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Original Article

A Clinicopathological Study of Guillain-Barrẽ Syndrome in a Tertiary Level Hospital

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Abstract:

Background: *Guillain-Barre syndrome (GBS) stands out as the most prevalent autoimmune neurological disorder. This investigation involves a comparative analysis of clinical observations, neurophysiological assessments, and cerebrospinal fluid examination, outcomes among patients with GBS.*

Method: *A retrospective review of medical records constituted the methodology for this study, spanning from July 1, 2023, to December 31, 2023. Sociodemographic traits, antecedent illnesses, clinical progression, laboratory results, therapeutic interventions, and ultimate outcomes were assessed and compared among the study participants.*

Results: *The study encompassed 8 patients, with an average age of 42.75 years. Respiratory complications were evident in 87.5% of the patients. In CSF analysis, 62.50% exhibited a normal cell count, while 37.50% displayed an elevated count. Elevated CSF protein levels were observed in 50% of patients, with a corresponding 50% revealing normal CSF protein levels. Increased CSF protein was associated with delayed lumbar puncture, demyelinating nerve conduction study subtype, and sensory motor variant. Regarding treatment modalities, 37.5% received intravenous immunoglobulin, and 25% underwent plasma exchange therapy. The acute phase of the disease resulted in a 25% mortality rate among patients.*

Conclusion: *Guillain-Barre syndrome manifests diverse clinical presentations and laboratory findings. Notably, a high cerebrospinal fluid cell count challenges the widely accepted Brighton criteria for GBS diagnosis. Further investigations are warranted to elucidate the correlation between elevated CSF cell count and other factors influencing pathogenesis and outcomes in GBS patients.*

Introduction:

Guillain-Barre syndrome (GBS) is an inflammatory disorder affecting the peripheral nervous system. It is characterized by acute monophasic areflexic paralysis with albuminocytological dissociation, a condition where there are high levels of protein in cerebrospinal fluid and a normal cell count. This syndrome was initially described in 1916. In 1956, the Miller Fisher syndrome was introduced, marked by ophthalmoplegia, ataxia, and areflexia.[1,2,3]

Numerous studies on the immunopathogenesis of GBS propose that it comprises a spectrum of peripheral nerve disorders.[1] Each disorder is distinguished by the pattern of limb weakness or involvement of cranial nerve-innervated muscles, as well as underlying pathophysiology. Diagnosis relies on a combination of patient history, neurological examinations, electrophysiological tests, and cerebrospinal fluid (CSF) analysis. Similar diseases must be ruled out due to the resemblance in clinical presentation.

Electrophysiological studies play a crucial role, offering evidence of peripheral nervous system dysfunction and aiding in the differentiation of GBS subtypes, namely acute inflammatory demyelinating neuropathy (AIDP), acute motor axonal neuropathy (AMAN), and acute motor sensory axonal neuropathy (AMSAN). Biochemical analysis, particularly through CSF studies, provides valuable insights into cellular and protein components, elucidating the intricate biochemical alterations associated with Guillain-Barre syndrome's progression and clinical diversity. [4,5]

Disease progression in GBS is often swift, with most patients experiencing maximum disability within two weeks of the onset of weakness. Approximately 20% of patients develop respiratory failure, necessitating mechanical ventilation.[6] Autonomic nervous system involvement can lead to cardiac arrhythmias and blood pressure instability, contributing to mortality. Following the initial progressive phase, GBS patients enter a plateau phase lasting days to weeks or even months. Fortunately, 60-80% of patients can regain the ability to walk independently within six months, with or without assistance. GBS relapse may occur in 2-5% of patients.[1,5,6]

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Methodology:

Study Design: The research employed a retrospective analysis of sociodemographic information, previous illness history, laboratory results, clinical course, and treatment data related to Guillain-Barre syndrome (GBS). The investigation utilized file records from the Intensive Care Unit at Dhaka Medical College Hospital, a tertiary-level medical facility, covering the period from July 1, 2023, to December 31, 2023.

Participant Selection: Patients diagnosed with Guillain-Barre syndrome based on the Brighton criteria were chosen for inclusion in the study. The analysis focused on relevant data, excluding individuals with suspected or undiagnosed conditions. The study specifically included patients aged 18 years and older while excluding those under 18 years, individuals with drug-induced polyneuropathy, and those with radiation, chemotherapeutic, or diabetic polyneuropathy. In the last six months, the study screened newly diagnosed and hospitalized GBS patients in the hospital, identifying eight patients meeting the study criteria. All laboratory findings for these patients were included and subjected to analysis.

Evaluation Parameters: Demographic information, symptoms at the time of admission, predisposing factors, physical examination results, laboratory findings, and electroneuro−myography (EMG) results were thoroughly assessed. Additionally, the clinical course, treatments administered, and ventilation requirements were scrutinized and compared concerning morbidity and mortality.

Variable Assessment: In the analysis of variables, the medical records of patients diagnosed with GBS were scrutinized to investigate their respiratory tract infection and acute gastroenteritis history. Patient files were reviewed to document potential pathogens and biochemical parameters. The focus was specifically on evaluating treatments involving intravenous immunoglobulin (IVIG) and plasmapheresis, with other symptomatic and specific treatments being disregarded.

Electroneuro−myography (EMG) examinations were conducted on all patients. Comprehensive EMG studies covered four motor nerves (median, ulnar, peroneal, and tibial), two sensory nerves (ulnar and sural), and two F waves (ulnar and tibial). The obtained EMG results were utilized to define the GBS subtype based on established criteria.

Statistical Insights: In the scope of this evaluation, statistical data pertaining to the prevalence of respiratory tract infections and acute gastroenteritis among GBS patients were collected from their medical records. The frequency of IVIG and plasmapheresis treatments was analysed, excluding consideration of other non-specific interventions. The distribution of GBS subtypes based on EMG results was determined, providing valuable statistical insights into the categorization of patients within the studied population.

Statistical analysis: In our study, statistical analyses were performed using IBM SPSS 25.0 package program. Kolmogorov-Smirnov test was used for normal distribution assessment. Categorical data were presented as frequency and percentage, mean and standard deviation was given if data is normally distributed, median and interquartile ranges (IQR) if it is not normally distributed.

In the statistical analyses, Student t test was used when the two groups are normally distributed, if the distribution is not normal, Mann-Whitney U test was chosen. When the compared group is three or more and it is normally distributed, one way ANOVA variance test was used, whereas, if the distribution is not normal, Kruskal Wallis variance test was used. The statistical significance of the study was taken as $P < 0.05$.

Results:

Table I: General characteristics of GBS patients

Characteristics	Total No. of patients (n=8)
Age (Mean, SD)	42.75 ± 13.65
Sex (Male,%)	5 (62.5)
Respiratory involvement (%)	5 (87.5)
Quadriparesis (%)	7 (87.5)
Ascending weakness (%)	4 (50)
Intubation (%)	5 (87.5)
Bulbar involvement (%)	2 (25)
Treatment given	
IVIG (%)	3 (37.5)
Plasmapheresis (%)	1 (12.5)
Treatment not given (%)	4 (50)

SD: standard deviation; GBS: Guillain-Barré syndrome

The mean age of GBS patients in this study is 42.75 years, with a standard deviation of 13.65, indicating the average and variability in age within the patient cohort. Of the total patients, 62.5% were male, illustrating the gender distribution within the GBS population under investigation. A substantial majority (87.5%) of GBS patients experienced respiratory involvement, emphasizing the prevalence of respiratory complications in this cohort. Similarly, 87.5% of the patients required intubation, highlighting the significant proportion of cases necessitating respiratory support. Bulbar involvement was present in 25% of the patients, indicating the extent of cranial nerve complications within the study population. IVIG was administered to 37.5% of the patients as part of the treatment protocol for GBS.

Table I offers a concise summary of the demographic and clinical characteristics of GBS patients in this study, providing a foundational understanding of the population under investigation. The findings underscore the variability in age, gender distribution, and the prevalence of respiratory complications, intubation requirements, bulbar involvement, and the utilization of IVIG in the management of GBS.

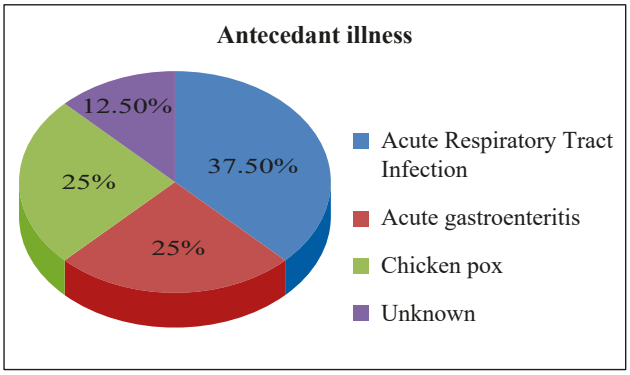

Figure 1: Predisposing factors detected in GBS patients

Figure 1 illustrates a significant proportion (37.50%) of GBS patients reported a history of respiratory tract infection as a precursor to the development of GBS. A quarter of the GBS patients (25%) reported a history of diarrhoea preceding the onset of GBS. Another 25% of GBS patients disclosed a prior episode of chickenpox. This data point suggests a potential correlation between a history of chickenpox and the subsequent occurrence of GBS.

Figure 2 illustrates NCS examinations result with distinct diagnoses among GBS patients. Specifically, acute inflammatory demyelinating polyradiculoneuropathy was identified in 62.50% of cases, while acute motor and sensory axonal neuropathy accounted for 25%. Additionally, acute motor axonal neuropathy was diagnosed in 12.5% of patients.

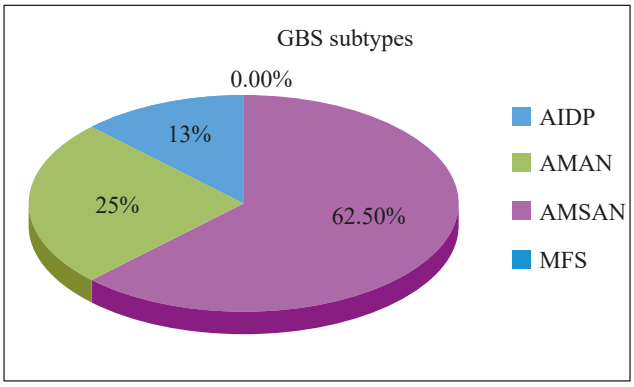

Figure 2. Distribution according to GBS subtypes according to NCS

GBS: Guillain-Barre Syndrome, AIDP: Acute inflammatory demyelinating polyradiculoneuropathy, AMSAN: Acute motor and sensory axonal neuropathy, AMAN: Acute motor axonal neuropathy, MFS: Miller-Fisher Syndrome

Table II: CSF study findings

	Mean± SD
Time from symptom onset to lumbar puncture (Day)	10.75 ± 2.007
CSF protein (g/dl)	3.05375 ± 1.395
CSF cell count (/mm3)	63.125 ± 13.76

CSF: Cerebrospinal Fluid, SD: Standard Deviation

Table II illustrates the key CSF findings. In this study, the cerebrospinal fluid (CSF) of 8 patients diagnosed with Guillain-Barré Syndrome (GBS) was analyzed to gain insights into the disease progression. The time from symptom onset to lumbar puncture, a crucial diagnostic procedure, was determined to have a mean duration of 10.75 days with a standard deviation of 2.007 days, providing a measure of the variability in the timing of lumbar puncture across the patient cohort.

Upon analysis of CSF protein levels, the study revealed a mean concentration of 3.05375 g/dl, accompanied by a standard deviation of 1.395 g/dl. This finding shed light on the presence and magnitude of protein abnormalities in the CSF of GBS patients, contributing valuable information for diagnostic and prognostic purposes.

Additionally, the CSF cell count was investigated, yielding a mean count of 63.125 cells/mm³ with a standard deviation of 13.76 cells/mm³. This observation provides insight into the inflammatory response within the central nervous system of GBS patients, as an elevated cell count is indicative of increased immune cell activity, a common feature in neuroinflammatory conditions.

Discussion:

The clinical and pathological profile of Guillain-Barré Syndrome is complex and multifaceted, and recent findings pertaining to CSF cell count in GBS patients introduce an interesting nuance that challenges the established Brighton criteria for diagnosis. According to the Brighton criteria, CSF cell count should typically fall below 50 cells/mm³ for a confident diagnosis of GBS. However, our study reveals a mean CSF cell count of 63.125 cells/mm³ with a standard deviation of 13.76 cells/mm³, indicating a noteworthy deviation from the established threshold. Additionally, CSF count was higher in patients with chicken pox (n=2) with mean 72 cells/mm³ which is higher than study mean (63.125 cells / mm³) of CSF cell count.[1,7,8,10]

The observed elevation in CSF cell count in our cohort highlights a prominent inflammatory response within the central nervous system, a characteristic feature of GBS. The influx of immune cells into the CSF, including lymphocytes and monocytes, signifies an active immune-mediated process contributing to the pathogenesis of the syndrome. While this aligns with the broader understanding of GBS as an immune-mediated neuropathy, the discrepancy with the Brighton criteria raises important questions about the variability in the inflammatory response across GBS subtypes and stages of the disease. [2,4,9]

It is essential to acknowledge the dynamic nature of GBS and the potential for heterogeneity in the immunopathological mechanisms involved. The Brighton criteria, though widely accepted, may not capture the full spectrum of GBS presentations, particularly those with heightened inflammatory responses evident in elevated CSF cell counts. This emphasizes the need for a nuanced interpretation of diagnostic criteria and consideration of additional factors such as disease stage, patient demographics, and the specific subtype of GBS.[1,4]

Future research endeavours should explore the clinical implications of elevated CSF cell counts in GBS, assessing whether this discrepancy correlates with distinct clinical phenotypes, disease outcomes, or treatment responses. A comprehensive understanding of the interplay between clinical and laboratory parameters, along with advancements in our knowledge of GBS subtypes, may inform revisions to existing diagnostic criteria, ensuring their applicability to the diverse presentations of this challenging neurological disorder.

Scopes and limitations:

However, the study's limitations include its retrospective nature, which may lead to incomplete or missing data. The small sample size of eight patients limits the generalizability of the findings to a broader population. Additionally, the absence of a control group and the lack of a comparative analysis with other autoimmune neurological disorders may restrict the study's ability to draw definitive conclusions.

Furthermore, the study acknowledges a mortality rate of 25% among patients during the acute phase, but it does not delve into the specific factors contributing to mortality or potential predictors of adverse outcomes. This limitation hinders a comprehensive understanding of the disease's severity and prognosis.

The study's focus on challenging the Brighton criteria for GBS diagnosis by highlighting a high CSF cell count opens avenues for further research but does not explore the potential clinical implications of this discrepancy. Future investigations should aim to elucidate the correlation between elevated CSF cell count and various clinical phenotypes, disease outcomes, and treatment responses.

Conclusion:

In conclusion, while the study contributes valuable insights into GBS, its retrospective design, small sample size, and limited exploration of mortality factors necessitate caution in generalizing the findings. The identified discrepancy in CSF cell counts challenges existing diagnostic criteria, emphasizing the need for continued research to refine our understanding of GBS and improve diagnostic accuracy

Conflict of Interest

The authors have no conflict of interest to declare.

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