Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2023i1.570
*Biol. Clin. Sci. Res. J., Volume, **2023**: 570*
Original Research Article

CLINICAL OUTCOME OF GUILLAIN BARRE SYNDROME IN THE INTENSIVE CARE UNIT OF A PEDIATRIC TERTIARY CARE HOSPITAL

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(Received, 24th August 2023, Revised 15th October 2023, Published 8th Decemebr 2023)

Abstract: *Since poliomyelitis was eradicated, Guillain-Barre syndrome has been the leading cause of acute flaccid paralysis globally. Critical care and mechanical breathing may be necessary in extreme circumstances. Among paediatric patients hospitalized in the intensive care unit of a Karachi tertiary hospital, we aimed to quantify the incidence of Guillain-Barré Syndrome clinical outcomes. Cardiology Intensive Care Unit (NICH) in Karachi, Pakistan. January 9, 2020, to July 10, 2020—six months. Children admitted to the intensive care unit at NICH with GBS, as defined operationally, ranging in age from six months to twelve years, were included in the study. They stimulated the posterior tibial nerve (PTN) and common peroneal nerve (CPN), allowing for studying motor nerve conduction and using the median and ulnar nerves to measure compound muscle action potentials' onset delay, amplitude and conduction velocity (CMAPs). Research on the conduction of sensory nerves was carried out to quantify SNAPs in the sural, median, and ulnar regions. All patients were given intravenous immunoglobulin for five days at a 400 mg/kg/day dosage, as per the protocol. Clinical outcomes were evaluated using the HFG scale at discharge and four weeks. The average patient age was 5.81 ± 3.26 years out of 30. Thirteen men (43.3%) and seventeen females (56.7%) were present. Fifteen patients (53.3%) had a history of upper respiratory illness, while seven (23.3%) had a history of gastrointestinal infection. A mean HFG score of 3.03 ±1.90 was recorded. Outcomes were good for 21 patients (56.7%) and deficient for 9 (43.3%). A tertiary care hospital in Karachi reported that 56.7% of children admitted with Guillain-Barre Syndrome had good clinical results in the intensive care unit.*

Keywords: Guillain-Barre Syndrome, Clinical Outcome, Intensive Care Unit

Introduction

Acute flaccid paralysis in children is most often misdiagnosed as Guillain-Barre Syndrome (GBS). "Polyradiculoneuropathy" is the best description of the symptoms, which include a symmetrical weakening of the ascending limbs accompanied by areflexia and a gradual worsening of the condition. The condition, which can have an autoimmune or viral origin, attacks the spinal roots and peripheral nerves (Chand et al., 2017). Days to six weeks before the start of weakness, patients may mention a history of diarrhea or an upper respiratory tract illness (Yuki & Hartung, 2012). According to Willison et al. (2016), while Campylobacter jejuni is the most well-known antecedent infection, there are others such as cytomegalovirus, Epstein-Barr virus, Mycoplasma pneumonia, influenza a virus, hepatitis E virus, and acute arbovirus, which includes Zika and Chikungunya. Between 0.4 to 1.3 cases per 100,000 per year have been reported as the global incidence of GBS in children (Ghazavi et al., 2020). A study conducted in a regional country revealed an annual incidence rate of 1.3 per 100,000 with a considerable male preponderance (Ra et al., 2017), while no population-based studies have been conducted in Pakistan to determine the incidence of paediatric GBS. Most cases of GBS are diagnosed based on clinical symptoms. Paralysis of the lower limbs, known as typical acute flaccid paralysis, can develop over hours to days and spread to the upper limbs, including the muscles of breathing, the meal muscles, and the cranial nerves (Sadek et al., 2016). Patients experience a progression from the previous infection to weakness within four weeks. Still, the vast majority hit rock bottom within two weeks (Willison et al., 2016). For a good prognosis and quick treatment, an early diagnosis is crucial. In children, the duration of sickness and the rate of recovery from GBS tend to be lower than in adults. After six months of sickness, 78% of children in Egyptian research with 50 instances of GBS had shown excellent outcomes. The results showed that 58% of the participants were in good health, 18% had mild symptoms, 12% needed assistance walking, 6% required assistance using a cane or walker, and 6% needed to be bedridden (Sadek et al., 2016). Likewise, a study conducted in Pakistan with 31 cases of paediatric GBS found that the average HFG score decreased from admission to discharge. At the 3-month follow-up, the average HFG score was 0.89 ± 1.12, indicating a positive result.1 Seventy-42 percent of children in a separate local trial with GBS demonstrated

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substantial improvement after 30 days. Only 7.4% had experienced severe handicaps by the 60-day mark (Yakoob et al., 2005). To determine the frequency of clinical outcomes of Guillain-Barre Syndrome among children admitted to the intensive care unit of a tertiary care hospital in Karachi.

Methodology

In the Medical Intensive Care Unit (MICU) at the National Institute of Child Health (NICH) in Karachi, Pakistan, a study was conducted from January 9, 2020, to July 10, 2020, spanning six months. The sampling procedure employed was non-probability consecutive sampling, and the sample size of 66 patients was determined using the WHO sample size calculator, considering a 10% margin of error and a 95% confidence interval. Children admitted to the ICU with Guillain-Barré Syndrome (GBS), aged six months to twelve years, were invited to participate. Parental written informed consent was obtained for eligible patients, excluding those for whom nerve conduction testing was not feasible. The study excluded minors whose parents declined participation and those who "Left Against Medical Advice," precluding follow-up. After obtaining ethical approval from the institutional review board, eligible patients underwent a comprehensive neurological evaluation, focusing on conscious level, cranial nerves, reflexes, muscle tone, muscular power, and the motor and sensory systems. Motor nerve conduction was assessed by stimulating the posterior tibial nerve (PTN) and common peroneal nerve (CPN), while the ulnar and median nerves were studied for compound muscle action potentials (CMAPs) onset delay, amplitude, and conduction velocity. Sensory nerve conduction investigations estimated sensory nerve action potentials (SNAPs) from the sural, median, and ulnar nerves.

Following the established protocol, all participating patients received intravenous immunoglobulin for five days at a dosage of 400 mg/kg/day. Clinical outcomes were evaluated at discharge and four weeks using the Hughes Functional Grading (HFG) scale. Despite the initial goal of including 66 patients, only 30 could be enrolled over the six months due to an unexpected surge in GBS cases, averaging five patients per month.

The data was entered and analyzed using SPSS for Windows version 21.0. We used the NEC scale to determine the frequency and proportion of specific categorical characteristics, such as gender, antecedent illnesses (urinary and gastrointestinal tract infections) evaluated through history, and outcome. Age, antecedent infection duration, time from infection resolution to CBS beginning, length of hospital stay, IVIg therapy duration and doses, HFG score, and standard deviation were all included in the analyzed continuous variables. Stratification, post-stratification, a chi-square test, and a p-value less than 0.05 were used to address effect modifiers such as age, gender, residential area, duration of hospital stay, duration of prior infections, time from residual infection to onset of GBS, IIG treatment doses and days, and chi-square test outcomes.

Results

Table 1 presents a comprehensive overview of the clinical characteristics of a group of patients diagnosed with Guillain-Barré Syndrome (GBS). The table provides insights into various demographic and medical factors related to the patient group. For instance, the table lists the mean age of the patients, which was 5.81 years with a standard deviation of 3.26 and a range spanning from 1 to 12 years. This variable offers essential information about the age distribution of the studied patient group.

Another variable in the table is the mean duration of antecedent infection, which was 3.61 months with a standard deviation of 1.23. The duration ranged from 2 to 6 months, indicating the time frame of antecedent infections preceding GBS diagnoses.

The mean time from residual infection to onset of GBS was 21.03 days with a standard deviation of 6.67, and the range extended from 1 to 32 days. This variable reveals the time interval between residual infection and the manifestation of GBS.

The mean duration of hospital stay was 41.10 days, with a standard deviation of 8.61. The minimum and maximum values were 20 and 60 days, respectively, which provides insights into the extent of medical care required for GBS patients during hospitalization.

Finally, the table also includes two variables related to the treatment of GBS. Although the details of these variables are not mentioned in the given text, they play an important role in providing a comprehensive understanding of the clinical characteristics of GBS patients. Table 2 provides a detailed comparison of outcomes on the Hughes Functional Grading (HFG) scale among patients diagnosed with Guillain-Barré Syndrome (GBS), taking into account various factors such as age, gender, residence status, duration of antecedent infection, time from residual infection to GBS onset, duration of hospital stay, duration of intravenous immunoglobulin (IVIG) treatment, and antecedent infection.

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Table 1: Clinical Characteristics of Patients with GBS (Guillain-Barré Syndrome)

Variable	Mean ± SD	Minimum	Maximum
Mean age of the patients (n=30)	5.81 ± 3.26	1	12
Mean duration of antecedent infection, months (n=23)	3.61 ± 1.23	2	6
Mean time from residual infection to onset of GBS, days (n=30)	21.03 ± 6.67	1	32
Mean duration of hospital stay, days (n=30)	41.10 ± 8.61	20	60
The mean duration of IVIG treatment, days (n=30)	3.81 ± 0.88	3	5
Mean doses of IVIG treatment (n=30)	1.53 ± 0.57	1	2
Mean HFG score of the patients (n=30)	3.03 ± 1.90	0	6

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Table 2: Comparison of HFG Scale Outcomes Across Different Factors

Variable	Subgroup	Good Outcome	Bad Outcome	Total	p-value
Age, years	≤6	11	8	19	0.858
	>6	6	5	11	
Gender	Males	8	5	13	0.638
	Females	9	8	17	
Residence status	Rural	14	5	19	0.013
	Urban	3	8	11	
Duration of antecedent infection, months	≤4	8	10	18	0.159
	>4	4	1	5	
Time from residual infection to onset of GBS, days	≤21	3	13	16	<0.001
	>21	14	0	14	
Duration of hospital stay, days	≤41	7	1	8	0.040
	>41	10	12	22	
Duration of IVIG	≤4	12	9	21	0.936
	>4	5	4	9	
Antecedent Infection	Upper RTI	9	7	16	0.558
	Gastrointestinal	3	4	7	
	None	5	2	7	

The analysis found significant associations between HFG scale outcomes and residence status, time from residual infection to GBS onset, and duration of hospital stay. Patients living in rural areas, those with a shorter time to GBS onset, and those with a more temporary hospital stay tend to have better outcomes. The p-value of 0.858 suggests no significant difference in HFG scale outcomes between patients aged ≤6 years and those > 6 years. With a p-value of 0.638, there is no significant difference in HFG scale outcomes between males and females. The p-value of 0.159 suggests no significant difference in HFG scale outcomes based on the duration of antecedent infection. The p-value of 0.936 indicates no significant difference in HFG scale outcomes based on the duration of IVIG treatment. The p-value of 0.558 suggests no significant difference in HFG scale outcomes based on the type of antecedent infection. The p-value of 0.013 indicates a significant association between residence status and HFG scale outcomes, with a higher proportion of good outcomes observed in rural areas. The highly significant p-value (<0.001) indicates a strong association between the time from residual infection to GBS onset and HFG scale outcomes, with better outcomes observed for cases with a shorter duration. A significant association is observed (p-value = 0.040), suggesting that a more temporary hospital stay is associated with a higher proportion of good outcomes.

These findings offer valuable insights for clinicians in predicting and managing GBS outcomes based on these factors.

Discussion

According to Menendez and Shakurnia (2016), Guillain-Barré syndrome is the leading cause of acute flaccid paralysis globally. When administered quickly and supportively, immunotherapy can be beneficial in some cases, even if the disease might progress quickly and be fatal in others (Chalela, 2001). A mean HFG score of 3.03 ±1.90 was recorded in the present investigation. Plus, out of the total patients included in this study, 21 (56.7%) had positive outcomes, and 9 (43.3%) had negative ones. A prior study also found somewhat similar results. On the HFG scale, 58% were considered healthy, 18% had mild symptoms, 12% could walk unassisted, 6% needed assistance, and 6% were bedridden.6 similarly, a study conducted in Pakistan with 31 cases of paediatric GBS cases found that the average HFG score decreased from admission to discharge. When the participants were followed up for three months, the average HFG score was 0.89 ± 1.12, indicating a positive result (Chand et al., 2017). Seventy-42 percent of children in a separate local trial with GBS demonstrated substantial improvement after 30 days. Only 7.4% had experienced severe handicaps by the 60-day mark (Momen & Shakurnia, 2016).

Regarding motor neurological recovery, 58% of the participants demonstrated normal or almost normal power, meaning they could walk alone, whereas 29% showed substantial residual weakness. In 58% of the instances reported by Halawa et al. (2011), functional recovery was complete or nearly complete. In 13% of the cases reported by Rees et al. (1998), there was substantial neurological dysfunction in adults. Results were better in Sweden (Cheng et al., 2000). Forty percent of patients showed signs of improvement after the first therapy. Results are proportional to the severity of the condition; patients with severe Guillain Barre Syndrome who need to be admitted to the paediatric intensive care unit (PICU) are not likely to respond well to treatment (Bazaraa et al., 2019).

There was a correlation between the severity of motor weakness and the likelihood of initial treatment failure. Another risk factor was the rate of weakness development within 24 hours. Other studies have also linked a quick onset of symptoms to a poor neurological outcome (McKhann et al., 1988). Axonopathy is one of the electrophysiological correlates linked to worse outcomes, quick advancement, and poor neurological outcomes (Sundar et al., 2005; Kumar et al., 2015). It has also been connected with protracted respiratory paralysis.

According to reports, the most prevalent subtype of GBS in Western countries is AIDP (Mitsui et al., 2015; Omejec & Podnar, 2012). However, axonopathy has been the underlying subtype in East Asia and South America,

according to Tang et al. (2011) and McGrogan et al. (2009). The AMAN type of axonopathy was present in 75% of our cases. The fact that this study only included severe patients requiring hospitalization to the PICU may have muddled the results. One of the more severe forms of the disease is axonal motor neuropathy (Kumar et al., 2015). However, although AIDP only accounted for 25% of all intensive care unit admissions during the study period, they responded best to the first treatment (Bazaraa et al., 2019).

While one study found that plasmapheresis was just as effective as intravenous immunoglobulin (IVIg) in treating GBS (Diener et al., 2001), another found that plasmapheresis significantly reduced hospital stays and increased the proportion of severe cases where children made a full recovery (Saad et al., 2016), and yet another found the opposite (El-Bayoumi et al., 2011). The reason behind this is that a large number of patients who need MV probably have an overabundance of autoantibodies, and when respiratory failure develops, a significant portion of these antibodies are linked to nerves. In contrast to inhibiting antibody generation with IVIg, PE might be more beneficial in removing antibodies from this group of patients (El-Bayoumi et al., 2011). Most patients in the research needed MV, and PE was the first line of treatment. The seven patients who got intravenous immunoglobulin (IVIg) had a better initial response, were younger, and needed less MV, but these differences did not achieve statistical significance (Cheng et al., 2000). According to Cheng et al. (2000), the study cannot conclude the differences between the two regimens because of its design. Due to the negative effects of corticosteroids on denervated muscle or their obstruction of macrophage repair mechanisms, the usage of steroids alone in GBS patients is quite contentious; recent studies have shown no therapeutic effects (Verboon et al., 2017). For patients with severe or prolonged GBS, some authors have suggested adding higher doses of intravenous steroids to the treatment plan, possibly in conjunction with intravenous immunoglobulin (IVIg) (van Koningsveld et al., 2004). An essential and contentious question is how to treat children who do not react well to the first round of treatment.

Conclusion

Good clinical outcome was found in 56.7% of children with Guillain-Barre Syndrome admitted to the intensive care unit of a tertiary care hospitalin Karachi.

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.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

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