International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Clinical Profile and Outcome of Patients Presenting with Guillain - Barré Syndrome in a Medical Intensive Care Unit of a Tertiary Care Hospital

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Abstract: ***Background: Guillain–Barré syndrome (GBS) is an inflammatory, autoimmune disorder of the peripheral nervous system that is acute in onset, self - limited, and can result in significant morbidity, placing a burden on the healthcare system. This study aims to study the clinical profile and outcome of patients with GBS who require intensive care unit (ICU) and mechanical ventilation (MV). Materials and methods: After Institutional Ethics Committee approval, a single - center, prospective, observational study was conducted, recruiting 51 patients from the medical ICU with GBS over 18 months. Patients were categorized into three groups as per the timing of the commencement of immunomodulator therapy. The association between dependent variables like the need for MV, patient outcome, and independent factors like time of initiation of immunomodulator therapy from the time of onset of symptoms and age - groups; were analyzed using the Chi - squared test and the overall disability sum score (ODSS) with Spearman's rank correlation test. Results: Out of 51 patients in the study, (52.94%) were male, with a male: female ratio of 1.12: 1. Most of them had quadriparesis (98.04%) or bulbar symptoms (56.86%). A total of 24 (47.05%) patients required MV. The presence of bulbar weakness at admission had a statistically significant positive correlation with the need for MV (Spearman's $\rho = 0.663$, $p = 0.001$), the need for prolonged MV (Spearman's $\rho = 0.457$, $p = 0.001$), duration of MV (Spearman's $\rho = 0.512$, $p = 0.001$) and duration of ICU stay (Spearman's $\rho = 0.516$, $p = 0.001$); and a negative correlation with improvement in ODSS (Spearman's $\rho = -0.409$, $p = 0.001$). Early commencement of immunomodulator therapy was associated with a significantly decreased probability of requiring ventilatory support ($p = 0.001$), decreased probability of requiring prolonged MV ($p = 0.04$), and a decreased duration of ICU stay ($p = 0.004$). Conclusion: Early commencement of immunomodulator therapy decreased the probability of requiring ventilatory support and improved the outcome. Breathlessness and bulbar symptoms at admission were poor prognostic indicators in terms of the need for MV and the duration of both the ICU stay and MV.***

Keywords: Guillian barre syndrome, Immunomodulator

1. Introduction

Guillain–Barré syndrome (GBS) is an acute, immune - mediated neuropathy of the peripheral nervous system characterized by progressive muscle weakness and sensory loss. This self - limiting disorder is caused by an inflammatory response targeting the myelin or axon of peripheral nerves and can lead to significant morbidity. Due to its impact on patients and the healthcare system, GBS is an important area of research and clinical management. It is usually triggered by a bacterial or viral infection (usually gastrointestinal or respiratory) or other antecedent events. It often presents with rapidly evolving areflexic motor paralysis that may or may not be associated with sensory and autonomic disturbances. The worldwide incidence of Guillain - Barre syndrome is estimated to be about 1–4 cases per 100, 000 annually.[1]

Nowadays, GBS is the primary cause of acute flaccid paralysis in Western countries, affecting individuals of all ages, and genders.[2] Around 30% of patients may require ventilatory support.[3] Autonomic disturbances are also common.[4] The extended morbidity caused by GBS results in a significant reduction in productivity and places a substantial burden on the healthcare system.[5] The treatment for this syndrome primarily consists of plasmapheresis or intravenous immunoglobulin (IVIG). Studies from India have largely focused on GBS patients admitted to general medical wards.

The primary objective of this study is to emphasize the clinical characteristics of patients with GBS requiring ICU admission, including the necessity of MV. Additionally, the study aims to compare the timing of treatment initiation with patient outcomes and prognoses, with the aim of determining the impact of early treatment on patient outcomes.

2. Material and Methods

This observational prospective study was conducted in a single - center setting, the ICU in tertiary care hospital of Uttar Pradesh. Patients fulfilling the inclusion and exclusion criteria were recruited. The sample size calculation was done by the Raosoft formula at a 95% confidence interval of 51 patients. Inclusion criteria were—patients above 12 years of age, either gender, fulfilling the Brighton criteria of diagnostic certainty 1, 2, and 3 of GBS, and willing to give informed consent and/or assent. Exclusion criteria were—patients with a past history of vasculitis, systemic lupus erythematosus, or Myasthenia gravis; diagnosed cases of diphtheria or botulism poisoning; and deranged serum potassium levels on presentation or cases wherein diagnosis of GBS was not sure.

The case record form was designed to collect data on— (1) relevant history and clinical examination findings; (2) investigations like electromyography, nerve conduction studies, cerebrospinal fluid examination, thyroid function tests, etc., done as per the physician's discretion; and (3) parameters on the clinical course, including clinical features at presentation, the time between presentation and commencement of immunomodulator therapy, need and duration for MV, duration of ICU stay, and improvement in neurological deficit on discharge or transfer out of the ICU. Disability was calculated according to the ODSS. The

endpoints were—death, discharge, or transfer out of the medical ICU.

3. Statistical Analysis

The data were processed with Microsoft Excel 2010 and subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) version 25.0. The presentation of results for quantitative variables, such as age and duration of MV, is done by reporting the mean [± standard deviation (SD)] and median (interquartile range). On the contrary, for qualitative variables like gender, immunomodulatory therapy, patient outcomes, and the need for MV, the results are presented in terms of frequency and percentage.

4. Results

Patients' Demography and Clinical Characteristics

During an 18 - month period, a total of 51 eligible patients were enrolled in the study. Of these patients, 32 (62.72%) fell within the age range of 12–30 years, with a mean age of 28.8 years. Only 11 (21.56%) patients were over 40 years of age. A total of 27 (52.9%) were males, 24 (47.0%) were females. There was slight male predominance in all the age groups except >40 years. At presentation, 50 (98.04%) patients had quadriplegia, while bulbar weakness was present in 29 (56.86%) patients. Around 24 (47.05%) patients had symptoms and signs of respiratory distress, but none of them showed autonomic involvement at the onset in this study.

Immunomodulator Therapy

All patients in this study received IVIG as immunomodulator therapy. The majority 25 (49.01%), received IVIG within 4 days of onset of symptoms (group I), while 16 (31.37%) received it within 4–6 days (group II), and 10 (19.60%) received >6 days after symptom onset (group III). None of them received plasma exchange.

Mechanical Ventilation

A total of 24 out of 51 (47.05%) required MV, of which 13 were male (48.15% of all males) and 11 were female (45.83% of all females). Four (16%) patients from group I, 11 (68.75%) patients from group II, and nine (90%) patients from group III required MV. A statistically significant positive correlation was obser ved between the timing of initiation of immunomodulator therapy and the requirement for MV, with a p - value of 0.001.

Out of 24 patients who required MV, 11 (21.57% of all patients) required prolonged MV (>21 days). Among the patients, eight were male, representing 29.63% of all male patients, while three were female, comprising 12.5% of all female patients. The need for prolonged MV was observed in two (8%) patients in group I, five (31.25%) patients in group II, and four (40%) patients in group III. There was a statistically significant correlation between the timing of the onset of immunomodulator therapy from symptom onset and the need for prolonged MV ($p = 0.04$).

In intubated patients, the average number of days on ventilatory support was 26.33 days (16.45 days for males and 34.69 days for females). The mean duration of MV was 35, 20.5, and 20 days in groups I, II, and III, respectively. There was no statistically significant correlation between the timing of the commencement of immunomodulator therapy and the duration of ventilatory support required by the patient ($p = 0.5$).

The presence of bulbar weakness at admission had a statistically significant positive correlation with the need for MV (Spearman's $\rho = 0.663$, $p = 0.001$), prolonged MV (Spearman's $\rho = 0.457$, $p = 0.001$), duration of MV (Spearman's $\rho = 0.512$, $p = 0.001$) and duration of ICU stay (Spearman's $\rho = 0.515$, $p = 0.001$); and a negative correlation with improvement in the ODSS (Spearman's $\rho = -0.409$, $p = 0.001$).

Outcome

Out of the 51 patients in the study, three (5.88%) patients expired in the ICU, nine (17.65%) patients had a full recovery, and 39 (76.47%) patients had a partial recovery while being transferred or discharged from the ICU. All three deaths occurred in patients needing MV and were attributed to sepsis secondary to lower respiratory tract infections.

The percentage recovery (%full recovery, %partial recovery, and %deaths) was (28, 72, and 0%), (12.5, 75, and 12.5%), and (0, 90, and 10%) in groups I, II, and III, respectively. Patients with delays in the initiation of IVIG were less likely to undergo full recovery ($p = 0.001$). The average duration of the ICU stay was 23.55 days (18.13 days for females and 28.48 days for males). For those who required MV, the average ICU stay was 37.71 days, and for those who did not, it was 10.96 days. There was no statistically significant correlation ($p = 0.18$) between the age of the patient and the duration of the ICU stay. There was a statistically significant positive correlation between the timing of the commencement of immunomodulator therapy and the ICU stay of the patient ($p = 0.001$). The mean duration of ICU stay was 16, 26, and 39 days in groups I, II, and III, respectively. Four patients in this study had diabetes mellitus (DM). It was found in this study that the presence of DM had no significant correlation with ICU stay ($p = 0.322$) or the percentage improvement in disability on discharge or transfer ($p = 0.144$).

Overall Disability Sum Score (ODSS)

As per the improvement in ODSSs of patients in all three groups at discharge or transfer compared to the score at admission, the improvement in disability was calculated. The percentage improvement in ODSS was 72.18, 66, and 58.33% in groups I, II, and III, respectively ($p = 0.09$). Prolonged MV (Spearman's $\rho = -0.432$, $p = 0.002$) and duration of ICU stay (Spearman's $\rho = -0.531$, $p = 0.001$) were negatively correlated with improvement of ODSS. It was found that the need for prolonged MV and days of ICU stay have a statistically significant impact on the improvement of ODSS at discharge or transfer out of the ICU ($p = 0.002$ and 0.001, respectively). The presence of bulbar weakness at admission showed a statistically significant correlation with the need for ventilation, the need for prolonged ventilation, and hence decreased improvement in disability and ODSSs at discharge or transferred out of ICU ($p = 0.001$).

Group	Required MV, n (%)	Required prolonged MV, n (%)	Percentage improvement in ODSS (%)	Average ICU stay (days)	The average duration of ventilatory support (days)
Group I (n = 25)	4 (16%)	2 (8%)	72%	16	35
Group II (n = 16)	11 (68.75%)	5 (31.25%)	66%	25.56	20.45
Group III (n = 10)	9 (90%)	4 (40%)	58.33%	39.2	29.66
p-value	0.001	0.04	0.09	0.004	0.5

*Groups I, II, and III are based on the timing of initiation of IVIG therapy from the time of symptom onset—<4 days, 4–6 days, and >6 days, respectively; p-value <0.05, statistically significant

Patient Group	Patients with VAP	Total patients in the group	Percent population with VAP in the group
Group I	2	25	8.0%
Group II	6	16	37.5%
Group III	4	10	40.0%

*Groups I, II, and III are based on the timing of initiation of IVIG therapy from the time of symptom onset—<4 days, 4–6 days, and >6 days, respectively

5. Discussion

This observational study was done to look at the profile of patients of GBS who were admitted to the medical ICU and the effect of immunomodulator therapy and its timing with respect to the patient's outcome and disease.

This study enrolled 51 patients, with a male - to - female ratio of 1.13: 1. Most patients were aged between 12 and 20 years and 21 and 30 years, with a mean age of 28.8 years. These results are consistent with those of a study conducted by Dhadke et al.6 in 2013 in 40 patients of GBS, in which the majority of the patients were in the age group of 13–40 years with a male - to - female ratio of 1.5: 1.

The incidence of bulbar weakness (56.86%) and respiratory weakness (47.05%) in our study was higher compared to the other studies. The majority (49.01%) of the patients in this study received immunomodulator therapy within 4 days of the onset of symptoms. The results obtained from this study showed that early commencement of immunomodulator therapy in a patient with GBS was associated with a significantly decreased probability of requiring ventilatory support ($p = 0.001$), decreased probability of the requirement of prolonged MV ($p = 0.04$), and a reduced duration of ICU stay ($p = 0.004$). However, it did not have a statistically significant correlation with the duration of MV ($p = 0.5$) or an improvement in ODSS ($p = 0.09$).

This may be explained by the argument that early initiation of therapy will halt the immunological process at an earlier stage, thus preventing and/or reducing permanent damage to the axons.

The presence of breathlessness and the requirement for ventilation is associated with an increased duration of ICU stay ($p = 0.001$). In our study, the presence of breathlessness as a symptom and bulbar weakness on examination at admission had a statistically significant positive correlation with the need for MV ($p = 0.001$, $p = 0.001$), need for prolonged MV ($p = 0.001$, $p = 0.001$), duration of MV ($p = 0.001$, $p = 0.001$) and duration of ICU stay ($p = 0.001$, $p = 0.001$). Bulbar weakness had a negative correlation with improvement in ODSSs ($p = 0.001$). The need for prolonged ventilation and an increased ICU stay is associated with a greater degree of disability at discharge or transfer, with p - values of 0.002 and 0.001, respectively.

6. Conclusion

In this study, we found that the majority of patients with GBS were in the younger age group, with a slight male predominance. Bulbar symptoms and breathlessness were common in GBS patients in the ICU, but none had autonomic involvement. In such patients, there is a requirement for MV and prolonged MV, and an ICU stay is not uncommon. Early commencement of immunomodulator therapy was associated with a significantly decreased probability of requiring ventilatory support, a decreased probability of prolonged MV, and a reduced duration of ICU stay. Breathlessness and bulbar symptoms at admission were poor prognostic indicators in terms of the need for MV as well as the outcome.

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