Association between Clinical Profile and Short-Term Outcomes in Paediatric Guillain-Barre Syndrome

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Abstract

Background: Guillain-Barre Syndrome (GBS) is a leading cause of acute flaccid paralysis in children. Clinical presentation and the nature of treatment significantly influence short-term outcomes. This study aims to assess the association between the clinical profile and short-term outcomes in paediatric GBS.

Objective: The objective of this study was to evaluate the association between various clinical presentations, with short-term outcomes in paediatric Guillain-Barre Syndrome (GBS)

Methods: This retrospective observational study included paediatric GBS patients (ages 6 months to 16 years) admitted to a tertiary care hospital in Bangladesh from January 2023 to December 2024. Data were collected on clinical features, electrophysiological subtype, and treatment modality. Short-term outcomes were assessed by using the Hughes GBS Disability Score during discharge and 3 months after discharge. Statistical analysis was done to find out the association between presentation, treatment, and outcomes.

Results: Among 45 children the most common clinical features were ascending lower limb weakness (100%), paraesthesia (89%), cranial nerve involvement (13.3%), and respiratory failure (24.4%). 31% were ambulatory. Electrophysiological subtypes included axonal type (84.4%) and demyelinating (15.6%). IVIG was administered to 42.2% of patients in ward and in ICU, while 31% required ICU care. The disease was progressive in 38%. Good outcomes (Hughes 0-3) were found in 47% at discharge and 62.2% after 3 months. Poor outcomes at discharge were significantly associated with progressive disease (OR =1.5, 95% CI: 0.7-3.2, p=0.01) and respiratory failure (OR=1.2, 95% CI: 0.64-2.4, p=0.02). After 3-month follow-up, several factors were found to be significant. The factors were progressive disease (OR = 6.72, 95% CI: 1.75–25.76, p = 0.005), Respiratory failure (OR = 7.4, 95% CI: 1.6–34.2, p = 0.01), respiratory tract infection as a preceding illness (OR = 3.5, 95% CI: 1.0–12.6, p=0.04) and Need for IVIG (OR=4.58 (95% CI: 1.26–16.63, p = 0.02).

Conclusion: The presence of progressive disease, respiratory failure, a history of preceding respiratory infection, and those who required intravenous immunoglobulin (IVIG) therapy were found to be significant indicators of poor outcome. Early identification and aggressive management of these risk factors are crucial for improving paediatric GBS outcomes.

Key words: Paediatric Guillain-Barré Syndrome, Clinical Profile, Electrophysiological subtypes, Short-Term Outcome, Prognostic Factors, IVIG, Respiratory Failure, Axonal Subtype, Cranial Nerve Involvement

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Introduction

Guillain-Barré Syndrome (GBS) is a post-infectious, immune- mediated polyneuropathy that affects motor, sensory, and in some cases, autonomic nerves.[1] It has become a leading cause of acute flaccid paralysis worldwide, particularly following the global decline in poliomyelitis incidence.[2] Although the exact aetiology remains unclear, GBS is widely considered an autoimmune disorder in which the immune system mistakenly targets peripheral nerves, leading to demyelination or axonal damage.[3] The onset of GBS is frequently preceded by an upper respiratory or gastrointestinal infection, which serves as a trigger for the aberrant immune response.[4]

The incidence of GBS among children under the age of 15 is estimated to range between 0.34 and 1.34 per 100,000 per year.[5] Diagnosis is primarily clinical, based on characteristic signs and symptoms, and by excluding other possible causes. It is supported by ancillary investigations such as nerve conduction studies (NCS) and cerebrospinal fluid (CSF) analysis.[3] Electrodiagnostic studies are classically recommended 10 to 14 days after symptom onset, to allow for Wallerian degeneration of nerve fibers. However, several studies have

demonstrated that early findings, even within 3 to 7 days, can be useful for diagnosing GBS.[6] NCS also helps to differentiate between GBS subtypes, such as Acute Inflammatory Demyelinating Polyneuropathy (AIDP), Acute Motor Axonal Neuropathy (AMAN), and Acute Motor and Sensory Axonal Neuropathy (AMSAN), by distinguishing between demyelinating and axonal involvement.[6]

CSF analysis in GBS often reveals albumin cytologic dissociation (elevated protein levels with a normal white cell count) which is present in approximately 80% of cases by the second week after symptom onset. However, its absence does not exclude the diagnosis.[7] The natural course of GBS involves progressive, ascending motor weakness that typically peaks (nadir) within four weeks, followed by a plateau and then a gradual recovery phase. Approximately 20–30% of patients require intensive care unit (ICU) admission, often due to complications such as respiratory failure and aspiration, which are major contributors to morbidity and mortality.[8-9] Although most children experience favourable outcomes, short-term recovery can vary significantly depending on the clinical presentation, disease subtype, the timeline and nature of therapeutic interventions. Intravenous immunoglobulin (IVIG) and plasmapheresis remain the cornerstone of the treatments, with early initiation being crucial for improving outcomes.[10] In this study, we aimed to evaluate the clinical presentation, electrophysiological subtypes, treatment modalities, and short-term outcomes of paediatric GBS patients admitted to the Neurology Department of a tertiary care hospital in Dhaka, Bangladesh. We further sought to identify associations between these variables and functional outcomes to better inform clinical management and prognosis

Methods: This retrospective study was conducted in the Paediatric Neuroscience Department of Bangladesh Shishu Hospital and Institute over a one-year period, from January 1, 2024, to December 31, 2024. The study reviewed medical records of children aged 6 months to 16years, diagnosed with Guillain-Barré Syndrome (GBS) based on the Brighton diagnostic criteria. Patients included in the study had at least two follow-up evaluations: one at the time of discharge and another 3 months after discharge. Data were extracted using a standardized data collection sheet. Variables included demographic characteristics (age and sex), clinical features (duration of illness, rate of progression, presence of weakness, walking difficulties, cranial nerve involvement, and respiratory compromise), electrophysiological findings, cerebrospinal fluid (CSF) analysis, treatment modalities (e.g., IVIG administration), need for ICU/PICU admission, and duration of hospital stay. All patients underwent at least one nerve conduction study during the acute phase of illness. Electrophysiological assessments included motor nerve conduction velocity (MNCV), sensory nerve conduction velocity (SNCV), and F-wave latency, which were interpreted against age-matched normative values. The electrophysiological diagnosis was made into the axonal group and demyelinating group. The Erasmus GBS Respiratory Insufficiency Score (EGRIS) was used to estimate the risk of respiratory failure and the need for intensive care. Patients with EGRIS scores of 0–4 were categorized as non-progressive, while those with scores >4 were considered progressive. Specific treatment with intravenous immunoglobulin (IVIG) at a dose of 2 g/kg over 2–5 days was administered to patients classified as progressive. Patients with incomplete medical records or who were lost to follow-up were excluded from the analysis.

Outcomes were assessed using the Hughes GBS Disability Score. A score of 0–3 was defined as a good outcome, while scores of 4–6 were classified as poor outcomes. Outcomes were compared with clinical features and treatment interventions to identify associated factors.

Data were analyzed using SPSS version 21. Categorical variables were presented as frequencies and percentages. Pearson's Chi-square test or Fisher's exact test was applied as appropriate to analyze qualitative variables. Logistic regression analysis was performed to identify predictors of poor outcomes. A p-value of <0.05 was considered statistically significant.

Hughes Disability Scale

0-Healthy

1 Minor symptoms or signs of neuropathy but capable of manual work/capable of running

2 Able to walk without the support of a stick (5m across an open space) but incapable of manual work/running

3 Able to walk with a stick, appliance, or support (5m across an open space)

4 Confined to bed or chair-bound

5 Requiring assisted ventilation (for any part of the day or night)

6 Death

Results

This study analyzed 45 children with Guillain-Barré Syndrome (GBS), with a near-equal gender distribution (51% male, 49% female). (Fig-1)

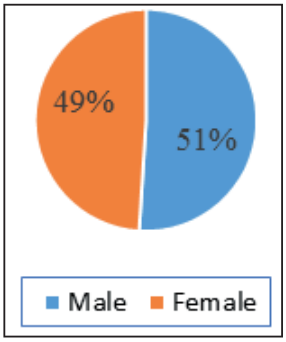

Fig. 1 : Sex distribution of the patients (n=45)

Among the 45 patients analyzed, Gastrointestinal infections were the most frequent preceding event, accounting for 60% of cases, followed by respiratory tract infections at 40% (Table I). The duration of illness (from onset of illness to recovery or maximum severity) was less than 15 days in 47% of the children and >15 days were 53% (Table I). The key clinical features observed were, Ascending limb weakness (100%), Paraesthesia (89%), respiratory failure (24.4%), Cranial nerve involvement (13.3%), 31% of children were ambulatory at presentation, the disease was progressive in 38% of cases and non-progressive in 62%. Cerebrospinal fluid (CSF) analysis showed raised protein concentration (>45 mg/dl) in 69% of patients, 42% of patients needed IVIG and the child was transferred to ICU in 19(31%) of patients. Electrophysiological studies revealed, Axonal Neuropathy 38(84.4%) and demyelinating neuropathy 7 (15.6%). Good outcomes (Hughes 0-3) were observed in 47% of patients at discharge and 62.2% after 3 months. (Table-I)

Table I : Clinical profile of GBS patients (n=45)

Variables	Frequency (n)	Percentage (%)
H/O preceding illness		
Gastrointestinal tract infection	27	60
Respiratory tract infection	18	40
Duration of illness		
(onset of illness to maximum severity)		
<15 days	21	47
>15 -30 days	24	53
Disease progression		
Progressive	17	38
Non- progressive	28	52
Respiratory failure		
Yes	11	24.4
No	34	75.6
Cranial nerve palsy		
Yes	5	13.3
No	39	86.7
Paraesthesia		
Yes	40	89
No	5	11
Gait		
Ambulatory	14	31
Non-ambulatory	31	69
GBS subtypes by NCS		
Axonal	38	84.4
Demyelinating	07	15.6
CSF Albumin cytological dissociation		
Present	31	69
Absent	14	31
IVIG		
Needed	19	42.2
Not-needed	26	57.8
ICU support		
Nedded	14	31
Not needed	31	69
Outcome at discharge		
Good	21	46.6
Poor	24	53.3
Outcome after 3 months		
Good	28	62.2
Poor	17	37.8

To see the outcome, Pearson Chi-square analysis was performed between the clinical variables and outcomes. A significant difference in clinical outcomes after 3 months of discharge was observed in many variables. Among those with gastrointestinal symptoms, 74.1% had a good outcome after 3 months of follow-up, whereas only 44.4% of those with preceding respiratory symptoms achieved a good outcome. Conversely, a higher proportion of poor outcomes was seen in the respiratory illness group (55.6%) compared to the gastrointestinal group (25.9%). This association was statistically significant (p = 0.04), indicating that the type of preceding illness may be related to the clinical outcome (Table II).

In this study, a longer duration of illness (>15 days) at presentation was associated with an increased likelihood of poor clinical outcomes at discharge (62.5%). However, this trend did not reach statistical significance in the chi-square test (p = 0.2).

Among the children with paraesthesia, 65% of patients had good outcomes, and only 40% of those without paraesthesia had poor outcomes after 3 months (Table I). However, the difference is not statistically significant (p=0.2)

Patients with respiratory failure had markedly higher rates of poor outcomes at discharge (81.8%, p = 0.029) and after 3 months of follow-up (72.7%, p=0.006) (Table II).

Cranial nerve involvement was 6 (13.3%). All 6 patients (100%) with cranial nerve palsy experienced a poor outcome, while among the 39 patients without cranial nerve involvement, 28 (71.8%) had good outcomes and 11 (28.2%) had poor outcomes. The association between cranial nerve palsy and poor clinical outcome after 3 months was statistically significant (p = 0.001). (Table II).

Those with a progressive illness had significantly worse outcomes compared to the non-progressive group both during discharge and after 3 months (p-values 0.004 and 0.01 respectively). (Table II).

Among those given IVIG, 8 (42.1%) had a good outcome after 3 months, while 11 (57.9%) had a poor outcome. Conversely, among those not given IVIG, 20 (76.9%) experienced a good outcome and 6 (23.1%) had a poor outcome. The result was statistically significant (p=0.01). (Table II).

A higher proportion of patients who could not walk at presentation had poor outcomes at discharge (61.3%) compared to those who could walk. However, this difference was not statistically significant both at discharge and after 3 months (p=0.1 and 0.8). (Table II).

There was no statistically significant difference was found between axonal and demyelinating variants of GBS (p=0.4). (Table II).

Though the association between ICU care and outcome at discharge(p=0.1) and after 3 months (0.07) was not statistically significant there is a potential trend where patients requiring ICU care may be more likely to have poor outcomes, compared to those who did not require ICU admissions. (Table II)

Table II : Association between clinical presentation and treatment with Outcome during discharge and after 3 months post discharge (n=45)

variables	Outcome at discharge		*p* value	Outcome after 3 months		*p* value
	Good	poor		Good	Poor	
Age <5 Year -??? >5Year -16	09 (39.1%) 12 (54.5%)	14 (60.9%) 10 (45.4%)	.3	12 (52.2%) 16 (72.7%)	11 (47.8%) 06 (27.3%)	.1
Duration of illness (onset to peak) <15 days >15 days-??	12 (57.1%) 09 (37.5%)	09 (42.9%) 15 (62.5%)	.1	15 (71.4%) 13 (54.2%)	6 (28.6%) 11 (45.8%)	.2
H/O previous illness GIT RTI	14 (51.9%) 07 (38.8%)	13 (48.1) 11 (61.2)	.3	20 (74.1%) 08 (44.4%)	07 (25.9%) 10 (55.6)	.04
Paraesthesi a Yes No	19 (47.5%) 02 (40%)	21 (52.5%) 03 (60%)	0.5	26 (65%) 02 (40%)	14 (35%) 03 (60%)	0,2
Course of disease Progressive Non-progressive	04 (23.5) 17 (60.7%)	13 (76.5%) 11 (39.3%)	.01	06 (35.3%) 22 (78.6%)	11 (64.7%) 06 (21.4%)	.004
Respiratory Failure Yes No	02 (18.2%) 19 (55.9%)	09 (81.8%) 15 (44.1%)	.02	03 (27.3%) 25 (73.5%)	08 (72.7%) 09 (26.5%)	0.006
Albumin -cytological dissociation Present Absent	09 (52.9%) 12 (42.9%)	08 (47.1%) 16 (57.1%)	.3	11 (64.7%) 17 (60.7%)	06 (35.3%) 11 (39.3%)	0.5
NCS diagnosis Axonal Demyelinating	17(44.7%) 04(57.1%)	21(55.3%) 03(42.9%)	.4	23(60.5%) 05(71.4%)	15(49.5%) 02(28.6%)	0.4
Cranial nerve palsy Yes No	01(16.7) 2051.3%)	05(83.3%) 19(48.7%)	0.1	0(0%) 28(71.8%)	06(100%) 11(28.2%)	0.001
Gait Ambulatory Non-ambulatory	09(64.3%) 12(38.7%)	05(35.7%) 19(61.3%)	0.1	09(64.3%) 19(61.3%)	05(35.7%) 12(38.7%)	0.8
ICU Needed Not needed	04(28.6%) 17(54.8%)	10(71.4%) 14(45.2%)	0.1	06(42.9%) 22(70.9%)	08(27.1%) 09(29.1)	.07
IVIG Given Not given	06(31.6%) 15(27.7%)	13(68.4%) 11(42.3%)	.08	08(42.1%) 20(76.9%)	11(57.9%) 06(23.1%)	.01

For further exploration, to see the predictor of outcome logistic regression analysis was performed. Poor outcomes at discharge were significantly associated with progressive disease (OR =1.5, 95% CI: 0.7-3.2, p=0.01) and respiratory failure (OR=1.2, 95% CI: 0.64-2.4, p=0.02). (Table III)

Table III : predictor of outcome of various clinical presentation and outcome at discharge (n=45)

Variables	Outcome at discharge		x^2test (*p*-value)	OR (95%CL)	*p*-value
	Good	Poor			
Respiratory Failure					
Yes	02	09	0.02	1.2(0.64 -2.4)	0.04
No	19	15			
Course of disease					
Progressive	04	13	0.01	1.5(0.7 -3.2)	0.01
Non -progressive	17	11			

After 3-month follow-up, several factors were found significant in the logistic regression model associated with poor outcomes. The factors were progressive disease (OR = 6.72, 95% CI: 1.75–25.76, *p* = 0.005), Respiratory failure (OR = 7.4, 95% CI: 1.6–34.2, *p* = 0.01), respiratory tract infection as a preceding illness (OR = 3.5, 95% CI: 1.0–12.6, *p*=0.04) and Need for IVIG (OR=4.58 (95% CI: 1.26–16.63, *p* = 0.021). (Table IV)

Table IV : Predictor of outcome of various clinical presentation and outcome at 3 months (n=45)

Variables	Outcome after 3 months		x^2test (*p*-value)	OR(95%CL)	*p*-value
	Good	Poor			
H/O preceding illness					
Gastrointestinal	20	07	0.04	3.5(1.0 -12.6)	0.04
Respiratory	08	10			
Respiratory Failure					
Yes	3	08	0.006	7.4(1.6 -34)	0.01
No	25	09			
Course of disease					
Progressive	6	11	0.004	6.7(1.7 -25.7)	0.005
Non -progressive	22	06			
IVIG					
Given	08	11	0.01		
Not given	20	06		4.5(1.2 -16.6)	.02

Logistic regression test. p value <0.05 is significant

Discussion

Among the 45 study population, male was 23(51%) female was 22(29%) and 51% of the children were less than 5 years of age. Gastrointestinal tract infection was the most common preceding illness, observed in 60% of cases. A study conducted in Iran by Ashrafi et al. showed similar findings in age and sex distribution but differed in preceding illness, where respiratory infections were the most common preceding events for GBS (28 cases, 62.2%).[11] Similarly, Yakoob et al. reported gastrointestinal infections as the most common prior history in 64.7% of cases.[12]

In this study, ascending weakness of limbs was found in almost all cases. Paraesthesia, the most common initial sensory symptom, was present in 89%, followed by an inability to walk in 69% of children. These findings are largely consistent with other studies, including Siddiqui et al., who found motor weakness in 98% of GBS patients.[13] Sen et al. reported paresthesia in approximately 33% of cases,[14] while Cavirani et al. found 83.3% of patients to be non-ambulatory.[15]

Few children in this study developed cranial nerve involvement (6%) and respiratory failure (11%) as complications of GBS. These frequencies were relatively low compared to Lin JJ et al., who reported cranial nerve involvement and respiratory failure in

39.5% and 30.2% of children, respectively.[16]

Nerve conduction studies were performed in all children within 10 days of symptom onset. Among the subtypes, Axonal Neuropathy (AMAN) was 84.4% followed by demyelinating group 15.6%. Electrophysiological classification of GBS subtypes varies across different studies. For instance, a recent study by Sen et al. showed axonal and demyelinating groups at 52.8%, and 36% respectively.[14] Other studies have reported in 66.6%, and 33.3% respectively.[17]

The finding of CSF albumin-cytological dissociation is one of the most important diagnostic features of GBS. We performed cerebrospinal fluid (CSF) analysis in all cases after 7 days of symptom onset, which showed albumin-cytological dissociation in 69% of patients, a finding almost similar to Sen et al. who reported 50%.14 While the findings by Joseph et al was 39.7%.[18]

In this study, the disease was progressive in 38% of cases, intravenous immunoglobulin (IVIG) was administered to 42% of patients and 31% required Intensive Care Unit (ICU) care. These numbers were higher compared to Verma R et al., who found that among 90 GBS patients, 14% received IVIG therapy and 16.7% required ICU care with mechanical ventilation.[19]

The outcome of GBS in this study showed no mortality during the study period. Good outcomes (Hughes score 0-3) were observed in 47% of patients at discharge and 62.2% after three months. Recently, Yadav et al. studied 36 children and reported a recovery rate of 84.4% at a three-month follow-up.[20] Another study in northern India by Kalra et al. found a recovery rate of 87.5% at one-year follow-up and 95% thereafter.[21]

The lower recovery rates in this may be due to a short-term follow-up period. A longer-term follow-up might reveal a higher proportion of favourable outcomes, as this was suggested by several small series and case reports.[22]

This study identifies several clinical features significantly associated with short-term functional outcomes in children diagnosed with Guillain-Barré Syndrome (GBS). Poor outcomes at discharge were significantly associated with progressive disease (OR =1.5, 95% CI: 0.7-3.2, p=0.01) and respiratory failure (OR=1.2, 95% CI: 0.64-2.4, p=0.02). After 3-month the factors associated with poor outcome were progressive disease (OR = 6.72, 95% CI: 1.75–25.76, p = 0.005), Respiratory failure (OR = 7.4, 95% CI: 1.6–34.2, p = 0.01), respiratory tract infection as a preceding illness (OR = 3.5, 95% CI: 1.0–12.6, p=0.04) and Need for IVIG (OR=4.58 (95% CI: 1.26–16.63, p = 0.02).

These findings align with previous research. Lin JJ et al who demonstrated that poor outcomes were likely due to respiratory signs (odds ratio, 32.00; 95% confidence interval, 3.07-333.79; p=0.001), the need for ventilator support (p=0.04), urinary incontinence (p<0.001), and clinical variant group.[16] Similarly, Verma et al. found that predictors of poor functional outcome at six months included autonomic dysfunction (p=0.013), neck flexor weakness (p=0.009), requirement for ventilator assistance (p<0.001), an MRC sum score <30 on admission (p<0.001), and an axonal pattern on electrophysiological assessment (p<0.001).[18] Conversely, a multivariable analysis by Joseph et al. indicated that IVIG treatment (p=0.05) was associated with improvement in the disease condition among patients.[23] Regarding the use of IVIG and associated outcomes, this study differs from the study by Joseph et al in the direction of association. Though the unadjusted chi-square test and logistic regression both demonstrated statistical significance, the direction of association indicates that those treated with IVIG were more likely to experience poor outcomes. Further analyses adjusting for baseline severity or comorbidities are needed to disentangle this relationship and assess whether the observed effect is causal or confounded by disease severity.

This study had several limitations. It was a single-center study with a small sample size, which may reduce the statistical power and reliability of the analysis. The short follow-up duration and retrospective data collection may have resulted in incomplete clinical information. In this regard large scale multicentre studies are required for further evaluation

Conclusion

This study identifies several clinical features significantly associated with short-term functional outcomes in children diagnosed with Guillain-Barré Syndrome (GBS). Specifically, the presence of progressive disease, respiratory failure, a history of preceding respiratory infection, and those who required intravenous immunoglobulin (IVIG) therapy were found to be significant indicators of a poor prognosis.

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