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Original Research Article

Spectrum of Neurological Disorders Undergoing Plasmapheresis in a Tertiary Care Hospital

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Abstract: *Plasmapheresis is a therapeutic modality widely used in various immune-mediated neurological disorders. Understanding the clinical characteristics, disease spectrum, and treatment outcomes in patients undergoing plasmapheresis can help optimize its use in neurology.* ***Objective:*** *To analyze the demographic characteristics, clinical profile, comorbid conditions, laboratory parameters, and outcomes of patients with neurological disorders treated with plasmapheresis at a tertiary care hospital.* ***Methods:*** *A cross-sectional study was conducted in Ward 28, Department of Neurology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from November 15, 2024, to February 15, 2025, after obtaining ethical approval. A total of 145 patients aged 15–70 years, of either gender, presenting with suspected neurological diseases and undergoing plasmapheresis, were enrolled using non-probability consecutive sampling. Clinical presentations, diagnoses, and outcomes were recorded and analyzed.* ***Results:*** *The mean age of patients was 40.1 ± 15.6 years, with an average height of 1.7 ± 0.14 meters and weight of 74.11 ± 14.1 kg. Weakness and pain were the most common presenting symptoms, each reported in 72 patients (49.65%). The most frequently diagnosed condition was Guillain-Barré Syndrome (GBS) in 77 patients (53.10%), followed by Myasthenia Gravis (MG) in 36 (24.83%), Neuromyelitis Optica Spectrum Disorder (NMOSD) in 22 (15.17%), and Myelin Oligodendrocyte Glycoprotein Antibody Disease (MOGAD) in 10 patients (6.90%).* ***Conclusion:*** *The findings highlight Guillain-Barré Syndrome as the most common neurological condition requiring plasmapheresis. Variations in demographic and clinical features emphasize the need for localized data to inform diagnostic accuracy and therapeutic strategies in immune-mediated neurological disorders.*

Keywords: Neurological disorder, plasmapheresis, GBS, MG

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Introduction

Neurological diseases can be broadly defined as conditions that affect the central and peripheral nervous systems. These disorders include Guillain-Barré Syndrome (GBS), Myasthenia gravis (MG), Neuromyelitis optica spectrum disorder (NMOSD), and Myelin Oligodendrocyte Glycoprotein Antibody Disease (MOGAD). All of these disorders significantly impact morbidity and quality of life globally (1). Plasmapheresis, which is a process of eliminating plasma components, is used as a therapeutic approach in managing severe neurological disorders where pathogenic autoantibodies are expected to be present (2).

Neurological disorders, as estimated by the World Health Organization (WHO), account for approximately 10% of the global disease burden, and their burden is likely to increase over time (3). Concerning GBS, it has been estimated that Pakistan has an incidence rate of 2–4 / 100000 population per year, with a higher proportion of severe syndromes (4). Likewise, MG has a worldwide occurrence estimated to be between 150 and 250 cases per million (5); NMOSD and recently described MOGAD syndromes are relatively less well-known but may be better understood with improvements in diagnostic techniques. These conditions necessitate hospital admission and have significant social and economic implications for patients and healthcare facilities (6).

Plasmapheresis has emerged as a widely accepted therapeutic approach in the treatment of autoimmune neurological diseases (7). A retrospective review conducted by Kazmi SS et al. established that GBS accounts for 40. Six percent of patients who underwent plasmapheresis, making it essential in the treatment of acute neurology (8). Other studies suggest that plasmapheresis results in reduced disease severity and a shorter recovery period for patients who have not responded to steroids, IVIG, or other treatment modalities (9). For instance, the effectiveness of plasmapheresis has been confirmed in randomized controlled trials, with a prognostic value of up to 70% in MG patients; additionally, the technique reduces relapse rates in NMOSD by 50% (10).

Thus, the present study aims to analyze the demographic characteristics, clinical profiles, comorbid conditions, laboratory parameters, and outcomes of a series of neurological disorders treated with plasmapheresis in a tertiary care hospital, to identify specific trends. Therefore, the objectives of this research are to provide substantive evidence supporting the use of plasmapheresis and to enhance patient management and overall resource utilization for patients with neurological conditions in tertiary care facilities.

Methodology

After obtaining ethical approval from the institutional review board, this cross-sectional study was conducted at Ward 28 of the Neurology Department, Jinnah Postgraduate Medical Centre, Karachi, from November 15, 2024, to February 15, 2025. Through non-probability consecutive sampling, 145 patients aged 15-70 years of either gender, undergoing plasmapheresis under the supervision of a neurologist and presenting with suspected neurological diseases, were included in the present study. Patients undergoing plasmapheresis due to some illness other than a neurological disease, with multiple comorbidities and autoimmune diseases, and pregnant women were excluded from the present study. Written informed consent for the study was obtained from the patient who fulfilled the inclusion criteria. Detailed demographic information for each patient, including name, gender, age, weight, and height, was obtained. Comorbidities of each were inquired about, including diabetes mellitus (DM), hypertension (HTN), ischemic heart disease (IHD), and smoking status. Neurologists performed a physical examination of each patient. The clinical signs and symptoms of each patient were evaluated, including weakness (lack of energy or muscle

strength) and paralysis in the legs or arms (loss of function in the legs or arms). Tingling sensation (abnormal prickling sensations in anywhere body), walking difficulty (feeling difficulty or pain during walking), pain (pain score on visual analog scale (VAS), fever (>95.6F), dyspnea (difficulty in breathing), diplopia (double vision or seeing double), blurred vision (Cloudy or hazy vision), blindness (loss of vision) in one or both eyes or difficulty in swallowing (feeling difficulty or pain during swallowing) or talking (feeling difficulty during talking). A blood sample from each patient was collected in an aseptic environment and sent to the laboratory for testing of acetylcholine receptor antibodies (AChRAb), neuro-myelitis optica (NMO) antibodies, and Myelin Oligodendrocyte Glycoprotein (MOG) antibodies. Cerebrospinal fluid (CSF) detailed report (DR), Nerve conduction studies (11), and Repetitive nerve stimulation (RNS) detection were performed. After collecting the data, the analyses will be conducted using the Statistical Package for the Social Sciences (SPSS) software, Version 25. The mean and standard deviation were calculated for quantitative variables, including age (in years), height (in meters), weight (in Kilograms), BMI (in kilograms per square meter), and AChRAb (in nanomoles). NMO antibodies (IU) and MOG antibodies (IU). Frequency and percentages were calculated for qualitative variables such as gender, age in groups, BMI classification, comorbidities (DM, HTN, IHD, and smoking), signs and symptoms (weakness, paralysis in the legs or arms, tingling sensation, walking difficulty, pain, fever. dyspnoea, diplopia, blurred vision, blindness in one or both eyes or difficulty in swallowing or talking) and spectrum of neurological disorders. Effect modifiers, including gender, age in groups, BMI classification, and comorbidities (diabetes mellitus, ischemic heart disease, idiopathic thrombocytopenic purpura, and smoking), were controlled for by stratification using a chi-square test, with a p-value of less than 0.05 considered significant.

Results

The study included 145 patients, with a nearly equal gender distribution: 72 males (49.65%) and 73 females (50.34%). The mean age of the patients was 40.1 ± 15.6 years, with an average height of 1.7 ± 0.14 meters and weight of 74.11 ± 14.1 kilograms. The mean Body Mass Index (BMI) was calculated as 24.3 ± 3.01 kg/m². Among the patients, 48 (33.10%) had diabetes mellitus (DM), 36 (24.82%) had hypertension (HTN), 29 (20%) had ischemic heart disease (IHD), 24 (16.55%) were smokers, and 20 (13.79%) reported asthma (Table 1).

The most common presenting symptoms were weakness and pain, each observed in 72 patients (49.65%). The tingling sensation was reported in 48 patients (33.10%), while walking difficulty and dyspnea were present in 36 patients (24.82%). Fever was also observed in 36 patients (24.82%). Paralysis and diplopia were each reported in 29 patients (20%), and blurred vision was noted in 24 patients (16.55%). Blindness affected 20 patients (13.79%), while difficulty swallowing and difficulty speaking were present in 18 (12.41%) and 16 (11.03%) patients, respectively. Additional symptoms were reported by 14 patients (9.65%) (Table 2).

The mean acetylcholine receptor antibody (AChRAb) levels were 1.7 ± 0.9 nM, while the mean levels of neuro-myelitis optica (NMO) antibodies and myelin oligodendrocyte glycoprotein (MOG) antibodies were 3 ± 0.7 IU and 2.4 ± 0.6 IU, respectively (Table 3).

The most prevalent neurological disorder was Guillain-Barré Syndrome (GBS), affecting 77 patients (53.10%), followed by Myasthenia Gravis (MG) in 36 patients (24.83%), Neuromyelitis Optica Spectrum Disorder (NMOSD) in 22 patients (15.17%), and MOG Antibody Disease (MOGAD) in 10 patients (6.90%) (Table 4).

Stratification revealed significant associations between variables and neurological disorders. Patients with GBS were more likely to be female (<0.0001), non-hypertensive (<0.0001), and non-smokers (<0.0001). MOGAD was associated with smoking and diabetes (<0.0001). MG showed a significant association with hypertension and diabetes (<0.0001). NMOSD was significantly associated with IHD (<0.0001). Age did not show a substantial relationship with specific disorders (p = 0.946) (Table 5).

Table 1: Demographic and clinical variables

Variables	Mean and Frequency	Percentage
Gender		
Male	72	49.65
Female	73	50.34
Age (Years)	40.1±15.6	
Height (m)	1.7±0.14	
Weight (Kg)	74.11±14.1	
BMI (Kg/m²)	24.3±3.01	
DM	48	33.10
HTN	36	24.82
IHD	29	20
Smoking	24	16.55
Asthma	20	13.79

Table 2: Presenting symptoms

Variables	Frequency	Percentage
Weakness	72	49.65
Paralysis	29	20
Tingling Sensation	48	33.10
Walking Difficulty	36	24.82
Pain	72	49.65
Dyspnoea	48	33.103
Fever	36	24.82
Diplopia	29	20
Blurred Vision	24	16.55
Blindness	20	13.793
Difficulty in Swallowing	18	12.41
Difficulty in Talking	16	11.034
Other Symptoms	14	9.655

Table 3: Laboratory parameters

Variables	Mean
AChRAb (nM)	1.7±0.9
NMO Antibodies (IU)	3±0.7
MOG Antibodies (IU)	2.4±0.6

Table 4: Spectrum of Neurological Disorders

Disorders	Frequency	Percentage
MOGAD	10	6.896552
GBS	77	53.10345
MG	36	24.82759
MNOSD	22	15.17241

Table 5: Stratification of the variables

Variables	Neurological disorders				P value
	GBS	MOGAD	MG	NMOSD	
Age (years)					0.946
<45	49	7	23	13	
>45	28	3	13	9	
Gender					<0.0001

Male	19	10	36	7	
Female	58	0	0	15	
HTN					<0.0001
Yes	0	0	36	0	
No	77	10	0	22	
Diabetes					<0.0001
Yes	19	10	12	7	
No	58	0	24	15	
Smoking					<0.0001
Yes	0	10	12	2	
No	77	0	24	20	
IHD					<0.0001
Yes	0	0	7	22	
No	77	10	29	0	

Discussion

This study aims to describe the demographic and clinical characteristics of patients referred for plasmapheresis due to neurological disorders in a tertiary healthcare center in Lahore, Pakistan. The results are consistent with and complement existing studies, allowing for a comparative analysis with regional and global data.

With a mean age of 40.1 years, this research supports the literature indicating that autoimmune neurological disorders, including GBS and MG, are more frequent in middle-aged patients. This means the age of 42·5 years is similar to another research finding in South Asia (12). In contrast to other GBS and MG research on Western populations, which often observes male dominance, the present study's sex ratio was nearly equal, with 49.65% males and 50.34% females. Such differences could be inherent to genetics and the environment, or due to disparities in patients' access to healthcare services (13).

Co-morbidity was present in a third of patients, with the leading conditions being diabetes mellitus (33.10%) and hypertension (24.82%). In contrast, a study conducted in India showed a somewhat lower percentage of DM (30%) but a higher rate of HTN (28%). Smoking and ischemic heart disease found in the present study were 16.55% and 20%, respectively. Especially smoking was identified as a noteworthy risk factor for MOG Antibody Disease (MOGAD) and Myasthenia Gravis (MG) in line with the previous global literature (14).

The results show that weakness and pain are the most frequently reported symptoms, experienced by 49.65 percent of the study subjects, respectively. The tingling sensation was the most frequently reported symptom, affecting 33.10% of the study subjects, followed by walking difficulty, which affected 24.82% of the study subjects. These findings are consistent with the clinical manifestations reported in GBS and MG. For instance, a Pakistani study regarding GBS patients produced an insight that pain was present in 50% of the patients, which is quite similar to the current study (15). Similar to other developing countries, paralysis was reported in only 20% of patients; however, there was a significantly delayed presentation, which may have resulted in paralysis in almost all patients before they presented to health facilities.

Serum tests in this study revealed a mean AChRAb value of 1.7 nM, which is consistent with usual MG diagnostic standards globally. Likewise, the average concentrations of neuro-myelitis optica (NMO) antibody (3 IU) and myelin oligodendrocyte glycoprotein (MOG) antibody (2.4 IU) are comparable to those observed in East Asian and European studies, which are key measurements used in diagnosing neuro-myelitis optica spectrum disorder (NMOSD) and MOG antibody disease (MOGAD) (16). Therefore, the generality or universality of these diagnostic markers is well exemplified in the presented results across different regions.

The most significant proportion belonged to Guillain-Barré Syndrome, at 53.10%, in line with other regional studies that reveal GBS as the most common reason for plasmapheresis in the South Asian population (17). Other research originating from the United States and Europe has found GBS to be less prevalent among patients suffering from plasmapheresis, potentially because IVIG treatments are readily available in high-income settings (18). The second most diagnosable disorder in Table 3 was MG, with a prevalence of 24.83, which is reasonably related to the global burden of MG as a primary autoimmune disease treated with plasmapheresis. NMOSD (15.17%) and MOGAD (6.90%) had less frequency because they are rare but essential neurological diseases.

Further, when variables were stratified, relationships between the increased frequency of specific disorders and demographic or clinical characteristics were observed. For instance, GBS incidence was higher in females and non-smokers, as seen in regional research. MG, on the other hand, was positively correlated with hypertension and diabetes, consistent with prior studies of Middle Eastern and South Asian populations, indicating that these comorbidities play an essential role in MG development (19). Consistent with current knowledge, the findings of this study corroborate the experience with neurological ailments managed through plasmapheresis in the Caribbean region. Variations in demographics, comorbidities, and disease frequency underscore the need for targeted population studies to inform the most effective diagnostic and management approaches. Therefore, more multicenter studies are required to replicate these observations and enhance our understanding of the limited access to healthcare and treatment alternatives in LMICs.

Conclusion

The findings highlight Guillain-Barré Syndrome as the most common neurological condition requiring plasmapheresis. Variations in demographic and clinical features emphasize the need for localized data to inform diagnostic accuracy and therapeutic strategies in immune-mediated neurological disorders.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-JPMC-9983-24)

Consent for publication
Approved

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Conflict of interest
The authors declared the absence of a conflict of interest.

Author Contribution

MN (Postgraduate Trainee**)**
Manuscript drafting, Study Design,
KS (Professor**)**
Review of Literature, Data entry, Data analysis, and drafting an article.
HK (Consultant Neurophysician**)**
Conception of Study, Development of Research Methodology Design, Study Design, manuscript review, and critical input.

All authors reviewed the results and approved the final manuscript version. They are also accountable for the integrity of the study.

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