extension (Figure 7).

Reproduction of familiar symptoms with alteration following structural differentiation was considered suggestive of neural involvement.

Palpation of Peripheral Nerves

The median, radial, and ulnar nerves were palpated at standard anatomical locations to assess mechanical tenderness. The presence or absence of tenderness over each nerve was documented (Figures 8– 10).

fig 5 ULTT 1 for
median nerve

fig 6 ULTT 2 for
radial nerve

fig 7 ULTT 3 for
ulnar nerve

fig 8 palpation of
median nerve

fig 9 palpation of
radial nerve

fig 10 palpation of
ulnar nerve

STUDY FLOW

Patients screened for eligibility
(n = 268)

↓

Excluded (n = 41)
• Not meeting criteria
• Declined participation
• Previous surgery
• Peripheral nerve injury
• Other exclusions

↓

Participants included
(n = 227)

↓

Standardized Clinical Assessment
• Cervical ROM
• Passive Movements
• Spurling's Test
• ULNT (Median, Radial, Ulnar)
• Peripheral Nerve Palpation

↓

Statistical Analysis

↓

Final Results
Median nerve: 140 (61.67%)
Radial nerve: 70 (30.84%)
Ulnar nerve: 17 (7.49%)

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version. Descriptive statistics were used to summarize participant characteristics and prevalence of median, radial, and ulnar nerve involvement. Categorical variables were expressed as frequencies and percentages. The prevalence of nerve involvement was calculated with 95% confidence intervals. Gender-wise and side-wise comparisons were analysed using the Chi-square test wherever applicable. A p-value of <0.05 was considered statistically significant.

Several measures were undertaken to minimize bias. Standardized assessment procedures were used for all participants. Systematic probability sampling reduced selection bias, and all clinical examinations were performed by the same investigator using predefined diagnostic criteria to reduce observer variation. However, examiner bias cannot be completely excluded because blinding was not feasible.

RESULT

A total of 227 participants diagnosed with neurogenic cervicobrachial pain were included in the study. Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants. The prevalence of peripheral nerve involvement, gender distribution, and side of symptom involvement were calculated and expressed as frequencies and percentages. Among the 227 participants, the median nerve was the most commonly involved peripheral nerve, affecting 140 participants (61.67%). The radial nerve was involved in 70 participants (30.84%), while the ulnar nerve showed the lowest prevalence, affecting 17 participants (7.49%) (Figure 1). Of the total participants, 128 (56.39%) were females and 99 (43.61%) were males. Females constituted a greater proportion of the study population compared to males (Figure 2). Right-sided involvement was observed in 122 participants (53.74%), whereas 105 participants (46.26%) presented with left-sided symptoms (Figure 3).

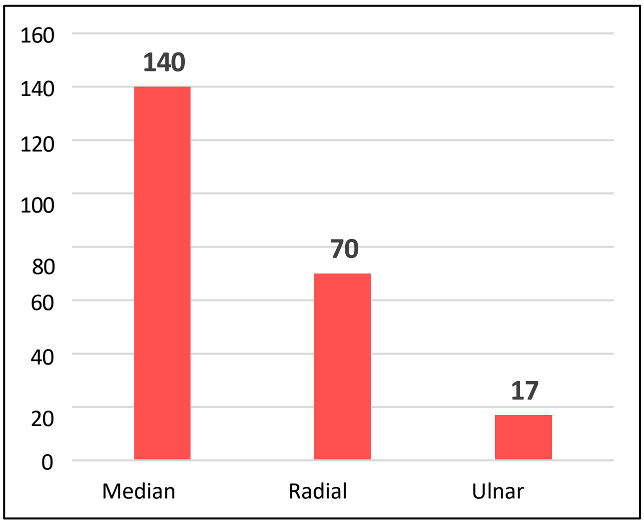

Figure 1: Distribution of nerve involvement

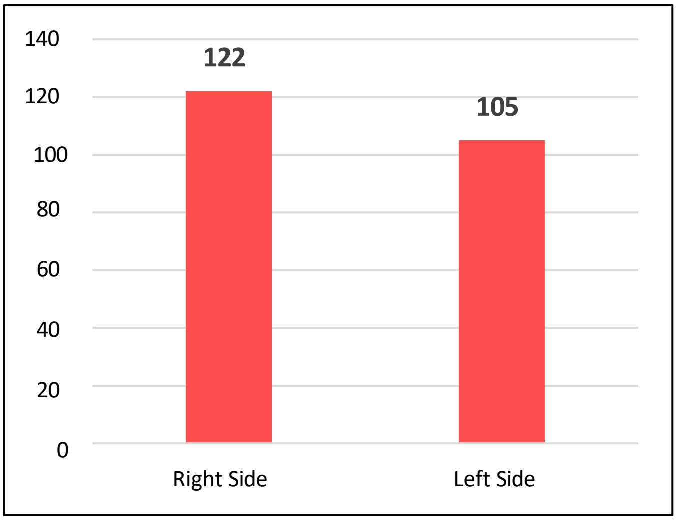

Figure 2: Side-wise distribution of nerve involvement

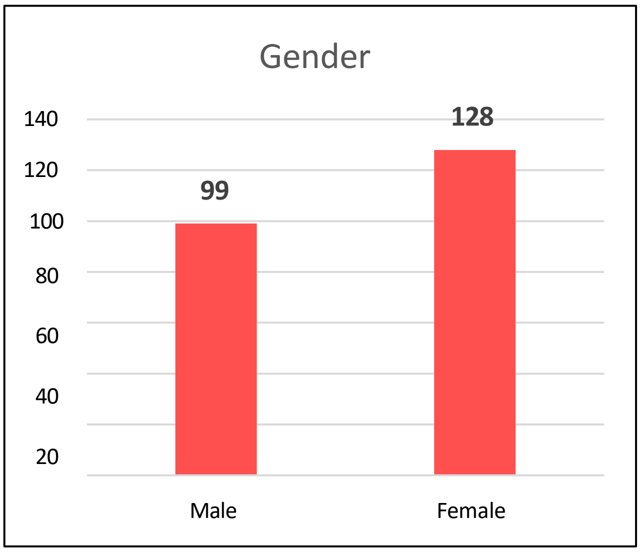

Figure 3: Gender-wise distribution or nerve involvement

DISCUSSION

The present research sought to examine the pattern and frequency of peripheral nerve involvement among adults aged 25–45 years diagnosed with neurogenic cervicobrachial pain syndrome. Results demonstrated a clear dominance of median nerve involvement (61.67%), followed by the radial (30.84%) and ulnar nerves (7.49%), underscoring the median nerve's primary contribution to symptom generation in this condition. Nearly two-thirds of participants exhibited signs indicative of median nerve mechanosensitivity, confirming that it represents the most commonly affected neural pathway. These observations correspond with established anatomical and biomechanical associations of the median nerve with cervical motion segments and upper limb kinetics, as well as with prior studies highlighting the frequent implication of the C6–C7 roots in cervicobrachial pathology (8, 9, 10, 11, 12).

The anatomical course of the median nerve offers a plausible explanation for its increased vulnerability. Extending from the brachial plexus through the arm and forearm before entering the carpal tunnel, it traverses multiple anatomical tunnels and muscular borders—including the interscalene triangle, the space beneath the pectoralis minor, and the pronator teres region. Each of these sites can act as a potential compression or traction interface, predisposing the nerve to cumulative strain. Sustained postures involving cervical extension, shoulder protraction, or repetitive upper limb activity can heighten mechanical load on the nerve, leading to irritation and inflammation (13, 14, 15, 16). These findings align with the principles of neurodynamics, which propose that disturbances in neural mobility or tension can generate pain and movement dysfunction (17, 18, 19).

In contrast, the radial nerve was affected in 30.84% of the cases. Though less frequent than median involvement, it still represents a significant proportion, underscoring its clinical importance. The radial nerve primarily governs the extensor compartments of the arm and forearm and, despite sharing the C6–C7 root levels with the median nerve, its anatomical route is less exposed to compressive stress from typical cervical or shoulder postures. This likely accounts for its lower incidence, though occupational and mechanical factors such as overhead activities or repetitive lifting can exacerbate radial nerve strain (9, 20, 11).

The ulnar nerve showed the lowest rate of involvement (7.49%), consistent with prior literature indicating the relatively rare occurrence of C8 radiculopathy and the lesser clinical frequency of ulnar neuropathic presentations (10, 21). Although anatomically susceptible at the cubital tunnel and Guyon's canal, the ulnar pathway appears less influenced by the cervical and scapular loading patterns that characterize cervicobrachial pain. This reduced prevalence likely reflects both its peripheral course and the fact that common occupational postures exert less direct tension on the ulnar distribution compared to the median or radial nerves.

Symptom localization across participants corresponded closely with the known sensory territories of the involved nerves. Median nerve involvement typically produced pain and paresthesia across the anterior and lateral forearm and hand, while radial nerve irritation was associated with the lateral arm and dorsum of the forearm, and ulnar involvement presented with symptoms along the medial forearm and hand. These characteristic distributions support previous research demonstrating that mapping pain regions provides valuable diagnostic insight into the affected neural pathways (22, 23).

Clinical assessment using upper limb neurodynamic tests (ULNTs) remains a key diagnostic approach for reproducing symptoms and differentiating between nerve involvements. The ULNT for the median nerve has been reported as the most sensitive for detecting cervicobrachial mechanosensitivity (24, 25), and the high positive rate observed in this study reinforces its diagnostic significance.

Radiological and epidemiological findings further substantiate the predominance of C6 and C7 root pathology, which form the major neural input to both the median and radial nerves. The lower cervical motion segments (C5–C6 and C6–C7) experience the highest degrees of motion and load, rendering them most prone to degenerative and compressive changes.

These structural stressors commonly result in foraminal narrowing and nerve root irritation, especially in individuals aged 25–45 years, who are exposed to occupational and postural demands. Numerous imaging and anatomical studies report the highest degeneration and radiculopathy rates at C6–C7, predominantly involving the C7 root, while C8-related (ulnar) findings are comparatively rare (8, 9, 20, 10, 21, 11, 12). Complementary electrophysiological and ultrasonographic research confirms that lower cervical pathology produces measurable morphological and functional alterations along the median and radial nerve pathways (26, 20, 27, 10). These cumulative findings provide a coherent radiological and biomechanical rationale for the observed predominance of median (61.67%) and radial (30.84%) nerve involvement in this study.

Although both the median and radial nerves originate from the C6–C7 roots, specific anatomical and physiological distinctions explain the median nerve's higher involvement rate. The median nerve receives a more concentrated input from these roots, whereas the radial nerve also integrates fibers from C5, C8, and T1, dispersing its segmental influence and thereby mitigating the impact of a single root lesion (28). Additionally, the cortical representation of the thumb and index finger—regions supplied by the median nerve—is significantly larger within the somatosensory cortex, resulting in more pronounced and functionally disruptive symptoms (29). The median nerve is also more susceptible to the double-crush phenomenon, in which cervical compression predisposes the nerve to additional entrapment distally, thereby amplifying its sensitivity (30). Moreover, repetitive occupational tasks, particularly those involving gripping and fine hand movements, preferentially overload muscles innervated by the median nerve, leading to greater mechanical strain compared with the radial distribution (31) . These combined anatomical, cortical, and biomechanical factors convincingly account for the predominance of median nerve involvement despite shared cervical root origins.

A mild gender disparity was noted, with females comprising 56.39% of cases compared to 43.61% males. Although statistically insignificant, this distribution mirrors prior observations reporting slight female predominance in cervical and neurogenic disorders (32, 33, 34). The difference likely reflects occupational and ergonomic exposures—such as prolonged computer use, repetitive domestic tasks, and sustained postural loading—rather than biological sex factors. Several studies have found minimal sex-based variations in nerve mechanosensitivity, suggesting that lifestyle and work-related factors exert greater influence than hormonal or connective tissue variations (35, 36, 37).

Side distribution analysis showed a minor right-sided predominance (53.74%) relative to left (46.26%). Morphological studies have not demonstrated significant asymmetry in cervical foraminal dimensions or root vulnerability (38, 39, 40, 41). Thus, the increased right-sided involvement likely corresponds with functional dominance, as right-handed individuals tend to impose greater repetitive load and strain on the right cervical and upper limb structures during occupational and daily activities.

The study's age group (25–45 years) represents an active working population exposed to considerable occupational stress, sustained postures, and repetitive arm and neck movements. Such activities are well known to alter neural mobility and increase the risk of neurogenic pain syndromes (42, 43, 44). With the modern rise in computer and device use among this age range, mechanical stress on the median and radial nerves has become particularly relevant. This underscores the necessity for early ergonomic modifications and postural correction strategies aimed at minimizing neural strain in daily practice.

Clinically, the high rate of median nerve involvement reinforces the need for comprehensive neurodynamic evaluation. Combining detailed physical assessment with specific neurodynamic tests remains crucial for confirming neural mechanosensitivity. The strong response to the median nerve ULNT observed here echoes earlier reports of its diagnostic precision in cervicobrachial conditions (24, 25). Furthermore, neurophysiological evidence indicates that limited nerve excursion and increased endoneurial pressure impair intraneural blood flow, contributing to hypoxia and ectopic neural discharge (45, 46, 47). These mechanisms help explain the persistent and radiating nature of pain seen in neurogenic cervicobrachial syndromes.

While this study did not directly examine treatment outcomes, its findings indirectly emphasize the therapeutic importance of interventions targeting the neural system, such as neural mobilization and cervical manual therapy. Current evidence supports that these techniques can restore neural gliding, reduce mechanosensitivity, and enhance axoplasmic transport, ultimately reducing pain and improving limb function (48, 49, 25, 50). Given the predominance of median nerve involvement, treatment strategies directed toward this pathway are likely to yield the most substantial clinical improvements.

Strengths of the Study:

- Large sample size (227 participants).
- Systematic probability sampling.
- Standardized clinical examination.
- Assessment of all three peripheral nerves.
- Provides prevalence data useful for physiotherapy practice

Limitations:

- Conducted in a single geographical region
- Long-term follow-up was not performed.

Clinical Implications:

- Median nerve assessment should be routinely performed in patients with neurogenic cervicobrachial pain.
- Upper Limb Neurodynamic Testing should be included in physiotherapy assessment.
- Early identification of nerve involvement may improve treatment planning.
- Neural mobilization can be directed according to the involved nerve.
- Future Recommendations:
- Multicentre prevalence studies should be conducted.
- Future studies should include MRI and nerve conduction studies.
- Prospective studies should evaluate treatment outcomes.
- Studies correlating nerve involvement with disability and pain scores are recommended

CONCLUSION

The present study aimed to determine the prevalence of median, radial, and ulnar nerve involvement in subjects aged 25 to 45 years with neurogenic cervicobrachial pain. Based on the analysis of 227 subjects, it is concluded that the Median nerve is the most predominantly involved nerve, with a prevalence of 61.67%. The Radial nerve was found to be the second most frequently involved nerve at 30.84%, while the Ulnar nerve was the least common, with a prevalence of 7.49%. The findings also indicate that neurogenic cervicobrachial pain was more prevalent in females (56.39%) within this cohort and occurred slightly more often on the right side (53.74%). This study provides clear quantitative data on the distribution of specific nerve involvement in this condition, which can inform clinical assessment and management.

Funding: No external funding was received for this study.

Conflict of Interest: The authors declare that there is no conflict of interest.

Acknowledgement

The authors sincerely thank all the participants for their cooperation. The authors also acknowledge the support of NIMS University and NIMS College of Physiotherapy, Jaipur, and the Institutional Ethics Committee and MVP College of Physiotherapy for facilitating this study.

Reporting Guideline: This manuscript has been prepared and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement for cross-sectional studies.

REFERENCES

1. Ranganath Gangavelli et al., Frequency of Cervicobrachial Pain Being Neurogenic. Journal of Clinical and Diagnostic Research. 2016 Mar, Vol-10(3): YC14-YC16.
2. Pandey, Shubhrendu Shekhar & Ph.D., Ashish & Rai, Gunjan & Singh, Royana. (2020). COMPARATIVE THERAPEUTIC INTERVENTIONAL STUDY OF CERVICOBRACHIAL PAIN SYNDROME IN EASTERN UTTAR PRADESH POPULATION. Biological Memoirs. 46. 27-31.
3. Pandey, Shubhrendu Shekhar & Ph.D., Ashish & Singh, Royana. (2021). Physiotherapeutic Intervention for Cervicobrachial Pain Syndrome: A Scoping Review. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. YE01 - YE06. 10.7860/JCDR/2021/47436.15030.
4. Mohiuddin, Abul & Nallathambi, Mohan & Islam, Md. (2021). Effect of Specific Manipulative Therapy Treatment in Cervico-Brachial Pain Syndrome. Archives of Orthopedics and Rheumatology. 4. 24-33. 10.22259/2639-3654.0401004.
5. Penthala Kushma, D. Rajesh Reddy, K. MADHAVI, E. Venkat Laxman. "EFFECTIVENESS OF CONVENTIONAL THERAPY AND COMBINED WITH NEURAL MOBILISATION IN PATIENTS WITH CERVICOBRACHIAL PAIN- A COMPARATIVE STUDY".INTERNATIONAL JOURNAL FOR RESEARCH TRENDS AND INNOVATION ISSN:2456-3315, Vol.9, Issue 3, pp.597 – 611.
6. Toma, Stefan & Toma, G. & Neagoe, C.I. & Rabolu, E.. (2024). Study on the Role and Effectiveness of Physiotherapy in Cervical Brachial Syndrome. Bulletin of the Transilvania University of Braşov. Series IX: Sciences of Human Kinetics. 219-224. 10.31926/but.shk.2024.17.66.2.24.
7. Mansfield M, Smith T, Spahr N, Thacker M. Cervical spine radiculopathy epidemiology: A systematic review. Musculoskeletal Care. 2020; 18: 555–567. https://doi.org/10.1002/msc.1498
8. K. Radhakrishnan, W. J. Litchy, W. M. O'Fallon, L. T. Kurland — Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. Brain. 1994.
9. John M. Caridi, Matthias Pumberger, Alexander P. Hughes — Cervical Radiculopathy: A Review. HSS Journal. 2011
10. R. A. Nardin, M. R. Patel, T. F. Gudas, S. B. Rutkove, E. M. Raynor — Electromyography and magnetic resonance imaging in the evaluation of radiculopathy. Muscle & Nerve. 1999.
11. S. Iyer, H. J. Kim — Cervical radiculopathy. Current Reviews in Musculoskeletal Medicine. 2016.
12. K. C. Kang et al. — Cervical Radiculopathy: Focus on Characteristics and Management (review). Spine/related review (2020).
13. Butler DS, Jones MA, Gore R. Mobilisation of the nervous system: Churchill Livingstone Melbourne; 1991.
14. Butler D, Shacklock M, Slater H. Treatment of altered nervous system mechanics. Grieve's Modern Manual Therapy: The Vertebral Column 2nd ed Edinburgh, UK: Livingston Churchill. 1994:693-703.
15. Shacklock M. Clinical neurodynamics: A new system of musculoskeletal treatment: Elsevier Health Sciences; 2005.
16. Shacklock M. Neurodynamics. Physiotherapy. 1995;81(1):9-1
17. Murphy DR, Hurwitz EL. A theoretical model for the development of a diagnosis based clinical decision rule for the management of patients with spinal pain. BMC Musculoskelet Disord. 2007 Aug 3;8:75.
18. Murphy DR. A clinical model for the diagnosis and management of patients with cervical spine syndromes. Australas Chiropr Osteopathy. 2004;12(2):57-71.
19. Murphy DR, Hurwitz EL, Nelson CF. A diagnosis-based clinical decision rule for spinal pain part 2: review of the literature. Chiropr Osteopat. 2008 Aug 11;16:7.
20. Metin Ökmen, Burcu M. Ökmen, Korgün Ökmen, Lale Altan — Investigation of the Effect of Cervical Radiculopathy on Peripheral Nerves of the Upper Extremity with High-Resolution Ultrasonography. Spine. 2018.
21. David G. Greathouse, Anand Joshi — Radiculopathy of the Eighth Cervical Nerve. Journal of Orthopaedic & Sports Physical Therapy (JOSPT). 2010.
22. Anekstein Y, Blecher R, Smorgick Y, Mirovsky Y. What is the best way to apply the Spurling test for cervical radiculopathy? Clin Orthop Relat Res. 2012;470(9):2566-72.
23. Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. Spine (Phila Pa 1976). 2003 1;28(1):52-62.
24. Elvey RL, Hall T. Neural tissue evaluation and treatment. Physical Therapy of the Shoulder. New York: Churchill Livingstone. 1997.
25. Coppieters MW, Stappaerts KH, Wouters LL, Janssens K. The immediate effects of a cervical lateral glide treatment technique in patients with neurogenic cervicobrachial pain. J Orthop Sports Phys Ther. 2003 Jul;33(7):369-78.
26. Kemal Balcı, Talip Asil, Ilkay Tekinaslan, Nasif Ir — Does cervical radiculopathy have an effect on peripheral nerve conduction studies? An electrophysiological evaluation. European Neurology. 2011.
27. Meenakshi Garg, Saurabh Gupta, Sushma Sood, Mohita Singh — The role of motor nerve conduction: in cervical radiculopathy patients. International Journal of Research in Medical Sciences. 2019.
28. Li, Y., Zhang, Y., Zhu, Y., Zhang, Y., Zhu, H., Chen, W., et al. — C7 nerve root sensory distribution in peripheral nerves: an fMRI study. PLoS ONE. 2014; 9(3): e91276. [PMC3966650]
29. Schweisfurth M.A., Frahm J., Schweizer R. — Individual fMRI maps of all phalanges and digit bases of all fingers in human primary somatosensory cortex. Frontiers in Human Neuroscience. 2014; 8: 658.
30. Rellán J., Orosa J., de Celis R., et al. — Double crush syndrome of the median nerve in the arm: pathophysiology, diagnosis, and management. Revista de la Asociación Argentina de Ortopedia y Traumatología. 2019; 84(1): 56-63.
31. Žídková J., Zachar M., Wágnerová P., et al. — Median nerve conduction changes in repetitive hand work: occupational overuse in automotive assembly workers. International Journal of Occupational Medicine and Environmental Health. 2017; 30(4): 573-584.

32. B. K. Humphreys, R. M. Peterson, H. Radke, J. A. McAllister — Comparison of outcomes in neck pain patients with and without dizziness: a prospective study. Chiropractic & Manual Therapies. 2013.
33. R. Güvercin, E. Erdem, M. D. Bakir, O. Yildirim, A. Yildiz, O. Akarsu — Age- and gender-related radiological changes of the cervical spine: a cross-sectional CT morphometric study. (PMC article) 2023.
34. M. R. Patel, A. S. Jevotovsky, et al. — Impact of Gender on Postsurgical Outcomes in Patients Undergoing Cervical Spine Procedures. PMCID (2022).
35. W. Ma, X. Zhang, Y. Zhou, Z. Xu, L. Li — Comparison of percutaneous endoscopic cervical keyhole foraminotomy versus anterior cervical discectomy and fusion for single-level unilateral cervical radiculopathy: a retrospective study. International Journal of General Medicine / DovePress. 2022.
36. M. Oshina, K. Nakanishi, T. et al. — Comparison of surgical outcomes for cervical radiculopathy by nerve root level: prospective multicenter study. Scientific Reports. 2024.
37. J. M. Fritz, D. E. Descarreaux, et al. — Exercise Only, Exercise with Mechanical Traction, or Exercise with Manual Therapy for Cervical Radiculopathy: randomized trial. Journal of Orthopaedic & Sports Physical Therapy (JOSPT). 2014.
38. Eunkuk Kim, Joon-Shik Yoon, Hyo Jung Kang — Ultrasonographic cross-sectional area of spinal nerve roots in cervical radiculopathy: A pilot study. American Journal of Physical Medicine & Rehabilitation. 2015;94(2):159–164.
39. Mikinobu Takeuchi, Norimitsu Wakao, Atsuhiko Hirasawa, Kazuhiro Murotani, Masanori Kamiya, Koichi Osuka, et al. — Ultrasonography has a diagnostic value in the assessment of cervical radiculopathy: a prospective pilot study. European Radiology. 2017;27:3467–3473.
40. S. H. Ahmed, A. A. Al-Ghamdi, M. M. Al-Shammari et al. — Morphological and radiometrical study of the human cervical intervertebral foramina and associated structures. Folia Morphologica (Warsaw). 2014.
41. J. Ong, A. et al. — Computed tomography-based investigation of cervical foraminal stenosis and laterality: a cross-sectional analysis (2025) — (CT/ imaging cohort study).
42. Bogduk N. The anatomy and pathophysiology of neck pain. Phys Med and Rehabil Clin N Am. 2011;22(3):367-82.
43. Donelson R. Mechanical diagnosis and therapy for radiculopathy. Phys Med Rehabil Clin N Am. 2011;22(1):75-89.
44. Gifford L. Acute low cervical nerve root conditions: symptom presentations and pathobiological reasoning. Man Ther. 2001;6(2):106-15
45. Butler DS, Jones MA, Gore R. Mobilisation of the nervous system: Churchill Livingstone Melbourne; 1991.
46. Shacklock M. Clinical neurodynamics: A new system of musculoskeletal treatment: Elsevier Health Sciences; 2005.
47. Shacklock M. Neurodynamics. Physiotherapy. 1995;81(1):9-1
48. Allison G, Nagy B, Hall T. A randomized clinical trial of manual therapy for cervicobrachial pain syndrome–a pilot study. Man Ther. 2002;7(2):95-102.
49. Cowell I, Phillips D. Effectiveness of manipulative physiotherapy for the treatment of a neurogenic cervicobrachial pain syndrome: a single case study– experimental design. Man Ther. 2002;7(1):31-38.
50. Ellis RF, Hing WA. Neural mobilization: A systematic review of randomized controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008; 16(1): 8-22

STROBE Checklist Mapping for Cross-sectional Study

STROBE Item	Recommendation	Manuscript Page	Status
1(a)	Study design in title	1	Done
1(b)	Informative abstract	1	Done
2	Background/rationale	2	Done
3	Objectives	2	Done
4	Study design	2	Done
5	Setting	2	Done
6(a)	Eligibility criteria	4	Done
6(b)	Matching criteria	NA	NA
7	Variables	4–5	Done
8	Data sources/measurement	4–6	Done
9	Bias	8	Done
10	Study size	4	Done
11	Quantitative variables	6	Done
12(a)	Statistical methods	6	Done
12(b)	Subgroup analysis	6	NA
12(c)	Missing data	6	NA
12(d)	Sampling strategy	3–4	Done
12(e)	Sensitivity analysis	NA	NA
13(a)	Participants	6	Done
13(b)	Reasons for exclusion	5	Done
13(c)	Flow diagram	8	Done
14(a)	Descriptive data	7	Done
14(b)	Missing data	7	Done
15	Outcome data	7	Done
16(a)	Main results	7	95% CI

16(b)	Category boundaries	4	Done
16(c)	Absolute risk	NA	NA
17	Other analyses	6–7	Optional
18	Key results	11	Done
19	Limitations	11	Done
20	Interpretation	8–11	Done
21	Generalizability	11	Done
22	Funding	11	Done