Winter 4-1-2020

Identification of Factors Affecting Clinical Management and the Outcomes in Patients with Guillain Barre Syndrome

Vijaynarayana Kunhikatta Dr

Identification of Factors Affecting Clinical Management and the Outcomes in Patients with Guillain Barre Syndrome

A Project Report Submitted to

MANIPAL ACADEMY OF HIGHER EDUCATION

In partial fulfilment for the degree of Doctor of Pharmacy (Pharm D)

MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Submitted by

VAIDEHI BHATIA	POONAM KHANT	INGUVA VYSHNAVEE	MOHAMMED SHIYAF
(Reg No: 150614001)	(Reg No: 150614005)	(Reg No: 150614054)	(Reg no: 150614004)

Pharm D 5th Year

Department of Pharmacy Practice,

Manipal College of Pharmaceutical Sciences,

Manipal Academy of Higher Education, Manipal.

April 2020

Under the guidance of

GUIDE

Dr. Vijayanarayana K
M.Pharm, PhD
Associate Professor
Department of Pharmacy Practice,
Manipal College of Pharmaceutical Sciences,
Manipal Academy of Higher Education

CO-GUIDE

Dr. Girish Thunga
M.Pharm, PhD
Assistant Professor (Selection Grade)
Department of Pharmacy Practice,
Manipal College of Pharmaceutical Sciences,
Manipal Academy of Higher Education

CO-GUIDE

Dr.(Brig) Sankar Prasad Gorthi
MD, DNB (Gen Med), DM (Neurol)
Professor and Head
Department of Neurology
Kasturba Medical College
Manipal Academy of Higher Education

MANIPAL COLLEGE
OF PHARMACEUTICAL SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Certificate

This is to certify that this project report entitled, **"Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome"** by **Ms. Vaidehi Bhatia, Ms. Poonam Khant, Ms. Inguva Vyshnavee** and **Mr. Mohammed Shiyaf T** for the completion of 5th year Pharm.D comprises of the bonafide work done by them in the Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences and Kasturba Hospital, Manipal under the guidance of **Dr. Vijayanarayana K**, M.Pharm, PhD, Associate Professor, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal, **Dr. Girish Thunga**, M.Pharm, PhD, Assistant Professor (Selection Grade) Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education and **Dr.(Brig) Sankar Prasad Gorthi,** MD, DNB (Gen Med), DM (Neurol), Professor and Head, Department of Neurology Kasturba Medical College, Manipal Academy of Higher Education**.**

I recommend this piece of work for acceptance for the partial fulfilment on the completion of the 5th year Pharm.D program of the Manipal Academy of Higher Education, Manipal for the Academic year 2019-2020.

Place: Manipal

Date:

Dr. Vijayanarayana K, M.Pharm, PhD
Associate Professor
Department of Pharmacy Practice,
Manipal College of Pharmaceutical Sciences,
Manipal Academy of Higher Education,
Manipal – 576104 , Karnataka.

MANIPAL COLLEGE
OF PHARMACEUTICAL SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Certificate

This is to certify that this project report entitled, **"Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome"** by **Ms. Vaidehi Bhatia, Ms. Poonam Khant, Ms. Inguva Vyshnavee** and **Mr. Mohammed Shiyaf T** for the completion of 5th year Pharm.D comprises of the bonafide work done by them in the Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences and Kasturba Hospital, Manipal under the guidance of **Dr. Vijayanarayana K**, M.Pharm, PhD, Associate Professor, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal, **Dr. Girish Thunga**, M.Pharm, PhD, Assistant Professor (Selection Grade) Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education and **Dr.(Brig) Sankar Prasad Gorthi,** MD, DNB (Gen Med), DM (Neurol), Professor and Head, Department of Neurology Kasturba Medical College, Manipal Academy of Higher Education**.**

I recommend this piece of work for acceptance for the partial fulfilment on the completion of the 5th year Pharm.D program of the Manipal Academy of Higher Education, Manipal for the Academic year 2019-2020.

Dr. Girish Thunga

M.Pharm, PhD

Associate Professor (Selection grade)

Department of Pharmacy Practice,

Manipal College of Pharmaceutical Sciences,

Manipal Academy of Higher Education,

Manipal – 576104, Karnataka

Dr.(Brig) Sankar Prasad Gorthi

MD, DNB (Gen Med), DM (Neurol)

Professor and Head

Department of Neurology,

Kasturba Medical College,

Manipal Academy of Higher Education.

Manipal – 576104, Karnataka

.

MANIPAL COLLEGE OF PHARMACEUTICAL SCIENCES

MANIPAL

(A constituent unit of MAHE, Manipal)

Certificate

This is to certify that this project report entitled, **"Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome"** by **Ms. Vaidehi Bhatia, Ms. Poonam Khant, Ms. Inguva Vyshnavee** and **Mr. Mohammed Shiyaf T** for the completion of 5th year Pharm.D comprises of the bonafide work done by them in the Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences and Kasturba Hospital, Manipal under the guidance of **Dr. Vijayanarayana K**, M.Pharm, PhD, Associate Professor, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal, **Dr. Girish Thunga**, M.Pharm, PhD, Assistant Professor (Selection Grade) Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education and **Dr.(Brig) Sankar Prasad Gorthi,** MD, DNB (Gen Med), DM (Neurol), Professor and Head, Department of Neurology Kasturba Medical College, Manipal Academy of Higher Education**.**

I recommend this piece of work for acceptance for the partial fulfilment on the completion of the 5th year Pharm.D program of the Manipal Academy of Higher Education, Manipal for the Academic year 2019-2020.

Place: Manipal

Date:

Dr. Mahadev Rao, M.Pharm, PhD

Professor and Head,

Department of Pharmacy Practice,

Manipal College of Pharmaceutical Sciences,

Manipal Academy of Higher Education,

Manipal – 576104, Karnataka.

MANIPAL COLLEGE
OF PHARMACEUTICAL SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Certificate

This is to certify that this project report entitled **"Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome"** by **Ms. Vaidehi Bhatia, Ms. Poonam Khant, Ms. Inguva Vyshnavee** and **Mr. Mohammed Shiyaf T** for the completion of 5th year Pharm.D comprises of the bonafide work done by them in the Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences and Kasturba Hospital, Manipal under the guidance of **Dr. Vijayanarayana K**, M.Pharm, PhD, Associate Professor, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal, **Dr. Girish Thunga**, M.Pharm, PhD, Assistant Professor (Selection Grade) Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education and **Dr.(Brig) Sankar Prasad Gorthi,** MD, DNB (Gen Med), DM (Neurol), Professor and Head, Department of Neurology Kasturba Medical College, Manipal Academy of Higher Education**.**

I recommend this piece of work for acceptance for the partial fulfilment on the completion of the 5th year Pharm.D program of the Manipal Academy of Higher Education, Manipal for the Academic year 2019-2020.

Place: Manipal

Date

Dr. C. Mallikarjuna Rao, M.Pharm, PhD
Principal,
Manipal College of Pharmaceutical Sciences,
Manipal Academy of Higher Education,
Manipal-576104, Karnataka.

MANIPAL COLLEGE
OF PHARMACEUTICAL SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Declaration

We hereby declare that the project entitled **"Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome"** by **Ms. Vaidehi Bhatia, Ms. Poonam Khant, Ms. Inguva Vyshnavee** and **Mr. Mohammed Shiyaf T** was carried out under the guidance of **Dr. Vijayanarayana K**, M.Pharm, PhD, Associate Professor, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences, Manipal. The extent and source of information derived from the existing literature have been indicated throughout the project work at appropriate places. The work is original and has not been submitted in part or full for any diploma or degree purpose for this or any other university.

Place: Manipal

Date:

VAIDEHI BHATIA
(Reg No: 150614001)

POONAM KHANT
(Reg No: 150614005)

INGUVA VYSHNAVEE
(Reg No: 150614054)

MOHAMMED SHIYAF T
(Reg No: 150614004)

ACKNOWLEDGEMENT

First and foremost, praises and thanks to the God, for His showers of blessings throughout this study.

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of our project.

It is our privilege to express sincere regards to our guide **Dr. Vijayanarayana K**, who took keen interest on our project work and guided us all along, till the completion of the work.

We express deep sense of gratitude to our co-guide **Dr. Girish Thunga** for his constant support and encouragement.

We express our heartfelt thanks to our co-guide **Dr.(Brig) Sankar Prasad Gorthi** for his valuable suggestions and guidance.

We are extremely thankful to our HOD, **Dr. Mahadev Rao** for constantly encouraging us to stay abreast with the latest advancements and broaden our horizons.

We take this opportunity to thank all the staff of our department who have directly or indirectly helped in our project. Including non-teaching staff, **Mr. Abhilash** and **Mrs. Asha** for their endless support and cooperation.

We thank our principal, **Dr. C. Mallikarjuna Rao** for providing us with the infrastructure and facilities.

A special thanks to all our friends for their most valuable effort to help in every way possible.

We would also like to thank the staff of **Medical Record Department of Kasturba Hospital** for their contribution in successfully completing this study.

Last but not the least, we acknowledge our parents and family members for their unconditional love, encouragement and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES:

LIST OF ABBREVIATIONS

1. ICD – International Classification of Diseases
2. GBS – Guillain Barre Syndrome
3. AIDP – Acute Inflammatory Demyelinating Polyneuropathy
4. AMAN – Acute Motor Axonal Neuropathy
5. AMSAN – Acute Motor and Sensory Axonal Neuropathy
6. MFS – Miller Fisher Syndrome
7. NINDS – National Institute of Neurological Disorders and Stroke
8. CSF – Cerebrospinal Fluid
9. NCS – Nerve Conduction Studies
10. CMAP – Compound Muscle Action Potential
11. SNAP – Sensory Nerve Action Potential
12. SIADH – Syndrome of Inappropriate Anti-diuretic Hormone Hypersecretion
13. PRES – Posterior Reversible Encephalopathy Syndrome
14. RCVS – Reversible Cerebral Vasoconstriction Syndrome
15. GI – Gastrointestinal
16. BP – Blood Pressure
17. ACS – Acute Coronary Syndrome
18. NMDAR – Anti-N-Methyl-D-Aspartate Receptors
19. IVIg – Intravenous Immunoglobulin
20. APCBN – Acute Pharyngeal Cervicobrachial Neuropathy
21. ALS – Amyotrophic Lateral Sclerosis
22. DPN – Diabetic Polyneuropathy
23. CRF – Case Record Form
24. MRD – Medical Record Department
25. DAMA – Discharge Against Medical Advice

ABSTRACT

ABSTRACT

Introduction: Guillain Barre syndrome (GBS) is a rare autoimmune neurological disorder in which the body's immune system attacks part of its peripheral nervous system resulting in limb and cranial nerve weakness often with respiratory compromise and limitation on physical function. The worldwide incidence of GBS ranges from 0.81 to 1.89 cases per 100000 person-years. Various factors such as age, symptoms and disease form that influence the outcome of GBS have been previously studied. This study seeks the additional fundamental knowledge of the factors affecting clinical management and the outcome in patients with GBS.

Objective: To identify factors affecting clinical management and the outcomes in patients with GBS

Method: A retrospective observational study was conducted in tertiary care teaching hospital of Southern India. Institutional Ethics Committee approval was obtained prior to the study. GBS patients admitted between January 2014 to December 2019 were identified from Medical Record Department (MRD) patient files using International Classification of Diseases (ICD) code G61.0. Patient information on demographic, medical history, medication history, laboratory parameters, electrophysiological data, type of GBS, duration of hospitalization and drug treatment were retrieved from medical records. Factors associated with outcome were identified by multiple logistic regression and odds ratio (OR) was calculated.

Results: Based on inclusion and exclusion criteria, 212 cases of GBS were included in the study. The mean age of the GBS patients was 39.92 ±20.09 years and majority of the patients were male (n=142, 67%). The most commonly prescribed regimen was Intravenous Immunoglobulin (IVIgG) plus physiotherapy/occupational therapy (n=79, 37.3%) in which 74 (93.7%) patients showed improvement. Patients with Acute Motor and Sensory Axonal Neuropathy (AMSAN) variant (Adjusted OR=2.652; 95% CI 0.677-10.393), hypertension (Adjusted OR=2.839 95% CI 0.986-8.175), who consume alcohol (Adjusted OR=4.457; 95% CI 1.342-14.799), developed sepsis (Adjusted OR= 8.685 95% CI 1.556-48.471), cardiac arrest (Adjusted OR= 6.020 95% CI 0.835-43.401)and were ventilated (Adjusted OR= 2.319 95% CI 0.739-7.277) were associated with risk of poor outcome. Whereas those with Miller Fisher Syndrome (MFS) variant (Adjusted OR=0.144; 95% CI 0.009-2.205) and diabetes mellitus (Adjusted OR=0.464 95% CI 0.135-1.587) showed better outcome.

Conclusion: It was found that alcoholism, history of hypertension, development of sepsis and cardiac arrest, requirement of mechanical ventilation and AMSAN variant of GBS were potential risk factors for poor outcome in GBS patients. MFS variant and history of Diabetes mellitus were found to have a protective effect against the same.

INTRODUCTION

INTRODUCTION

1. Introduction

Guillain Barre syndrome (GBS) is a rare autoimmune neurological disorder in which the body's immune system attacks part of its peripheral nervous system resulting in limb and cranial nerve weakness often with respiratory compromise and limitation on physical function. [1]

In 19th century there were cases of rapidly progressive weakness that may have been acute inflammatory neuropathy. These cases were further studied by Guillain, Barre and Strohl in 1916, by careful interpretation of motor polyradiculoneuritis and characteristic albuminocytologic dissociation in cerebrospinal fluid, and thus justified their inclusion in its name. [2]

2. Epidemiology

The worldwide incidence of GBS ranges from 0.81 to 1.89 cases per 100000 person-years. [1] The male to female ratio of the disease is 1.25:1. Although GBS affects all ages, but a bimodal peak is observed which represents young adults and elderly. [4] It is lower in children at 0.34 to 1.34 per 100000 and increases after age 50 years from 1.7 to 3.3 per 100000. [3]

The incidence is increasing every year, however may vary based on quality of surveillance and geographical prevalence of causal factors.

3. Etiology

GBS may be preceded by gastrointestinal or respiratory infection weeks prior to its onset. This may be caused by bacterial (*Campylobacter jejuni, Mycoplasma pneumoniae*) or viral (Cytomegalovirus, Epstein-Barr virus) infection.

GBS may also been triggered by vaccination, underlying disease, surgery, certain malignancies, pregnancy, trauma and tissue transplantation.[5]

4. Pathophysiology

GBS results from an immune response that mistakenly attacks the hosts nerve tissue by recognizing a molecular similar epitope mechanism (molecular mimicry) [5] i.e. complement fixation of antibodies against peripheral nerve gangliocytes resulting in autoimmune nerve injury. The subtype and severity of the syndrome are partly determined by the nature of the preceding infection and specificity of such antibodies.

In case of bacterial infection, the walls of the bacteria contain ganglioside like epitopes that trigger antibody response in patients with GBS.[6]

5. Diagnosis

The most commonly used diagnostic criteria for GBS was developed by the National Institute of Neurological Disorders and Stroke (NINDS) in 1978. It is preferred by the clinicians as it includes the clinical features of typical and atypical types of GBS.

Lumbar puncture is done to obtain the cerebrospinal fluid. The CSF examination typically shows albuminocytological dissociation i.e. increase in protein or albumin level without increase in CSF cell count.

In addition, nerve conduction studies and electromyography can be done to assess nerve and muscle function. They are normal in early stage but show typical changes after a week or so with conduction block and multifocal motor slowing.

Further investigative procedures can be done to identify underlying cause and exclude diseases that mimic GBS:

-Chest X-ray, stool culture and immunological tests to rule out presence of cytomegalovirus, mycoplasma, zika virus, *C. jejuni* etc.

-Antibodies to gangliosides

MRI can be helpful for excluding differential diagnosis. The presence of nerve root enhancement on gadolinium-enhanced MRI is a sensitive feature of GBS, and can be useful in diagnosis, especially in children where other diagnostic measures can be challenging.

Ultrasound imaging of peripheral nerve reveals enlarged cervical nerve roots early in the disease course. This is a new diagnostic tool in GBS which helps in the early detection of the disease, but further validation is required. [9]

6. Variants

6.1 Acute inflammatory demyelinating polyneuropathy (AIDP)

The immune response damages the myelin coating and therefore interferes with the transmission of nerve signal.

The activated CD4 T-helper cells bind to specific antigen on myelin-producing Schwann cells or on myelin sheath itself [7], releasing cytokines which activate B-cell and macrophages. B-cell produce antibodies that mark the auto-antigen. Macrophages use those antibody markers to bind to and strip the myelin.

Patients with AIDP typically present with paraesthesia, muscle weakness and areflexia/hyporeflexia if motor nerves are affected; double vision and difficulty speaking if cranial nerves are involved; diaphragmatic muscle weakness; heart rate and blood pressure fluctuations, constipation, urinary retention in case of autonomic instability.

Nerve conduction studies (NCS) may show evidence of demyelination with distal latency

prolongation and conduction velocity slowing or blocked. This may be accompanied by temporal dispersion of compound muscle action potential (CMAP) configuration, giving the appearance of prolonged F-wave latencies. Sensory nerve studies may be abnormal- response at the hand more affected than those at the foot. [7,8]

6.2 Acute motor axonal neuropathy (AMAN)

In this the axon themselves are damaged by immune response.

AMAN is often associated to prior *C. jejuni* infection. The body produces antibodies against lipopolysaccharides on the bacterial membrane. These antibodies cross-react with the gangliosides at the node of Ranvier beneath the intact Schwann cells; gangliosides involved are GM1, GD1a, Ga1Nac-GD1a and GM1b. This leads to complement activation and macrophage invasion causing disruption of ion channel and blockade of conduction.

The patients present with symptoms similar to AIDP without sensory involvement. They manifest rapidly progressive weakness including craniobulbar and respiratory function.

NCS shows evidence of CAMP amplitude loss without demyelination features with normal sensory nerve action potential (SNAP).

6.3 Acute motor and sensory axonal neuropathy (AMSAN)

Similar to AMAN with ventral nerve root, dorsal nerve root and sensory fibre involvement. Gangliosides involved are GM1, GD1a and GM1b.

The patients present with symptoms similar to AIDP but with poor prognosis.

NCS shows evidence of severe axon loss of sensory and motor fibres without demyelinating features. [8]

6.4 Miller-fisher syndrome (MFS)

Involves the presence of GQ1b antigen on oculomotor nerves, sensory nerves, cerebellar neurons and cell-membrane of *C. jejuni.* Antibodies to this ganglioside inhibit synaptic transmission at the motor nerve terminals.

The patients present with ophthalmoplegia, ataxia and areflexia. Unilateral or bilateral facial weakness, dysphagia, dysarthria, abnormal pupillary reactivity and extremity weakness may also be seen.

NCS may show evidence of patchy loss of SNAP amplitude in the arm and leg without significant abnormalities along motor nerve trunks. They may also be loss of facial motor CMAP amplitudes and abnormalities of blink reflexes.[8]

7. Treatment

The cornerstone of therapy in GBS is IVIg and plasmapheresis.

Although IVIg is preferred over plasmapheresis due to its easy availability and greater convenience both are equally effective. However, the combination is not significantly superior over individual treatment options.

IVIg are dosed as 0.4gm/kg/day (2gm/day) for 5 consecutive days whereas plasmapheresis is performed 5 times on alternative days or during 2week with total 5 plasma volume exchange.

Corticosteroid monotherapy is not effective for treatment of GBS nevertheless short-term benefits, when combined IVIg therapy are noted.

Eculizumab, a monoclonal antibody was studied during a small randomized controlled trial (Japanese Eculizumab Trialist) where it did not show differences in primary end-points but they concluded it was an effective therapy for GBS. [11]

Physiotherapy should be started earlier during the course of the disease as it has shown to significantly improve muscle strength, functional ability and fatigue. [12] In case of severe fatigue a physical training program should be considered. Rehabilitation program should be started as soon as the patient begins to improve.

GBS patients who are symptomatic should be carefully observed for any fluctuations in blood pressure or heart rate, clinical signs of respiratory failure that may be signs of disease progression, and these should be managed at specialized centres. [13]

NEED FOR THE STUDY

NEED FOR THE STUDY

Need: GBS is a rare and important life-threatening disease that affects all age groups and gender. There are currently two treatments commonly used: plasmapheresis and high dose iv immunoglobulin G therapy that provide significant recovery for GBS. These therapies are costly and the cost increases with increase in severity- where the patient would need intensive medical care at that stage. Despite intensive care management of the patients with advanced form of GBS, the mortality and morbidity remain high. Various factors that influence the outcome of GBS have been previously studied. Patient age, symptoms and disease form influence the outcome whereas treatment method did not significantly influence the outcome. [14] This study seeks the additional fundamental knowledge of the factors affecting clinical management and the outcome in patients with GBS so as to reduce the burden of neurological disorders.

OBJECTIVES

OBJECTIVES

General objective:

- To identify factors affecting clinical management and the outcomes in patients with GBS

Specific objectives:

- To know the in-hospital prevalence of GBS.
- To study the clinical presentation & subtypes of GBS.
- To know the socio-demographic characteristics of GBS patients
- To know the co-morbid conditions, present in GBS patients
- To identify the complications that occur in GBS patients.
- To identify the risk factors affecting clinical management and outcome in patients with GBS using multiple logistic regression.

METHODOLOGY

METHODOLOGY

Study site: Tertiary care teaching hospital in Southern India.

Study design: Retrospective observational study.

Study period: 12 months (Data collected from Jan 2014 till Dec 2019)

Ethical clearance: Was obtained from the Institutional Ethical Committee, Kasturba Hospital, Manipal University, Manipal.

Sample size: 212 GBS cases diagnosed and admitted during Jan 2014 to Dec 2019

Study criteria:

Inclusion: All the patients admitted to intensive care units, medical wards and neurological wards of Kasturba Hospital, Manipal diagnosed with GBS.

Exclusion:

- Acute myelopathy
- Vasculitic neuropathy
- Myasthenia gravis
- Acute pharyngeal cervicobrachial neuropathy (APCBN)
- Botulism
- West Nile encephalomyelitis
- Amyotrophic lateral sclerosis (ALS)
- Diabetic polyneuropathy (DPN)
- Poliomyelitis
- Toxic neuropathy

Sources of data collection: Patient case records

Materials used: Case Record Form (CRF)

Operational modality

Identification of patient: GBS cases were identified from medical record department using ICD code G61.0.

Collection of Data:

Guillain Barre Syndrome (GBS) patients admitted during Jan 2014 to Dec 2019 were identified from MRD registry using ICD code G61.0. GBS patients who have fulfilled the inclusion criteria were selected and the following information was collected:

- Demographical data, clinical data, laboratory parameters, electrophysiology, medication history, comorbid conditions, type of GBS, treatment during hospital stay and outcomes

Interpretation of data:

- The data collected was analyzed to identify the factors that were correlated with the clinical management and outcome

Statistical Analysis:

Continuous data was expressed as mean ± SD. Nominal data was described and expressed in frequency and percentage. Univariate analysis was used to identify the risk factors affecting the clinical management and outcomes in patients with GBS, and calculation of unadjusted odds ratio. Odds ratio is a measure of the association between risk factors and outcome (not-improved). The factors identified in univariate analysis with $p<0.25$ were selected and taken for multiple logistic regression for calculation of p value and adjusted odds ratio. Data entry and statistical analysis were done using IBM SPSS software version 20.0.

RESULTS

RESULTS

A total of 254 patient records were identified with a confirmed diagnosis of GBS over a period of 6 years from January 2014 to December 2019 in Kasturba Hospital, Manipal. Among them 212 cases were included and the rest 42 were not considered either due to exclusion criteria or missing records.

1. Demographic and social characteristics of study population

The demographic and social characteristic of the study population are described in Table 1. The mean age of the GBS patients was 39.92 ±20.09 years. Majority of patients were in the age category of 30-60 years (n=104, 49.1%). In our study population majority of the patients were male (n=142, 67%). Alcohol consumption, smoking and tobacco use was observed in 24 (11.3%), 13 (6.1%) and 9 (4.2%) patients respectively.

In our study, majority of the patients (n=51, 24.1%) were include in services category such as company employees, teachers, bank employees, healthcare service etc.

Table 1: Demographic and social characteristics of study population

Parameter	**Frequency (%)**
Age (mean ± SD)	39.92 ± 20.09141
Age category • <30 • 30-60 • >60	 • 68 (32.1%) • 104 (49.1%) • 40 (18.9%)
Gender • Male • Female	 • 142 (67%) • 70 (33%)
Duration of hospitalization • (mean ± SD) • (median ± IQR)	 • 16.49 ± 19.35120 • 10.5 ± 10.75
Alcoholism • Yes • No	 • 24 (11.3%) • 188 (88.7%)
Smoking • Yes • No	 • 13 (6.1%) • 199 (93.9%)
Tobacco use • Yes • No	 • 9 (4.2%) • 203 (95.8%)
Occupation • Student • Farmer • Service • Housewife • Cooly • Fishing • Labour • No occupation	 • 41 (19.3%) • 30 (14.2%) • 51 (24.1%) • 39 (18.4%) • 19 (9%) • 4 (1.9%) • 4 (1.9%) • 24 (11.3%)

2. Types, complication and clinical outcomes of GBS

Types and complication of GBS and clinical outcomes in GBS patients are described in Table 2. AIDP was found to be the most common variant among the GBS patients (n=136, 64.2%). Total of 40 (18.9%) patients suffered from respiratory paralysis due to the disease. Out of 212 patients, 168 (79.2%) patients showed improvement whereas the remaining 44 (20.8%) did not show any improvement.

Table 2: Types, complications and clinical outcomes of GBS

Parameter	Frequency
Types of GBS	
• AIDP	• 136 (64.2%)
• AMAN	• 31 (14.6%)
• AMSAN	• 14 (6.6%)
• MFS	• 16 (7.5%)
• UNKNOWN	• 15 (7.1%)
Complications	
• Respiratory paralysis	• 40 (18.9%)
• Sepsis	• 12 (5.7%)
• Pulmonary embolism	• 3 (1.4%)
• Cardiac arrest	• 9 (4.2%)
• Others	• 26 (12.3%)
Clinical outcome	
• Unchanged	• 6 (2.8%)
• Improved	• 164 (77.4%)
• Recovered	• 4 (1.9%)
• Worsened	• 1 (0.5%)
• Expired	• 7 (3.3%)
• DAMA	• 30 (14.2%)

3. Signs and symptoms of GBS based on Diagnostic criteria

The signs and symptoms based on Diagnostic criteria for GBS published in Annals of Neurology as requested by NINDS in 1978 are given in Table 3. Progression of symptoms over days to 4weeks and Relative symmetry (n=206, 97.2%) were observed in most patients followed by Areflexia or hyporeflexia (n=203, 95.8%) and positive EMG/nerve conduction velocity studies (n=174, 82.1%) and Progressive weakness in both arms and legs (n=161, 75.9%).

Table 3: Signs and symptoms of GBS based on Diagnostic criteria

Signs and symptoms	**Frequency (%)**
Progressive weakness in both arms and legs	161 (75.9%)
Areflexia or hyporeflexia	203 (95.8%)
Progression of symptoms over days to 4weeks	206 (97.2%)
Relative symmetry	206 (97.2%)
Mild sensory signs and symptoms	73 (34.4%)
Cranial nerve involvement, especially bilateral facial weakness	81 (38.2%)
Recovery beginning 2 to 4 weeks after progression ceases	1 (0.5%)
Autonomic dysfunction	76 (35.8%)
Absence of fever at onset	147 (69.3%)
Typical CSF (albuminocytologic dissociation)	92 (43.4%)
EMG/nerve conduction velocity studies (characteristic signs of demyelinating process in the peripheral nerves)	174 (82.1%)
Asymmetrical weakness	3 (1.4%)

4. Possible etiological factors of GBS

Possible etiological factors of GBS are described in Table 4. Diarrhoea (n=29, 13.7%) was found to be the most common etiological factor among GBS patients studied followed by pesticide exposure (n=28, 13.2%) and vaccine (n=26, 12.3%)

Table 4: Possible etiological factors of GBS

Possible etiological factors	**Frequency (%)**
Viral infection	12 (5.7%)
Vaccine	26 (12.3%)
Bacteria	1 (0.5%)
Diarrhoea	29 (13.7%)
Surgery	10 (4.7%)
Pesticide exposure	28 (13.2%)

5. Comorbidities

The comorbid conditions in the GBS patients are given in Table 5. Hypertension (n=38, 17.9%) and diabetes (n=32, 15.1%) were the most common comorbid observed in GBS patients.

Table 5: Comorbidities

Disease/Conditions	Frequency (%)
Hypertension	38 (17.9%)
Diabetes	32 (15.1%)
Ischemic Heart Disease	5 (2.4%)
Rheumatoid Heart Disease	1 (0.5%)
Respiratory Tract Infection	3 (1.4%)
Thyroid disorders	3 (1.4%)
Bronchial asthma	7 (3.3%)
Dyslipidaemia	2 (0.9%)
Epilepsy	2 (0.9%)
Tuberculosis	1 (0.5%)

6. Treatment in GBS

Different treatment regimens that are given to the patients are shown in Table 6. The most commonly prescribed regimen was IVIgG plus physiotherapy/occupational therapy (n=79, 37.3%) in which 74 (93.7%) patients showed improvement, followed by physiotherapy/occupational therapy (n=32, 15.1%) in which 26 (81.3%) patients showed improvement and IVIgG + Physiotherapy/occupational therapy + Corticosteroids (n=18, 8.5%) in which 16(88.9%) patients showed improvement.

Most of the patients who did not opt to take any therapy (n=34, 16.0%) were discharged against medical advice (n=22, 64.7%) and few of them (n=11, 32.4%) showed improvement in their symptoms with time.

Table 6: Treatment in GBS

Types of treatment	**Frequency (%)**	IMPROVED	NOT IMPROVED
A only	12 (5.7%)	11 (91.7%)	1 (8.3%)
A + B	79 (37.3%)	74 (93.7%)	5 (6.3%)
A + C	3 (1.4%)	3 (100%)	0
A + B + C	18 (8.5%)	16 (88.9%)	2 (11.1%)
D only	1 (0.5%)	0	1 (100%)
D + B	13 (6.1%)	12 (92.3%)	1 (7.7%)
D + C	1 (0.5%)	0	1 (100%)
D + B + C	4 (1.9%)	2 (50%)	2 (50%)
B only	32 (15.1%)	26 (81.3%)	6 (18.8%)
C only	5 (2.4%)	3 (60%)	2 (40%)
B + C	9 (4.2%)	9 (100%)	0
A + D + B	1 (0.5%)	1 (100%)	0
No therapy	34 (16.0%)	11 (32.4%)	23 (67.6%)

KEY:
- A- IVIgG
- B- Physiotherapy/Occupational therapy
- C- Corticosteroids
- D- Plasmapheresis

7. Identification of factors affecting outcome in GBS patients by univariate analysis.

The factors that significantly affect the outcomes in GBS are given in Table 7 along with their odds ratio and *p* value.

Table 7: Results of Univariate analysis of factors affecting outcome in GBS patients

Parameter	**Pearson chi square**	**p value**	**odd ratio (95% CI)**	**Percentage not improved**
Age category • <30 • >60	 8.665 6.083	 0.003 0.014	 0.270 (0.108-0.675) 2.549 (1.192-5.449)	 8.8% 35%
AMSAN	4.452	0.035	3.158 (1.034-9.640)	42.9%
MFS	2.214	0.137	0.237 (0.030-1.947)	6.2%
Smoking	9.221	0.002	5.108 (1.622-16.091)	53.8%
Alcohol	14.074	0.001	4.875 (2.010-11.823)	50%
Hypertension	7.285	0.007	2.800 (1.300-6.033)	36.8%
Diabetes	2.524	0.112	1.952 (0.846-4.501)	31.2%
Vaccine	5.151	0.023	0.133 (0.018-1.010)	3.8%
Respiratory paralysis	2.562	0.109	1.875 (0.861-4.081)	30%
Sepsis	16.302	0.001	9.111 (2.602-31.905)	66.7%
Pulmonary embolism	3.900	0.048	7.952 (0.704-89.806)	66.7%
Cardiac arrest	18.582	0.001	15.703 (3.136-78.664)	77.8%
Ventilation	8.030	0.005	2.691 (1.337-5.415)	33.9%

8. Identification of factors affecting outcome in GBS patients by Multiple Logistic Regression.

The factors identified in univariate analysis with $p < 0.25$ were selected and taken for multiple logistic regression. The result of multiple logistic regression along with adjusted OR, 95% CI and p value is presented in Table 8.

The association remain intact only with certain variables and rest may have failed to show higher intensity of the association to odds ratio due to the presence of confounding factors.

Patients with AMSAN variant (Adjusted OR=2.652; 95% CI 0.677-10.393) of GBS had a higher risk of poor outcome whereas those with MFS (Adjusted OR=0.144; 95% CI 0.009-2.205) variant showed better outcome.

Patients who consume alcohol (Adjusted OR=4.457; 95% CI 1.342-14.799) were associated with risk of poor outcome.

Patients with hypertension (Adjusted OR=2.839 95% CI 0.986-8.175) of GBS had a higher risk of poor outcome whereas those with diabetes mellitus (Adjusted OR=0.464 95% CI 0.135-1.587) showed better outcome.

Patients who developed sepsis (Adjusted OR= 8.685 95% CI 1.556-48.471) and cardiac arrest (Adjusted OR= 6.020 95% CI 0.835-43.401) were associated with risk of poor outcome in GBS.

Patients who were ventilated (Adjusted OR= 2.319 95% CI 0.739-7.277) were associated with risk of poor outcome.

Table 8: Results of Multivariate analysis of factors affecting outcome in GBS patients

Parameter	p value	Adjusted odd ratio (95% CI)	Percentage not improved	Percentage improved
AMSAN	0.162	2.652 (0.677-10.393)	42.9%	57.1%
MFS	0.164	0.144 (0.009-2.205)	6.2%	93.8%
Alcohol	0.015	4.457 (1.342-14.799)	50%	50%
Hypertension	0.053	2.839 (0.986-8.175)	36.8%	63.2%
Diabetes Mellitus	0.221	0.464 (0.135-1.587)	31.2%	68.8%
Sepsis	0.014	8.685 (1.556-48.471)	66.7%	33.3%
Cardiac arrest	0.075	6.020 (0.835-43.401)	77.8%	22.2%
Ventilation	0.149	2.319 (0.739-7.277)	33.9%	66.1%

DISCUSSION

DISCUSSION

This retrospective study performed on 212 GBS patients revealed several factors that affect outcome, by multivariate analysis. The mean age of the GBS patients was 39.92 ±20.09 years. In our study population majority of the patients were male (n=142, 67%).

The most commonly prescribed regimen was IVIgG plus physiotherapy/occupational therapy (n=79, 37.3%) in which 74 (93.7%) patients showed improvement.

Among the different variants of GBS, patient with AMSAN (Adjusted OR=2.652; 95% CI 0.677-10.393) showed to have high risk of poor outcome whereas those with MFS (Adjusted OR=0.144; 95% CI 0.009-2.205) showed to have better outcome. Yitao Z et al. stated that among the variants of GBS, the prognosis of MFS was the best. [22] Amin B et al. observed that AMSAN variant was associated with the worst outcome in GBS. [23]

Alcoholism was assessed to be a potential risk factor for poor outcome in GBS patients (Adjusted OR=4.457; 95% CI 1.342-14.799). Thomas J et al. stated that NCS conducted among chronic alcohol abusers had higher rates of neuropathy, with 10% representing polyneuropathies. [15] Ammendola et al showed an increased duration of alcoholism and higher total life time dose of ethanol in group with neuropathy compared to alcoholics without neuropathy. [16]

Hypertension was found to be a risk factor for poor outcome in GBS patients (Adjusted OR=2.839 95% CI 0.986-8.175). Ferraro-Herrera AS et al. observed hypertension in 60-70% of the patients with GBS and marked it to be a bad prognostic sign. [17] Eiben et al. noted that 60% of all GBS patients developed hypertension with higher incidence of respiratory failure (95%) and 20% mortality rate. [18] Gupta S et al. through univariate analysis found that cardiovascular complications including hypertension (28.12%) was associated with poor outcome in GBs patients. [19]

Diabetes mellitus was found to be statistically significant but protective factor in the patients (Adjusted OR=0.464 95% CI 0.135-1.587). However, Bae JS et al through multivariate analysis identified diabetes mellitus as an independent factor for poor outcome in patients with GBS (OR= 9.049, 95% CI 2.152-38.044).[20]. In our study, most of the patients who had diabetes mellitus received IVIg plus physiotherapy/occupational therapy, which was found to be the best possible

treatment as it has the highest percentage of improved patients. Hence, this may be the confounding factor that resulted in diabetes mellitus being a protecting factor.

Sepsis was found to be a risk factor for poor outcome in patients with GBS (Adjusted OR= 8.685 95% CI 1.556-48.471). Netto A et al. stated that sepsis among other complications was considered significant in causing death (p=0.38), Hughes scale ≤3 (p=0.015), prolonged mechanical ventilation > 21 days (p=0.058) or prolonged hospitalization >36 days (p=0.019).[21]

Cardiac arrest was found to be a risk factor for poor outcome in patients with GBS (Adjusted OR=6.020 95% CI 0.835-43.401). Gupta S et al. observed that 54.2% of patients developed cardiovascular complications including cardiac arrest which showed significant association with poor outcome as revealed by the results of univariate analysis. [19]

Mechanical ventilation was found to be a risk factor for poor outcome in patients with GBS (Adjusted OR= 2.319 95% CI 0.739-7.277). Yitao Z et al. reported 14.4% incidence of mechanical ventilation in patients with GBS with worse MRC score at discharge for those patients. [22]

LIMITATIONS

LIMITATIONS

1. The general limitations of a retrospective study apply to this study also. The residual disability associated with GBS cannot be directly assessed.

2. Some clinical parameters which have been reported as factors affecting outcome in the previous studies but didn't show statistical difference in our study such as age, maybe due to confounding factors.

3. Failure to categorize the variant of GBS in some patients due to lack of sufficient data or NCV not conducted for some patients.

CONCLUSION

CONCLUSION

Guillain Barre syndrome (GBS) is a rare autoimmune neurological disorder in which the body's immune system attacks part of its peripheral nervous system resulting in limb and cranial nerve weakness often with respiratory compromise and limitation on physical function. In our study the mean age of the GBS patients was 39.92 ±20.09 years and majority of the patients were male (n=142, 67%).

The most commonly prescribed regimen was IVIgG plus physiotherapy/occupational therapy (n=79, 37.3%) in which 74 (93.7%) patients showed improvement. Out of 212 GBS patients studied, 168 (79.2%) patients showed improvement whereas the remaining 44 (20.8%) did not show any improvement.

The risk factors that resulted in poor outcome in these patients were alcohol intake, medical history of hypertension, complications such as sepsis and cardiac arrest and mechanical ventilation support. Also, patient with AMSAN variant of GBS showed poor outcome whereas patients with MFS variant of GBS had better outcome. Medical history of diabetes was found to have a protective action against poor outcome in GBS.

.

BIBLIOGRAPHY

References:

1. Walteros D, Soares J, Styczynski A, Abrams J, Galindo-Buitrago J, Acosta-Reyes J, et al. Long-term outcomes of Guillain-Barré syndrome possibly associated with Zika virus infection. PLOS ONE. 2019; 14(8): p.e0220049

2. Winer JB. Treatment of GBS. QJM. Nov 2002; 95(11): 717-721

3. Dimachkie MM, Barohn RJ. Guillain-Barré Syndrome and Variants. Neurologic Clinics. Feb 2013; 31(2): 491–510

4. Lynn CG, Jeffrey MK, Cynthia C. Pediatric Clinical Advisor- Instant Diagnosis and Treatment. 2nd ed. New York: Mosby; 2007. 231-232p

5. Avila-Funes JA, Mariona-Montero VA, Melano-Carranza E. Guillain-Barre syndrome: etiology and pathogenesis. Europe PMC. Jul 2002; 54(4): 357-363

6. Hughes RAC, Hadden RDM, Gregson NA, Smith KJ. Pathogenesis of Guillain–Barré syndrome. Journal of Neuroimmunology. Dec 1999; 100(1-2): 74-97

7. Hardy TA, Blum S, McCombe PA, Reddel SW. Guillain-Barré Syndrome: Modern Theories of Etiology. Current Allergy and Asthma Reports. 2011; 11(3): 197–204

8. Levin KH. Variants and Mimics of Guillain Barré Syndrome. The Neurologist. 2004; 10(2): 61–74

9. Leonhard SE, Mandarakas MR, Gondim FAA. et al. Diagnosis and management of Guillain–Barré syndrome in ten steps. Nat Rev Neurol. 2019; 15: 671–683

10. Wang Y, Zhang HL, Wu X, Zhu J. Complications of Guillain-Barré syndrome. Expert Review of Clinical Immunology. 2016; 12(4): 439–448

11. Misawa S, Kuwabara S, Sato Y et al. Safety and efficacy of eculizumab in Guillain-Barré syndrome: a multicentre, double-blind, randomised phase 2 trial. Lancet Neurol. 2018; Jun 2018; 17(6): 519-529

12. Shah N, Shrivastava M. Role of Physiotherapy in Guillain Barre Syndrome: A Narrative Review. International Journal of Health Sciences & Research. Sept 2015; 5(9): 529-540

13. Meena AK, Khadilkar SV, Murthy JMK. Treatment guidelines for Guillain–Barré Syndrome. Annals of Indian Academy of Neurology. Jul 2011; 14(1): S73-S81

14. Seta T, Nagayama H, Katsura K et al. Factors influencing outcome in Guillain Barre Syndrome: comparison of plasma adsorption against other treatments. Clin Neurol Neurosurg. Oct 2005; 107(6): 491-6

15. Thomas J, Nicholas G, Rubiya S et al. Alcohol-related peripheral neuropathy: a systematic review and meta-analysis. J Neurol. 2019; 266(12): 2907-2919

16. Ammendola A, Tata MR, Aurilio C et al. Peripheral neuropathy in chronic alcoholism: a retrospective cross-sectional study in 76 subjects. Alcohol and alcoholism. 2001; 36(3): 271-275

17. Ferraro-Herrera AS, Kern HB, Nagler W. Autonomic dysfunction as the presenting feature of Guillain Barre Syndrome. Arch Phys Med Rehabil. 1997; 78:777-9

18. Eiben RM, Gerson WM. Recognition, prognosis and treatment of the Guillain Barre syndrome. Med Clin North Am. 1963; 47:1371-80

19. Gupta S, Verma R, Sethi R et al. cardiovascular complications and its relationship with functional outcomes in Guillain Barre syndrome. QJM. Feb 2020; 113(2):93-99

20. Bae JS, Kim YJ, Kim JK. Diabetes mellitus exacerbates the clinical and electrophysiological features of Guillain Barre syndrome. Eur J Neurol. Mar 2016; 23(3): 439-46

21. Netto A, Taly A, Kulkarni G et al. Complications in mechanically ventilated patients of Guillain Barre syndrome and their prognostic value. J Neurosci Rural Pract. Jan-Mar 2017; 8(1): 68-73

22. Yitao Z, Yanyin Z, Yi W. Prognostic factors of Guillain Barre syndrome: a 111-case retrospective review. Chinese Neurosurgical Journal. June 2018; 4(14)

23. Amin B, Meghnathi H, Gajjar MD et al. Impact of electrophysiological and clinical variants, and timing of plasmapheresis on outcome of Guillain Barre syndrome. J Assoc Physicians India. Nov 2017; 65(11): 14-15

APPENDICES

Appendix - I

KASTURBA HOSPITAL
MANIPAL
(An associate Hospital of MAHE, Manipal)

Kasturba Medical College and Kasturba Hospital
Institutional Ethics Committee
(Registration No. ECR/146/Inst/KA/2013/RR-16)

Communication of the decision of the Institutional Ethics Committee

Wednesday 14th August 2019 **IEC : 543/2019**

Project title	:	Identification of factors affecting clinical management and the outcomes in patients with Guillain Barre Syndrome.
Principal Investigator	:	Miss. Vaidehi Bhatia
Guide/ Co Guide/ Co Investigators	:	Dr. Vijayanarayana K, Poonam Khant, Inguva Vyshnavee, Mohammed Shiyaf T, Dr. Girish Thunga, Dr.(Brig) Sankar Prasad Gorthi
Name & Address of Institution	:	Department of Pharmacy Practice, MCOPS, MAHE, Manipal, Department of Neurology, KMC, MAHE, Manipal.
Status of review	:	New
Date of review	:	13.08.2019
Decision of the IEC	:	Approved for the study period from 13.08.2019 to 12.08.2020.

- The PI and all members of the project shall ensure compliance to current regulatory provisions (as per Schedule Y of Drugs and Cosmetics Act and ICH-GCP), Ethical Guidelines for Biomedical Research on Human Participants by ICMR, and the SOP of IEC including timely submission of Interim Annual Report and Final Closure Report
- Participant Information Sheet and a copy of signed Informed Consent shall be given to every research participant
- Inform IEC in case of any proposed amendments (change in protocol / procedure, site / Investigator etc)
- Inform IEC immediately in case of any Adverse Events and Serious Adverse Events.
- Members of IEC have the right to monitor any project with prior intimation.

Dr. Rajeshkrishna Bhandary P
MEMBER SECRETARY - IEC

ETHICS COMMITTEE KASTURBA HOSPITAL, MANIPAL APPROVED

IEC Secretariat, Room No. 22, Ground Floor, Faculty Room Complex, Kasturba Medical College Premises,
Kasturba Medical College, Manipal - 576104, Karnataka, India. Phone : +91 - 0820 - 2933522,Fax : +91 - 0820 - 2571927. Email : iec.kmc@manipal.edu

(Yoga and Ayurveda services are excluded from the scope of NABH accreditation)

Appendix – II

CASE RECORD FORM (CRF)
STUDY: IDENTIFICATION OF FACTORS AFFECTING CLINICAL MANAGEMENT AND THE OUTCOMES IN PATIENTS WITH GUILLAIN BARRE SYNDROME
DEPARTMENT OF PHARMACY PRACTICE, KASTURBA HOSPITAL, MANIPAL

Unique ID:	Weight:	Date of Admission:
Age:	Height:	Date of Discharge:
Sex:	BMI:	Duration of stay:

Complaints on Admission:

Personal history:	Smoking: Yes ☐ No ☐
Occupation:	Previous allergies:
Medication history:	Previous steroids: Yes ☐ No ☐

Medical History:

DIAGNOSIS:

Required features	Features supportive of diagnosis	Features casting doubt on the diagnosis	Features that rule out the diagnosis
☐ Progressive weakness in both arms and legs ☐ Areflexia (or hyporeflexia)	☐ Progression of symptoms over days to 4 weeks ☐ Relative symmetry ☐ Mild sensory signs or symptoms ☐ Cranial nerve involvement, especially bilateral facial weakness ☐ Recovery beginning 2 to 4 weeks after progression ceases ☐ Autonomic dysfunction ☐ Absence of fever at onset ☐ Typical CSF (albuminocytologic dissociation) ☐ EMG/nerve conduction studies (characteristic signs of a demyelinating process in the peripheral nerves)	☐ Asymmetrical weakness ☐ Persistent bladder and bowel dysfunction ☐ Bladder or bowel dysfunction at onset ☐ >50 mononuclear leukocytes/mm^3 or presence of polymorphonuclear leukocytes in CSF ☐ Distinct sensory level.	☐ Hexacarbon abuse ☐ Abnormal porphyrin metabolism ☐ Recent diphtheria infection ☐ Lead intoxication ☐ Other similar conditions: poliomyelitis, botulism, hysterical paralysis, toxic neuropathy

Idiopathic ☐	Viral Origin ☐	vaccine ☐	Underlying Disease ☐	Bacterial origin ☐	surgery ☐	others ☐
	.....	.....	.....	.....	.....	.....

Type: **AIDP** ☐ **AMAN** ☐ **AMSAN** ☐ **MFS** ☐										
COMPLICATIONS: Respiratory paralysis ☐ Sepsis ☐ Pulmonary embolism ☐ Cardiac arrest ☐ Others ☐										
DAILY PROGRESS CHART										
Parameter										
Heart Rate										
Blood Pressure										
Respiratory Rate										
Temperature										
ECG:										

TREATMENT: IVIgG ☐ Plasmapheresis ☐ Physiotherapy/occupational therapy ☐ Others: ☐

Ventilation given: Yes ☐ No ☐										
FEV										
FVC										
SpO2										
SpCO2										
COST										
Medication charges:										
Physiotherapy/occupational therapy:										
Consultation charges:										
Investigational charge:										
Cardiac and respiratory monitoring charges:										
Nursing charges:										
Bed charges:										
Other charges:										
TOTAL COST:										
OUTCOMES: Unchanged ☐ Improved ☐ Recovered ☐ Worsened ☐ Expired ☐ DAMA ☐										