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Demographic Profile and Pattern of Neuropathy in Patients Underwent Nerve Conduction Study-Retrospective Analysis in a Tertiary Neurocare Hospital in Bangladesh

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Abstract

Background: Peripheral neuropathies and neuromuscular disorders are major causes of neurological morbidity and nerve conduction studies (NCS) are central to their evaluation. Data on electrophysiological patterns in Bangladesh are limited. This study aimed to describe the demographic profiles and patterns of neuropathy among patients undergoing nerve conduction studies in a tertiary neurocare hospital in Bangladesh. ***Methods:*** This retrospective observational study was conducted at the Neurophysiology Laboratory of the National Institute of Neurosciences & Hospital, Dhaka, Bangladesh, from September 2024 to August 2025. This study reviewed the neuroelectrophysiological records of 1,500 patients. Demographic data, type of investigation and final electrophysiological diagnoses were extracted and analyzed using SPSS version 25. ***Results:*** The majority of patients were aged 21–40 years (43.7%), with near-equal sex distribution. NCS alone was the most frequently performed investigation (76.8%). Normal electrophysiological findings were observed in 32.5% of the patients. Carpal tunnel syndrome was the most common abnormal diagnosis (28.0%), followed by Guillain–Barré syndrome (14.2%) and mononeuropathy (9.3%), respectively. Bilateral carpal tunnel syndrome was slightly more frequent than unilateral disease, with mild severity. Among Guillain–Barré syndrome cases, acute motor axonal neuropathy was the most common subtype. ***Conclusion:*** Nerve conduction studies reveal a wide spectrum of neuropathies in routine clinical practice, with carpal tunnel syndrome and Guillain–Barré syndrome predominating. These findings provide valuable baseline data for understanding neuropathy patterns and optimizing neurophysiological services in Bangladesh.

Keywords: Nerve conduction study, Neuropathy, Electrophysiology.

INTRODUCTION

Peripheral neuropathies and neuromuscular disorders represent a significant cause of neurological morbidity worldwide and constitute a major proportion of referrals to neurophysiology laboratories. Nerve conduction study (NCS), often complemented by electromyography (EMG), remains the cornerstone for objective evaluation of peripheral nerve and motor neuron disorders, enabling confirmation of diagnosis, classification of disease subtypes and assessment of severity [1,2]. In routine clinical practice, NCS plays a critical role in distinguishing focal entrapment neuropathies from generalized neuropathic processes and motor neuron disorders [1,3].

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy globally, holding significant relevance as a frequent indication for electrophysiological testing. Epidemiological studies consistently highlight its association with various

factors, including occupational hazards, advancing age and specific metabolic disorders [4,5]. The mechanism behind CTS involves the compression of the median nerve as it traverses the carpal tunnel, leading to clinical manifestations such as hand pain, numbness and tingling [6].

Large-scale retrospective analyses of NCS data offer valuable insights into disease patterns, service utilization and demographic distributions within specific populations. Studies from different regions have highlighted substantial geographic and ethnic variations in neuropathy patterns, influenced by healthcare access, referral practices and underlying disease prevalence [7,8]. However, data from South Asian countries, particularly Bangladesh, remain limited despite a high burden of neurological disorders and increasing demand for neuro-electrophysiological services.

Previous studies in Bangladesh have primarily focused on specific disease entities such as Guillain–Barré syndrome or pediatric electrodiagnostic outcomes [8,9]. Comprehensive analyses describing the overall demographic profile and electrophysiological diagnostic spectrum in a tertiary neurocare setting are scarce. Such data are essential for understanding local disease patterns, optimizing diagnostic pathways and informing resource allocation in neurophysiology services.

Furthermore, most published studies from the region involve relatively small sample sizes or short study durations, limiting generalizability. A large retrospective dataset can provide a more representative overview of referral patterns and diagnostic yield of nerve conduction studies in routine clinical practice. This is particularly relevant in tertiary referral centers, where patients often present with a wide range of neuromuscular and peripheral nerve disorders.

Against this background, the present study aimed to describe the demographic characteristics and electrophysiological patterns of neuropathy among patients undergoing nerve conduction study in a tertiary neurocare hospital in Bangladesh. By analyzing a large cohort of patients over one year, this study seeks to contribute baseline epidemiological data that may serve as a reference for future analytical studies and regional comparisons.

MATERIALS & METHODS

This was a retrospective, hospital-based descriptive observational study conducted in the Neurophysiology Laboratory of the National Institute of Neurosciences & Hospital, Dhaka, Bangladesh. Neuro-electrophysiological records from September 2024 to August 2025 were reviewed. The study included 1,500 consecutive patients referred for neuro-electrophysiological evaluation during the study period. Only the first complete study for each patient was included.

Eligibility criteria

Inclusion criteria

- Patients of any age and sex who underwent nerve conduction study (NCS) with or without electromyography (EMG)
- Availability of complete demographic data and finalized electrodiagnostic reports
- Referral for evaluation of suspected peripheral nerve, motor neuron, or related neuromuscular disorders

Exclusion criteria

- Studies performed for myasthenia gravis, primary myopathy, other peripheral neuropathies, or polyneuropathy
- Incomplete records or missing final diagnostic interpretation
- Technically inadequate or non-interpretable studies
- Repeat evaluations of the same patient
- Investigations conducted solely for intraoperative monitoring or non-neuromuscular indications

Data collection Procedure: Data were extracted retrospectively from laboratory registers and archived reports using a structured extraction form. The variables included age, sex, type of investigation, final electrophysiological diagnosis and subtype classifications for major diagnostic categories. All studies were performed according to standardized protocols under temperature-controlled conditions and the interpretations were made by consultant neurologists. The extracted data were anonymized, cleaned and entered into a secure database. Data were analyzed using SPSS version 25. Continuous variables were summarized as mean and standard deviation and categorical variables as frequencies and percentages. No inferential statistical tests were performed.

RESULTS

Table 1: Age distribution of study population (n=1500)

Age group (years)	Frequency (n)	Percentage (%)
<20	220	14.7
21–40	656	43.7
41–60	517	34.5
>60	107	7.1
Mean±SD	38.06±19.95	

Table 1 presents the age and sex distribution of the study population. The largest proportion of patients belonged to the 21–40-year age group, followed by those aged 41–60 years. Patients aged below 20 years constituted a smaller proportion, while individuals over 60 years represented the least frequent group.

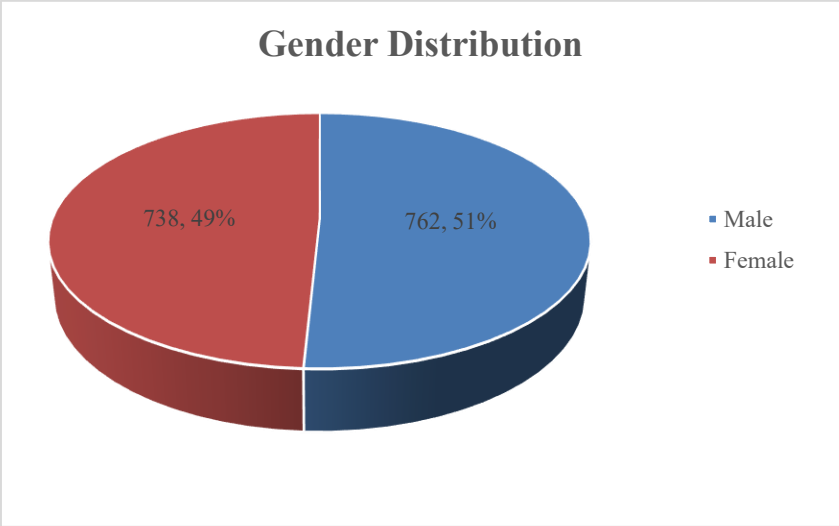

Figure 1: Gender distribution of study population

Sex distribution was nearly equal, with a slight male predominance.

Table 2: Distribution of neuro-electrophysiological investigations performed

Investigation type	Frequency (n)	Percentage (%)
NCS	1152	76.8
NCS + EMG	307	20.5
RNS	31	2.1
VEP	5	0.3
Others	5	0.3

Table 2 shows the types of neuro-electrophysiological investigations conducted. The nerve conduction study alone accounted for the majority of investigations. Combined nerve conduction study and electromyography represented approximately one-fifth of all procedures. Repetitive nerve stimulation and visual evoked potential studies were performed infrequently.

Table 3: Electrophysiological diagnostic spectrum based on nerve conduction study

Diagnosis	Frequency (n)	Percentage (%)
Normal study	487	32.5
Carpal tunnel syndrome	420	28
Guillain–Barré syndrome	213	14.2
Mononeuropathy	139	9.3
Anterior horn cell disease	89	5.9
MND-ALS	84	5.6
Plexopathy	29	1.9
Radiculopathy	17	1.1
CIDP	7	0.5
Others	15	1

Table 3 describes the overall diagnostic outcomes of nerve conduction studies. Normal electrophysiological findings were observed in nearly one-third of patients. Among abnormal diagnoses, carpal tunnel syndrome was the most frequent, followed by Guillain–Barré syndrome and mononeuropathy. Less common diagnoses included anterior horn cell disease, motor neuron disease–amyotrophic lateral sclerosis, plexopathy, radiculopathy and chronic inflammatory demyelinating polyneuropathy.

Table 4: Laterality and severity of carpal tunnel syndrome

CTS characteristic		Frequency (n)	Percentage (%)
Laterality	Unilateral	196	13.1
	Bilateral	223	14.9
Severity – Unilateral CTS	Mild	111	7.4
	Moderate	50	3.3
	Severe	49	3.3
Severity – Bilateral CTS	Mild	71	4.7
	Moderate	75	5
	Severe	57	3.8

Table 4 presents the laterality and severity grading of carpal tunnel syndrome. Bilateral involvement was slightly more frequent than unilateral disease. In both unilateral and bilateral cases, mild severity was the most commonly observed grade, followed by moderate and severe forms.

Table 5: Distribution of major neuropathy subtypes other than carpal tunnel syndrome

Condition	Subtype	Frequency (n)	Percentage (%)
GBS	AIDP	77	5.1
	AMAN	118	7.9
	AMSAN	12	0.8
Mononeuropathy	Ulnar	59	3.9
	Peroneal	32	2.1
	Median	25	1.7
	Radial	17	1.1
Plexopathy	Brachial	26	1.7
Radiculopathy	Lumbosacral	11	0.7
	Cervical	5	0.3
CIDP	Motor / Sensory-motor	5	0.3

Table 5 outlines the electrophysiological subtypes of Guillain–Barré syndrome and the distribution of other focal neuropathies. Acute motor axonal neuropathy was the most frequent GBS subtype. Among mononeuropathies, ulnar nerve involvement was most common, followed by peroneal and median nerve lesions. Plexopathies and radiculopathies were relatively uncommon and chronic inflammatory demyelinating polyneuropathy was rarely identified.

DISCUSSION

This retrospective descriptive study provides a comprehensive overview of the demographic profile and electrophysiological patterns among patients undergoing nerve conduction study in a tertiary neurocare hospital in Bangladesh. The findings demonstrate a predominance of young and middle-aged adults, an almost equal sex distribution and a broad diagnostic spectrum, with carpal tunnel syndrome emerging as the most frequent abnormal electrophysiological diagnosis.

The age distribution observed in this study, with the highest proportion of patients in the 21–40 and 41–60-year age groups, is consistent with reports from regional and international neurophysiology-based studies, where economically active populations constitute the majority of referrals [7,8]. This pattern likely reflects increased healthcare-seeking behavior, occupational exposure and referral bias toward symptomatic working-age individuals. The near-equal male-to-female ratio aligns with findings from large hospital-based electrophysiological audits, suggesting comparable access to neurodiagnostic services across sexes in tertiary centers [10,11].

Nerve conduction study alone was the most commonly performed investigation, highlighting its central role as the first-line diagnostic modality for peripheral nerve and motor neuron disorders. Similar utilization patterns have been reported in retrospective analyses from both high-income and resource-limited settings, emphasizing the practicality and diagnostic yield of NCS in routine clinical practice [12,13]. The relatively lower proportion of combined NCS–EMG studies may reflect selective use of EMG when motor neuron disease or radiculopathy is clinically suspected.

Carpal tunnel syndrome accounted for more than one-quarter of all diagnoses, reinforcing its status as the most prevalent entrapment neuropathy encountered in neurophysiology laboratories worldwide. Comparable proportions have been reported in retrospective CTS studies from the Middle East and South Asia, where occupational factors, repetitive hand use and metabolic conditions contribute substantially to disease burden [10,14]. The predominance of mild CTS in both unilateral and bilateral cases in the present study is consistent with early referral patterns and supports the role of NCS in detecting subclinical or early disease before irreversible nerve damage occurs.

Guillain–Barré syndrome was the second most common abnormal diagnosis, with axonal variants—particularly acute motor axonal neuropathy—being more frequent than demyelinating forms. This distribution mirrors previous electrophysiological studies from Bangladesh and neighboring regions, where axonal subtypes of GBS are reported more commonly than in Western populations [15,16]. Islam B et al. demonstrated a similar predominance of axonal GBS variants in Bangladeshi patients, suggesting regional differences in disease pathophysiology, antecedent infections and immune responses [9]. These findings underscore the importance of electrophysiological subtyping for prognostication and management.

Mononeuropathy represented a notable proportion of diagnoses, with ulnar nerve involvement being most frequent, followed by peroneal and median nerve lesions. This pattern aligns with clinical observations that ulnar neuropathy at the elbow and peroneal neuropathy at the fibular head are common focal neuropathies due to compression and trauma [17]. The relatively lower prevalence of radiculopathy and plexopathy may reflect selective referral practices, where imaging modalities often precede or replace electrophysiological evaluation in such cases.

Motor neuron disease–amyotrophic lateral sclerosis and anterior horn cell diseases collectively accounted for a modest but clinically significant proportion of cases. The identification of these disorders through neurophysiological testing highlights the essential role of NCS and EMG in differentiating motor neuron pathology from mimicking peripheral neuropathies, as emphasized in prior electrophysiological literature [8,18].

The substantial proportion of normal NCS findings observed in this study is consistent with other large retrospective analyses and reflects appropriate utilization of neurophysiology to exclude peripheral nerve involvement in patients with nonspecific neurological symptoms [7,13]. Such findings reinforce the value of NCS not only in confirming diagnoses but also in guiding further clinical evaluation.

Overall, this study adds robust local evidence on the demographic and electrophysiological patterns of neuropathy in a tertiary neurocare setting in Bangladesh. The large sample size and comprehensive diagnostic coverage provide a valuable reference for clinicians and health planners and facilitate meaningful comparison with regional and international data.

CONCLUSION

This retrospective analysis demonstrates that nerve conduction studies are highly utilized and diagnostically valuable investigations in a tertiary neurocare setting in Bangladesh. Carpal tunnel syndrome and Guillain–Barré syndrome were the most frequently identified abnormalities, with distinct electrophysiological patterns observed. These findings provide baseline epidemiological data on neuropathy patterns and highlight the importance of neurophysiological evaluation in guiding diagnosis and clinical decision-making.

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Conflict of Interest: None declared.

Ethical Approval: This study was ethically approved.

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