Scientific Research Publishing

Neuroscience & Medicine, 2019, 10, 232-246
http://www.scirp.org/journal/nm
ISSN Online: 2158-2947
ISSN Print: 2158-2912

Prediction of Outcome in Patients with Guillain Barre Syndrome—An Egyptian Study

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How to cite this paper: Alloush, T., Fahmy, N.A., Fouad, M.M., Albaroudy, H.O., Hamdy, M. and Salem, H.H. (2019) Prediction of Outcome in Patients with Guillain Barre Syndrome—An Egyptian Study. *Neuroscience & Medicine*, **10**, 232-246.
https://doi.org/10.4236/nm.2019.103018

Received: July 8, 2019
Accepted: September 13, 2019
Published: September 16, 2019

Abstract

Study Objectives: Guillain-Barre syndrome (GBS) is an acute-onset, monophasic immune-mediated disorder of the peripheral nervous system that often follows an infection. The outcome and prognosis of GBS depend on many factors such as the etiology, clinical features, neurophysiology and immunological parameters. The aim of this study was to assess the factors (clinical, investigatory tools, and therapies) that may affect the outcome of patients with GBS. Patients and methods: this was an analytical observational study that was conducted at Ain Shams university hospitals and Kobri Elkoba Military Hospital including twenty patients with the diagnosis of Guillain Barre Syndrome in the duration from 2016 to 2018. This study included twenty patients with the diagnosis of GBS within two weeks from onset of neurologic symptoms, whom their diagnosis based on the established clinical criteria and verified by investigations. Patients were selected from both genders and aged from 18 to 65 years old. Nerve conduction studies and electromyography were performed within two weeks from admission. Various lines of treatment such as plasma exchange (PE), intravenous immunoglobulins (IVIG) or both were used during the period of admission in hospital. Outcome was assessed by the Hughes functional score (F-score), that was applied to the patients on admission, at end of 4 weeks from onset of neuropathy and at the end of 8 weeks. The final outcome at the end of 8 weeks was classified as follow: Group I: good prognosis (0 - 2) on the Hughes functional score (15 patients) and Group II: poor prognosis (3 - 6) on the Hughes functional score (5 patients). Results: the age of the study population ranged from 18 to 65 years with mean of 36.10 ± 16.08 years. Fifteen (75%) patients were males and 5 (25%) patients were females. There was no statistically significant difference found between poor and good prognosis regarding gender. The most common electrophysiological subtype was demyelinating followed by axonal neuropathy. Most patients (75%) had a good outcome at end of study period.

It was found that the different line of treatment administered (plasma exchange or IVIG or both) was not associated with poor or good outcome. The patients who needed mechanical ventilation had significantly poor prognosis. Conclusion: the most common electrophysiological subtype was demyelinating followed by axonal neuropathy. Ascending pattern of weakness was more common than descending pattern in this study population and was not related to prognosis. High Hughes score at admission was associated with poor outcome at 8 weeks.

Keywords

Guillain-Barre Syndrome (GBS), Nerve Conduction Studies and Electromyography, Demyelinating and Axonal Neuropathy, Hughes Functional Score (F-Score), Plasma Exchange, IVIG

1. Introduction

Guillain Barré syndrome (GBS) is an acute postinfectious immune mediated peripheral neuropathy characterized by rapidly progressive weakness and sensory loss, usually followed by slow clinical recovery [1]. The progressive phase peaks in 7 to 14 days and can lead to various levels of weakness, from abnormal gait to total paralysis, cranial nerve weakness, pain, respiratory compromise, and autonomic instability. The reported incidence rates for GBS are 1 to 2 in 100,000. GBS is equally common in men and women and can occur at any age [2]. The etiopathogenesis of GBS has been hypothesized to involve a direct immune-mediated mechanism against the peripheral nerves components, including the myelin sheath and the axon [3]. Fifty to seventy percent of the cases are preceded by respiratory or gastrointestinal infectious episodes either bacterial or viral, less likely by vaccination. The strongest relationship is with infection by Camplylobacter jejuni and Mycoplasma pneumoniae [4]. Advances in general care facilities and the availability of specific treatments have improved the outcome of patients with GBS. The type of preceding infection and patient-related host factors seem to determine the form and severity of the disease. Electrodiagnostic study is very important in the diagnosis of GBS, with clinical, biological or biochemical criteria [5]. As GBS is an autoimmune disease the goal of immunotherapy is to limit the damage to the nerves and myelin, thereby enhancing the ability of the peripheral nerves to survive and regenerate. Plasma exchange (PE) and intravenous immunoglobulins (IVIG) are effective immunotherapy for adult and pediatric patients with GBS if given during the first few weeks of disease [6].

2. Subject and Methods

This is an analytical observational study that was conducted at Ain Shams university hospitals and Kobri Elkoba Military Hospital including twenty patients with the diagnosis of GBS in the duration from May 2016 to December 2018 af-

ter the patients or their relatives signed an informed consent. Inclusion criteria included patients from both genders aged from 16 to 70 years old who were diagnosed as GBS within two weeks from onset of neurologic symptoms, depending on the history, clinical examination and investigatory tools.

Exclusion criteria included patients with other causes of polyneuropathy such asdiabetic, uremic, hypothyroidism, drug-related neuropathy, para neoplastic neuropathy or hereditary neuropathy.

All patients were subjected to the following; a full medical, neurological history and the history of any antecedent events occurring during the few weeks before the onset of neurologic symptoms. Full Neurological examination at the time of presentation and laboratory investigations; Random blood sugar, Complete blood picture, Serum urea, Serum creatinine, Serum electrolytes (sodium, potassium, calcium), Liver function tests, Erythrocyte sedimentation rate, and C-reactive protein (quantitative). Nerve conduction studies and electromyography were performed within two weeks from admission. Motor and sensory nerve conduction studies (NCS) and F wave response were done for the median and ulnar nerves in both upper limbs, posterior tibial and common peroneal in both lower limbs and sensory conduction for sural nerve. Electromyography (EMG) study was done for motor units to the abductor pollicus brevis, deltoid and triceps muscles in upper limbs, and tibialis anterior and gastrocnemius in the lower limbs. Various lines of treatment such as PE, IVIG or both were received during the period of admission in hospital. Outcome was assessed by the Hughes functional score (F-score), that applied to the patients on admission, at end of 4 weeks from onset of neuropathy and at the end of 8 weeks for follow up and to assess outcome [7]. Hughes functional grading scale consists of Grade 6: dead, Grade 5: requires assisted respiration, Grade 4: bed bound, Grade 3: able to walk 5 meters with aid, Grade 2: ambulates independently, Grade 1: minimal signs and symptoms, able to run and grade 0: normal. Experimental procedures were previously approved by the Ethical Committee for Human Research at the faculty of medicine Ain Shams University.

Statistical Analysis

All data collected were tabled and statistically analyzed by Microsoft Office 2003 (excel) and Statistical Package for Social Science (SPSS) version 16. Parametric data were expressed as mean ± SD, and non-parametric data were expressed as number and percentage of the total. Comparing the mean ± SD of 2 groups was done using the paired student's t-test. P value < 0.05 is considered significant.

3. Results

The prognosis of patients after 8 weeks of from onset of symptoms was classified as good or favorable prognosis (Hughes score < 3) in 15 patients (75.0%) of the study population and poor or unfavorable prognosis (Hughes score ≥ 3) in 5 patients (25.0%).

The age of the study population ranged from 18 to 65 years with mean of 36.10 ± 16.08 years. 15 patients (75%) were males and 5 patients (25%) were females (Table 1).

As regards the clinical characteristics of the study population, 16 patients (80.0%) had preceding respiratory tract infection, 3 patients (15.0%) had preceding gastrointestinal tract infection and 1 patient (5.0%) had preceding both respiratory and gastrointestinal tracts infection (Table 2). The Pattern of weakness was ascending in 16 patients (80.0%) and descending in 4 patients (20.0%). The first symptoms were motor symptoms in 3 patients (15.0%), sensory symptoms in 5 patients (25.0%) and mixed motor and sensory symptoms in 12 patients (60.0%). Then all of the patients developed motor symptoms, 17 patients (85.0%) developed sensory symptoms while 4 patients (20.0%) developed autonomic symptoms (Table 3).

Table 1. Demographic data of the studied cases.

		Total No. = 20
Gender	Female	5 (25.0%)
	Male	15 (75.0%)
Age	Mean ± SD	36.10 ± 16.08
	Range	18 - 65
	16 - 39	12 (60.0%)
	40 - 59	4 (20.0%)
	60 - 70	4 (20.0%)

Table 2. Clinical data of the studied cases.

		No. (%)
Infection preceding illness	RTI	16 (80.0%)
	GE	3 (15.0%)
	GE and RTI	1 (5.0%)
Pattern of weakness	Ascending	16 (80.0%)
	Descending	4 (20.0%)
First symptom	Sensory	5 (25.0%)
	Motor	3 (15.0%)
	Motor and sensory	12 (60.0%)

RTI; respiratory tract infection, GE; gastroenteritis.

Table 3. Clinical features of the studied cases.

Symptoms		**Total No. = 20**
Sensory	No	3 (15.0%)
	Yes	17 (85.0%)
Motor	No	0 (0.0%)
	Yes	20 (100.0%)
Autonomic	No	16 (80.0%)
	Yes	4 (20.0%)

The duration between the preceding infection and onset of symptoms ranged from 6 to 15 days with mean 9.35 ± 2.35 days. The duration between the onset of first symptoms and starting the treatment ranged from 2 to 12 days with mean of 5.15 ± 2.89 days. The total duration of admission to hospital ranged from 1 to 14 weeks with mean 4.30 ± 2.52 weeks. This duration was less than 4 weeks in 15 patients (75.0%) and more than 4 weeks in 5patients (25.0%). Only 4 patients (20.0%) needed mechanical ventilation and among those patients the duration lapsed between the first symptoms and mechanical ventilation ranged from 2 to 11 days with median (IQR) 3.00 (2.5 - 7). This duration was less than 3 days in 3 patients (75.0%) from ventilated patients and 3 or more days in one patient (25.0%) from ventilated patients (Table 4).

As regards the data of NCS and EMG, 3 patients (15.0%) had evidence of axonal motor neuropathy, 5 patients (25.0%) had evidence of demyelinating motor and sensory neuropathy while 12 (60.0%) had evidence of mixed demyelinating and axonal motor neuropathy. All of the patients had abnormal F-wave (Table 5).

Table 4. Onset, course and duration of the disease in the studied cases.

		Total No. = 20
Time between infection and illness (days)	Mean ± SD	9.35 ± 2.35
	Range	6 - 15
	<7 day	5 (25.0%)
	≥7 day	15 (75.0%)
Time starting medication from onset of first symptoms (days)	Mean ± SD	5.15 ± 2.89
	Range	2 - 12
Duration stay in hospital (weeks)	Mean ± SD	4.30 ± 2.52
	Range	1 - 14
	<4 weeks	15 (75.0%)
	≥4 weeks	5 (25.0%)
Mechanical ventilation	No	16 (80.0%)
	Yes	4 (20.0%)
Time between first symptom and mechanical ventilation (days)	Median (IQR)	3.00 (2.5 - 7)
	Range	2 - 11
	<3	3 (75.0%)
	≥3	1 (25.0%)

Table 5. NCV and EMG of the studied cases.

		No. (%)
NCV and EMG	Demyelinating motor and sensory	5 (25.0%)
	Axonal motor neuropathy	3 (15.0%)
	Both	12 (60.0%)
F-wave	Abnormal	20 (100.0%)

As regards Hughes scale of the studied population, on presentation one patient (5.0%) was Grade 1, 2 patients (10.0%) was Grade 2, 6 patients (30.0%) was Grade 3, 8 patients (40.0%) was Grade 4 and 3 patients (15.0%) was grade 5. After 4 weeks from onset of symptoms 3 patients (15.0%) was Grade 1, 8 patients (40.0%) was Grade 2, 5 patients (25.0%) was Grade 3, 3 patients (15.0%) was Grade 4 and one patient (5.0%) was Grade 6. After 8 weeks from onset of symptoms 5 patients (25.0%) was grade 0, 8 patients (40.0%) was Grade 1, 2 patients (10.0%) was grade 2, 3 patients (15.0%) was Grade 3, one patient (5.0%) was grade 4 and one patient (5.0%) was grade 6 (Table 6).

As regards the treatments received during period of admission, 10 patients (50.0%) received plasma exchange sessions, 4 patients (20.0%) received IVIG only and 6 patients (30.0%) received plasma exchange session then followed by IVIG due to unsatisfactory response after sessions. The sessions of PE ranged from 3 to 9 sessions with mean of 5.44 ± 1.55 sessions. 11 patients (68.8%) received less than 5 plasma exchange sessions while 5 patients (31.3%) received 5 or more sessions (Table 7).

Table 6. Hughes scale of the studied cases.

	Grade	No. (%)
Hughes scale at presentation	Grade 1	1 (5.0%)
	Grade 2	2 (10.0%)
	Grade 3	6 (30.0%)
	Grade 4	8 (40.0%)
	Grade 5	3 (15.0%)
Hughes scale at 4 weeks	Grade 1	3 (15.0%)
	Grade 2	8 (40.0%)
	Grade 3	5 (25.0%)
	Grade 4	3 (15.0%)
	Grade 6	1 (5.0%)
Hughes scale at 8 weeks	Grade 0	5 (25.0%)
	Grade 1	8 (40.0%)
	Grade 2	2 (10.0%)
	Grade 3	3 (15.0%)
	Grade 4	1 (5.0%)
	Grade 6	1 (5.0%)

Table 7. Treatment of studied cases.

		Total No. = 20
Mode or treatment	PE	10 (50.0%)
	IVIG	4 (20.0%)
	PE and IVIG	6 (30.0%)
Sessions of PE	Mean ± SD	5.44 ± 1.55
	Range	3 - 9
	<5 sessions	11 (68.8%)
	≥5 sessions	5 (31.3%)

The prognosis of patients after 8 weeks of from onset of symptoms was classified as group I; good or favorable prognosis (Hughes score < 3) in 15 patients (75.0%) of the study population and group II; poor or unfavorable prognosis (Hughes score ≥ 3) in 5 patients (25.0%) (Table 8).

There was no statistically significant difference found between both groups regarding gender and age of the study population. But it was noticed that patients with age ranging from 16 to 39 years showed significantly good or favorable prognosis compared to those with age ranging from 40 - 59 or ≥60 years (Table 9).

There was no significant difference between both groups regarding infection preceding illness, the pattern of weakness either ascending or descending and the nature of first symptoms (Table 10).

Table 8. Prognosis of the studied cases.

Prognosis	Total No. = 20
Group I (good) (Hughes score < 3)	15 (75.0%)
Group II (poor) (Hughes score ≥ 3)	5 (25.0%)
Total	20 (100%)

Table 9. Comparison between two groups for prognosis regarding demographic data.

		Group I	Group II	Test Value	P-Value	Sig.
		No. = 15	No. = 5			
Gender	Female	5 (33.3%)	0 (0.0%)	2.222	0.136	NS
	Male	10 (66.7%)	5 (100.0%)			
Age	Mean ± SD	33.93 ± 15.92	42.60 ± 16.47	1.046	0.309	NS
	Range	18 - 65 - 3	19 - 65			
	16 - 39	11 (73.3%)	1 (20.0%)			
	40 - 59	1 (6.7%)	3 (60.0%)	7.111	0.029	S
	≥60	3 (20.0%)	1 (20.0%)			

Table 10. Comparison between both groups regarding clinical data.

		Group I	Group II	Test Value	P-Value	Sig.
		No. (%)	No. (%)			
Infection preceding illness	RTI	13 (86.7%)	3 (60.0%)	3.444	0.179	NS
	GE	1 (6.7%)	2 (40.0%)			
	GE and RTI	1 (6.7%)	0 (0.0%)			
Pattern of weakness	Ascending	12 (80.0%)	4 (80.0%)	1.852	0.172	NS
	Descending	3 (20.0%)	1 (20.0%)			
First symptom	Sensory	5 (33.3%)	0 (0.0%)	2.222	0.329	NS
	Motor	2 (13.3%)	1 (20.0%)			
	Motor and sensory	8 (53.3%)	4 (80.0%)			

There was no significant difference between both groups regarding Sensory symptoms and autonomic symptoms. All of the patients of good and poor prognosis had motor symptoms (Table 11).

The comparison between both groups showed that the patients who needed mechanical ventilation had significantly poor prognosis; among 4 patients who needed mechanical ventilation, 3 patients had poor prognosis and among 5 patients with poor prognosis, 3 (60.0%) of them were mechanically ventilated, while among 15 patients with good prognosis, 14 (93.3%) of them did not need mechanical ventilation. For those who needed mechanical ventilation, 3 patients were mechanically ventilated within the first two days from the onset of first symptoms and these patients had significantly poor prognosis, while one patient only was mechanically ventilated after 2 days from onset of symptoms and this patient had good prognosis. Also patients who started treatment earlier tended to have significant good prognosis; the duration between the onset of first symptoms and starting the treatment ranged from 2 to 5 days with mean 2.80 ± 1.30 days among patients with good prognosis while it ranged from 2 to 12 days with mean of 5.93 ± 2.87 days among patients with poor prognosis. Also patients who stayed at hospital during treatment for less than 4 weeks had significant good prognosis; among 15 patients with good prognosis, 13 (86.7%) of them stayed at hospital for less than 4 weeks while among 5 patients with poor prognosis, 3 (60.0%) of them stayed at hospital 4 weeks or more. There was no significant difference between patients with good and poor prognosis as regarding duration between preceding infection and illness (Table 12).

There was no significant difference between patients with good and poor prognosis as regarding NCS and EMG findings (Table 13).

The comparison between the two groups as regards Hughes scale done at presentation showed that group II patients had significantly higher scores as all of them had either Grade 4 or Grade 5, while group I patients had variable scores ranging from grade 1 to grade 4 and none had Grade 5 score. As regards Hughes scale done at 4 weeks from onset of symptoms, group I patients had score ranging from 1 to 3 while those of group II had scores ranging from 3 to 6 (Table 14).

Regarding modes of treatment and number of sessions of plasma exchange there was no statistically significant differences between both groups (Table 15).

Table 11. Comparison between both groups regarding symptoms.

Symptoms		Group I	Group II	Test Value	P-Value	Sig.
		No. =15	No. = 5			
Sensory	No	2 (13.3%)	1 (10.0%)	0.131	0.718	NS
	Yes	13 (86.7%)	4 (80.0%)			
Motor	No	0 (0.0%)	0 (0.0%)	-	-	-
	Yes	15 (100.0%)	5 (100.0%)			
Autonomic	No	13 (86.7%)	3 (60.0%)	1.667	0.197	NS
	Yes	2 (13.3%)	2 (40.0%)			

Table 12. Comparison between both groups regarding clinical data.

		Group I	Group II	Test Value	P-Value	Sig.
		No. = 15	No. = 5			
Time between infection and illness (days)	Mean ± SD	9.60 ± 1.67	9.27 ± 2.58	0.268	0.791	NS
	Range	6 - 15	8 - 12			
	<7 day	5 (33.3%)	0 (0.0%)	2.222	0.136	NS
	≥7 day	10 (66.7%)	(100.0%)			
Time starting medication from onset of first symptoms (days)	Mean ± SD	2.80 ± 1.30	5.93 ± 2.872	−2.333	0.031	S
	Range	2 - 5	2 - 12			
Duration stay in hospital (weeks)	Mean ± SD	3.73 ± 0.70	6.00 ± 4.85	1.854	0.080	NS
	Range	3 - 5	1 - 14			
	<4 weeks	13 (86.7%)	2 (40.0%)	4.356	0.037	S
	≥4 weeks	2 (13.3%)	3 (60.0%)			
Mechanical ventilation	No	14 (93.3%)	2 (40.0%)	6.667	0.010	S
	Yes	1 (6.7%)	3 (60.0%)			
Time between first symptom and mechanical ventilation (days)	Median (IQR)	11 (11 - 11)	3 (2 - 3)	-1.414≠	0.157	NS
	Range	11 - 11	2 - 3			
	<3	0 (0.0%)	3 (100.0%)	4.000	0.046	S
	≥3	1 (100.0%)	0 (0.0%)			

Table 13. Comparison between both groups regarding NCV and EMG.

		Group I	Group II	Test Value*	P-Value	Sig.
		No. (%)	No. (%)			
NCV and EMG	Demyelinating motor and sensory	5 (33.3%)	0 (0.00%)	2.222	0.329	NS
	Axonal motor polyneuropathy	2 (13.3%)	1 (20.0%)			
	Both	8 (53.3%)	4 (80.0%)			
F-wave	Abnormal	15 (100.0%)	5 (100.0%)	–	–	–

Table 14. Comparison between both groups regarding Hughes scale.

		Group I	Group II	Test Value*	P-Value	Sig.
		No. (%)	No. (%)			
Hughes scale at presentation	Grade 1	1 (6.7%)	0 (0.0%)	12.000	0.017	S
	Grade 2	2 (13.3%)	0 (0.0%)			
	Grade 3	6 (40.0%)	0 (0.0%)			
	Grade 4	6 (40.0%)	2 (40.0%)			
	Grade 5	0 (0.0%)	3 (60.0%)			

Continued

Hughes scale at 4 weeks	Grade 1	3 (20.0%)	0 (0.0%)	15.733	0.003	HS
	Grade 2	8 (53.3%)	0 (0.0%)			
	Grade 3	4 (26.7%)	1 (20.0%)			
	Grade 4	0 (0.0%)	3 (60.0%)			
	Grade 6	0 (0.0%)	1 (20.0%)			
Hughes scale at 8 weeks	Grade 0	5 (33.3%)	0 (0.0%)	20.000	0.001	HS
	Grade 1	8 (53.3%)	0 (0.0%)			
	Grade 2	2 (13.3%)	0 (0.0%)			
	Grade 3	0 (0.0%)	3 (60.0%)			
	Grade 4	0 (0.0%)	1 (20.0%)			
	Grade 6	0 (0.0%)	1 (20.0%)			

Table 15. Comparison between both groups regarding treatmentmode.

		Group II	Group I	Test Value	P-Value	Sig.
		No. = 15	No. = 5			
Mode or treatment	PE	9 (60.0%)	1 (20.0%)	3.200	0.202	NS
	IVIG	3 (20.0%)	1 (20.0%)			
	PE and IVIG	3 (20.0%)	3 (60.0%)			
Number of session of PE	Mean ± SD	5.67 ± 1.61	4.75 ± 1.26	-1.028	0.322	NS
	Range	3 - 9	3 - 6			
	<5	8 (66.7%)	3 (75.0%)	0.097	0.755	NS
	≥5	4 (33.3%)	1 (25.0%)			

4. Discussion

GBS is an acute-onset, monophasic immune-mediated disorder of the peripheral nervous system that follows an antecedent infection [8]. Prognosis is usually good, but residual motor and sensory deficits may occur. Nonetheless, about 20%of patients die from the complication of GBS or remain disabled. Outcome from GBS is determined by the extent of nerve damage in the acute phase and the capacity to recover in the convalescent phase [9].

The aim of this study was to assess the factors (clinical, investigatory tools, and therapies) that may affect the outcome of patients with GBS.

In this study twenty patients with the diagnosis of Guillain Barre Syndrome within two weeks from onset of neurologic symptoms were included, whom their diagnosis based on the established clinical criteria and verified by investigations. Patients were selected from both genders and aged from 18 to 65 years old. NCS and EMG were performed within two weeks from admission. In this study various lines of treatment such as PE, IVIG or both were received during the period of admission in hospital. Outcome was assessed on the Hughes func-

tional score (F-score), that was applied to the patients on admission, at end of 4 weeks from onset of neuropathy and at the end of 8 weeks and the final outcome (either good or poor prognosis) was at the end of 8 weeks as follow; Group I: 15 patients with good prognosis (0 - 2) on the Hughes functional score and Group II: 5 patients with poor prognosis (3 - 6) on the Hughes functional score; 5 patients.

The results of this study showed no statistical significant difference between the studied groups as regard demographic data; sex and age. However, the group age ranging from 16 to 39 years reported significantly favorable prognosis. Similar findings were reported by *van Koningsveld et al.* (2007) and *Munayco et al.* (2019) [10] [11]. This may be due to the occurrence of higher incidence of complications during hospitalization in elderly patients, such as lymphocytopenia, hyponatremia, hypoalbuminemia, hyperglycemia, dysautonomia and pneumonia [12]. This study showed no significant differences as regard the type of antecedent illness for both groups. The most common illness reported was upper respiratory tract infection. But *Hadden et al.* (2011) and *Zhang et al.* (2018) reported that antecedent illness of gastroenteritis was a predictor of poor prognosis in their studies [13] [14]. Also, Campylobacter jejuni infections are associated with more severe types of GBS with axonal involvement rather than demyelinating peripheral nervous system involvement [12] [15].This discrepancy from present study can be explained by small sample number in the current study and small number of patients with antecedent gastroenteritis infection. Regarding the autonomic dysfunction, the results of this study showed no significant difference in relation to the final outcome. Similar findings were reported by [16]. However *Verma et al.* (2013) and *Zaem et al.* (2019) reported that autonomic dysfunctions ranged from isolated tachy- or bradycardia with or without hemodynamic fluctuations to cardiac arrest, neurogenic pulmonary edema, urinary retention, gastrointestinal dysfunction and changes in sweating were significant predictor of poor prognosis [17] [18]. This discrepancy from present study can be explained by small sample number with autonomic dysfunction and early management in high-quality ICU to avoid autonomic complications. The current study results showed that patients who started treatment earlier had significant good prognosis. Similar findings were reported by *van Doorn* (2013) and *Christine et al.* (2017) [19] [20]. Asearly treatment will probably reduce the incidence of patients who required assisted ventilation, and decrease in the time to onset of motor recovery. The present study reported that patients with long duration stay in hospital showed significant poor prognosis. Similar findings were reported by *van Doorn* (2013) and *Nasiri et al.* (2018) [19] [21]. This might be due to the high incidence of complications associated with long stay duration such as hospital acquired pneumonia, sepsis, adult respiratory distress syndrome, DVT, pulmonary embolism and dysautonomia [21] [22]. The current study results showed the patients who needed mechanical ventilation had significantly poor prognosis. Similar findings were reported by *Wu et al.* (2015) and *EL-Khayat et al.* (2018) [23] [24]. This can be explained by those who needed

mechanical ventilation It is known that adequate ventilation may hadinadequate inspiratory effort, ineffective expiratory force, and the inability to protect the airway. Also, complication of ventilator as pneumonia related ventilator, extubation, ruptured lung alveoli and hemoptysis may occur [25]. *Zhahirul et al.* (2019) found that those who needed mechanical ventilation, the short duration between first symptom and mechanical ventilation had significantly poor prognosis [26]. This may be due to the short duration is an indicator of rapid worsening of GBS with compromised respiratory function. In similar patients with rapid deterioration the possibility of immune-mediated damage to the peripheral nervous system may occur very early and the reversibility of this process may be incomplete with various immunomodulatory therapies, accounting for the delayed pulmonary functional recovery and poor prognosis [27].In this study most of patients showed mixed demyelinating motor and sensory and axonal motor polyneuropathy followed by demyelinating motor and sensory and the least common type was axonal motor polyneuropathy, with no statistical significant difference between both two groups. Similar findings were reported by *Versace et al.,* (2017) and *Mustafa and Ali* (2019) [28] [29]. The current study results showed majority of patients had a high Hughes score at presentation. A high Hughes scale score at presentation was seen to have significant poor outcome. Similar findings were reported by *EL-Khayat et al.* (2018) [24]. In this study, the type of treatment given showed no statistical significant difference with outcome at 8 weeks. Similar findings were reported by *Hughes et al.,* (2007) and *Zhang et al.* (2018) which demonstrated equal efficacy with IVIG monotherapy and plasmapheresis monotherapy or plasmapheresis followed by IVIG and evidenced in the current study by absence of significant difference between good and poor prognosis [14] [30].

Limitations and Strengths

This study has some limitations which have to be taken into consideration. First, the sample size was relatively small, resulting in low statistical power for detecting significant differences between two groups. Second, non-usage of recent immunological tests was for the different subtypes of GBS as, IgG anti GT1b, anti GD1b, anti GM1, anti GM2. Finally, the complications should be evaluated for a long time. However, the strengths of this study were the correlation between the clinical, investigation modalities; EMG & NCT and functional outcome assessment in different modalities of treatment in GBS for better prognostic evaluation.

5. Conclusion

GBS is an acute-onset, monophasic immune-mediated disorder of the peripheral nervous system that often follows an antecedent infection. This study included twenty patients with the diagnosis of GBS within two weeks from onset of neurologic symptoms, whom their diagnosis based on the established clinical criteria and verified by investigations. Nerve conduction studies and electromyogra-

phy were performed within two week from admission. In this study various lines of treatment such as plasma exchange, IVIG or both were received during the period of admission in hospital. In this study, an older age group was a predictor of poor outcome. An antecedent infection was seen in all cases as gastroenteritis and respiratory tract infection. Ascending pattern of weakness was more common than descending pattern in this study population and was not related to final outcome. The most common electrophysiological subtype was demyelinating type followed by axonal neuropathy type. High Hughes score at admission was associated with poor outcome at 8 weeks. In this study, various lines of treatment such as PE, IVIG or both showed a similar outcome. Mechanical ventilation was associated with poor outcome at 8 weeks. Long Duration stay in hospital was a predictor of poor outcome. Thus early diagnosis, early management in high-quality ICU to avoid complications and the use of PE or IVIG or both in GBS are of utmost important.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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