



St. Paul's Hospital Millennium Medical College Graduate Study Program

A thesis submitted to the Department of Internal Medicine for Partial fulfillment of
the Requirements for specialty in Internal Medicine

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Full title of the research project	Factors affecting the outcome of GBS patients admitted to SPHMMC and ZMH
Duration of the project	October 2025 -March 2026
Study area	St. Paul's hospital millennium medical college and Zewditu memorial hospital, Addis Ababa, Ethiopia
Total cost of the project	75,000 ETB
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Acknowledgment

I would like to extend my heartfelt thanks to my advisor, Dr. Firaoly for generously sharing her expertise and wisdom. Your encouragement and patience have been invaluable in guiding me to complete this thesis. Additionally, I am deeply grateful to the St. Paul's Hospital Millennium Medical College Department of Internal Medicine for providing me with the opportunity to develop this research thesis.

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Acronyms and Abbreviations

AIDP.....	Acute Inflammatory Demyelinating Polyneuropathy
AMAN.....	Acute Motor Axonal Neuropathy
AMSAN.....	Acute Motor-Sensory Axonal Neuropathy
AOR.....	Adjusted Odds Ratio
CI.....	Confidence Interval
CSF.....	Cerebrospinal Fluid
EMA.....	Ethiopian Medical Association
EPHA.....	Ethiopian Public Health Association
ESN.....	Ethiopian Society of Neurologists
GBS.....	Guillain-Barré Syndrome
HFGS.....	Hughes Functional Grading Scale
HIV.....	Human Immunodeficiency Virus
ICU.....	Intensive Care Unit
IQR.....	Interquartile Range
IRB.....	Institutional Review Board
IVIG.....	Intravenous Immunoglobulin
LMIC.....	Low- and Middle-Income Country
LOS.....	Length of Stay
MRN.....	Medical Record Number
NCS.....	Nerve Conduction Study
NINDS.....	National Institute of Neurological Disorders and Stroke
PLEX.....	Plasma Exchange
SD.....	Standard Deviation
SPHMMC.....	St. Paul's Hospital Millennium Medical College
TASH.....	Tikur Anbessa Specialized Hospital
VIF.....	Variance Inflation Factor
ZMH.....	Zewditu Memorial Hospital

Abstract

Background: Guillain-Barré syndrome (GBS) is an acute immune-mediated polyneuropathy with significant mortality and disability. Outcomes in low- and middle-income countries are substantially poorer than in high-income settings, but institution-specific data from Ethiopia remain limited.

Objective: To identify factors associated with in-hospital mortality and functional recovery among GBS patients admitted to St. Paul's Hospital Millennium Medical College and Zewditu Memorial Hospital, Addis Ababa, Ethiopia.

Methods: A retrospective cohort study was conducted among 50 patients with GBS admitted between 2022 and 2026. Data on demographic, clinical, laboratory, treatment, and outcome variables were extracted from medical records. In-hospital mortality was the primary outcome. Functional recovery was assessed at discharge and at three months using the GBS Disability Score. Logistic regression was used to identify predictors of mortality.

Results: The in-hospital mortality rate was 16% (8/50). The mean age was 35.2 years (SD 15.0), and 78% were male. Preceding diarrheal illness was reported in 38% of patients, and 52% required mechanical ventilation. In multivariable analysis, preceding diarrheal illness (adjusted odds ratio 11.88, 95% confidence interval 1.08–130.58, $p=0.043$) and mechanical ventilation (adjusted odds ratio 44.78, 95% confidence interval 1.94–1035.80, $p=0.018$) were independent predictors of mortality. Higher GBS disability score at admission was associated with mortality in univariate analysis (crude odds ratio 5.48 per one-point increase, $p=0.035$). At discharge, only 4% of patients had good functional recovery. Among 18 patients with three-month follow-up, 61% achieved good recovery.

Conclusion: Mortality from GBS in Ethiopian referral hospitals remains high. Preceding diarrheal illness and the need for mechanical ventilation are strong independent predictors of death. Early risk stratification and improved access to respiratory support and immunomodulatory therapy are urgently needed to improve outcomes.

Keywords: Guillain-Barré syndrome, mortality, mechanical ventilation, preceding diarrheal illness, Ethiopia, functional recovery

1. Introduction

1.1 Statement of the problem

Guillain-Barré Syndrome represents a neurological emergency where outcomes are critically dependent on timely, specialized medical care. In high-resource settings, systematic management has reduced mortality to below 5% (1). In stark contrast, studies from low-resource countries report significantly higher mortality, exceeding 15-20% in some sub-Saharan African contexts (2).

In Ethiopia, the limited available data paints a concerning picture. A study at Tikur Anbessa Specialized Hospital in Addis Ababa reported a mortality rate of 18.9% among GBS patients, with factors like delayed presentation, respiratory failure, and autonomic dysfunction contributing to poor outcomes (3). Similarly, research from Jimma University Medical Center identified the need for mechanical ventilation and pneumonia as significant predictors of death (4). These findings underscore a substantial national burden.

Despite these insights, a critical gap persists. St. Paul's Hospital Millennium Medical College (SPHMMC) and Zewditu memorial hospital (ZMH), as a major national referral and teaching hospital, manages a significant volume of severe GBS cases. However, there is no institution-specific analysis to determine the mortality rate, patterns of functional recovery, or the specific constellation of factors demographic, clinical, therapeutic, and logistical that dictate patient outcomes within its unique care ecosystem. The absence of this localized evidence hinders the development of targeted clinical protocols, rational resource allocation (such as for IVIG or ICU beds), and effective quality improvement initiatives at SPHMMC and ZMH.

Consequently, without a clear understanding of the predictors of mortality and poor recovery, clinicians at SPHMMC and ZMH may be unable to proactively identify high-risk patients for intensified monitoring and intervention. This study, therefore, seeks to address this gap by systematically investigating the factors affecting the outcomes of GBS patients admitted to SPHMMC and ZMH. The findings will provide an essential evidence base for improving patient care, guiding hospital policy, and ultimately reducing GBS-related morbidity and mortality at this key institution.

1.2 Literature Review

1.2.1 Clinical Spectrum, Diagnosis, and Standard Management

Clinically, GBS presents with progressive motor weakness that typically ascends from the lower to upper limbs, often accompanied by sensory symptoms and cranial nerve involvement, most notably bilateral facial palsy. Autonomic dysfunction, manifesting as labile blood pressure, cardiac arrhythmias, and ileus, is a common and potentially life-threatening complication (5). The diagnosis remains primarily clinical, supported by cerebrospinal fluid (CSF) analysis showing albuminocytological dissociation (elevated protein with normal cell count) and nerve conduction studies (NCS) revealing features of demyelination or axonal loss (6).

The standard of care in high-income countries involves supportive therapy in tandem with specific immunomodulation. Two treatments with Class I evidence are therapeutic plasma exchange (PLEX) and intravenous immunoglobulin (IVIG), which are equally effective if administered within the first two weeks of symptom onset (7). The pivotal role of supportive care, particularly timely respiratory monitoring and mechanical ventilation for the 20-30% of patients who develop respiratory failure, cannot be overstated (5). Access to multidisciplinary rehabilitation is also crucial for long-term functional recovery (8).

1.2.2. Factors Affecting GBS Outcomes: Evidence from Global Studies

Patient outcomes are heterogeneous and influenced by a complex interplay of factors. Systematic reviews and cohort studies from high-resource settings have identified several key determinants of poor prognosis (defined as death or inability to walk independently at one year).

Clinical Severity at Presentation: A high clinical disability grade at admission (e.g., Hughes Functional Grading Scale ≥ 3), rapid progression to peak disability (< 7 days), and severe muscle weakness on admission are consistent predictors of poor outcome and need for ventilation (9, 10).

Demographic Factors: Advanced age, particularly over 60 years, is strongly associated with higher mortality, increased likelihood of respiratory failure, and poorer functional recovery (11).

Electrophysiological Subtype: The axonal forms of GBS (especially Acute Motor Axonal Neuropathy) are generally associated with more severe initial weakness and a slower, often less complete, recovery compared to the demyelinating forms (12).

Preceding Infections: Diarrheal illness, often linked to *C. jejuni*, is associated with the axonal subtype, more severe disease, and residual disability (13).

Treatment-Related Factors: Delay in initiating immunotherapy (IVIG or PLEX) beyond two weeks from onset is linked to poorer outcomes (7). The equivalence of IVIG and PLEX is well-established, though some studies suggest a slight benefit of sequential treatment in non-responders (14).

Complications: The development of major complications is a critical determinant of outcome. These include respiratory failure requiring mechanical ventilation, ventilator-associated pneumonia, sepsis, severe autonomic dysfunction (e.g., cardiac arrest), and thromboembolic events (5, 15). The quality of intensive care support is thus a major modifier of survival.

1.2.3 The Disparity in Low- and Middle-Income Countries (LMICs)

The GBS mortality rate in high-income countries with advanced neurocritical care is consistently reported below 5%. In contrast, mortality in LMICs is substantially higher, often ranging between 10% and 30% (2, 16). This disparity highlights that GBS outcomes are not merely a function of the disease biology but are profoundly shaped by healthcare system capabilities. The challenges in LMICs are multifactorial:

Limited Access to Specific Therapy: IVIG and PLEX are often unavailable, prohibitively expensive, or subject to significant procurement delays, forcing clinicians to rely solely on supportive care (15).

Critical Care Constraints: Shortages of mechanical ventilators, ICU beds, and trained personnel for neurological intensive care directly increase mortality from respiratory failure and autonomic instability (16).

Delayed Presentation and Diagnosis: Lack of public awareness, transportation barriers, and initial presentations to primary care facilities without neurological expertise lead to critical delays in diagnosis and referral (17).

High Burden of Complications: Limited nursing ratios, inadequate monitoring equipment, and high rates of nosocomial infections contribute to a higher incidence of life-threatening complications like pneumonia, sepsis, and pulmonary embolism (18).

A systematic review focusing on sub-Saharan Africa confirmed these challenges, noting that mortality was most strongly linked to respiratory failure, the need for mechanical ventilation, and the presence of comorbid conditions like HIV (19).

1.2.4 The Ethiopian Context and the Justification for the SPHMMC and ZMH Study

Research on GBS in Ethiopia is emerging but remains limited to a few institutional studies, underscoring the need for more localized data.

A retrospective study at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa (2009-2013) found a mortality rate of 18.9% among 37 GBS patients (20). Predictors of poor outcome included delayed admission (>7 days from onset), autonomic dysfunction, and bulbar involvement. The study highlighted constraints in accessing IVIG. Another study at Jimma University Medical Center (2013-2018) involving 127 patients reported a slightly lower mortality rate of 14.2% (21). Multivariable analysis identified pneumonia and the need for mechanical ventilation as independent predictors of mortality. A more recent study from the University of Gondar Comprehensive Specialized Hospital (2014-2019) reported a mortality rate of 16.7%, with ventilation and dysautonomia as significant risk factors(22).

These studies provide valuable foundational insights but have limitations that this study aims to address. The sample sizes were relatively small, and they did not always comprehensively analyze the interplay of factors like the timing of specific treatment initiation, detailed electrophysiological subtypes, or the impact of ICU resource utilization on outcomes. Most importantly, there is no published data specifically from SPHMMC, a premier national referral hospital that likely manages a high volume of severe GBS cases from across the country. The

patient population, resource availability (e.g., ICU capacity, access to IVIG), and clinical protocols at SPHMMC and ZMH may differ from those at TASH, Jimma, or Gondar.

Therefore, a significant knowledge gap exists. The factors driving outcomes for GBS patients within the specific operational context of SPHMMC and ZMH are unknown. Understanding these factors whether they are patient-related (age, comorbidity), disease-related (subtype, severity), or system-related (delay in treatment, ICU access) is not an academic exercise but a critical step towards improving care. This study will generate institution-specific evidence that can inform clinical decision-making, guide resource allocation (e.g., prioritizing IVIG for high-risk groups), and serve as a baseline for future quality improvement projects aimed at reducing GBS-related mortality and disability at SPHMMC and ZMH.

1.3 Conceptual framework

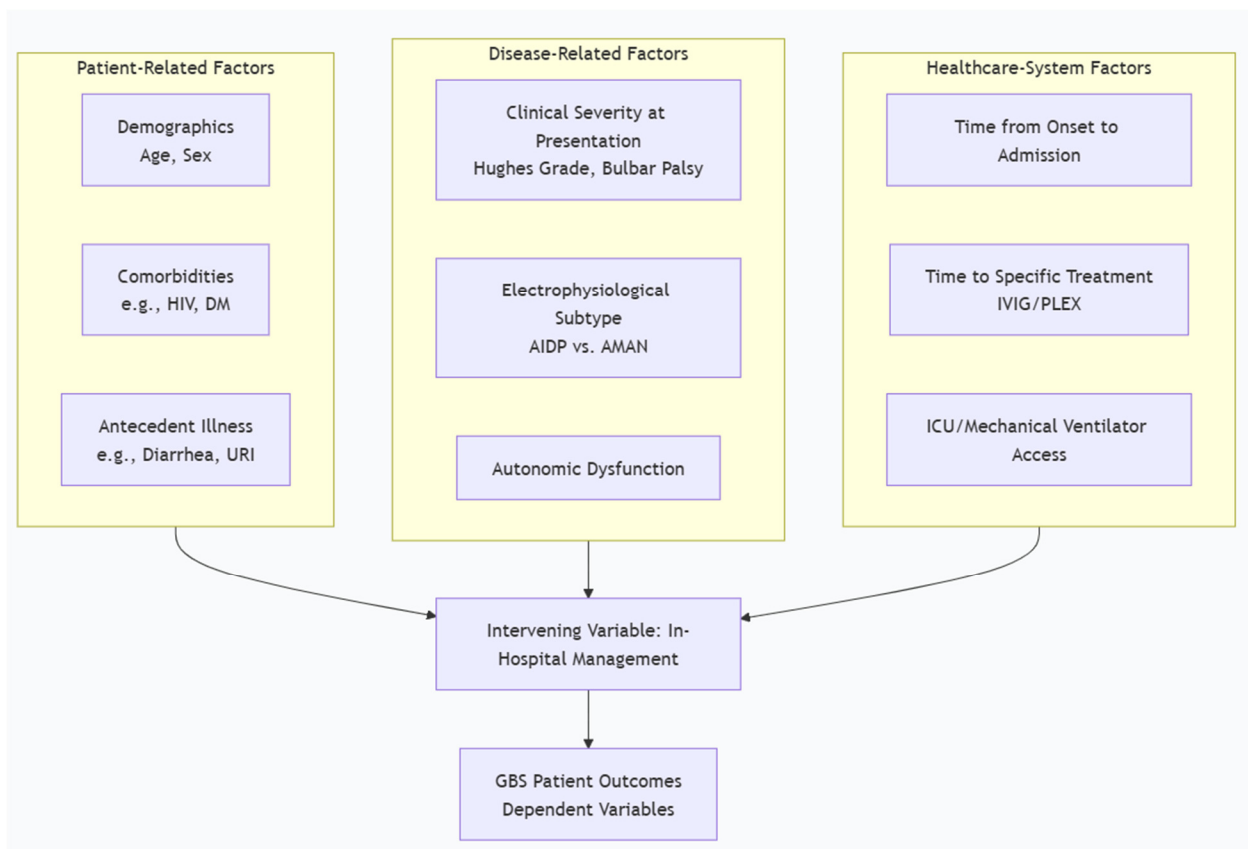


Figure 1 Conceptual framework of the research on Factors affecting the outcome of GBS patients admitted to SPHMMC and ZMH (14,18,20).

1.4 Justification of the Study

This study will identify local predictors of poor outcomes. With this evidence, clinicians can develop a risk stratification protocol to prioritize monitoring and intervention for high-risk patients, potentially preventing deaths through earlier escalation of care. Understanding the impact of treatment delays will also strengthen advocacy for streamlining hospital pathways to accelerate diagnosis and administration of IVIG.

SPHMMC, as a major referral center, must make informed decisions about allocating scarce and expensive resources such as ICU beds, ventilators, and IVIG. This study will provide data to guide these decisions. For instance, if the analysis reveals that delayed admission is a major driver of mortality, the hospital could invest in community awareness campaigns or develop referral protocols with primary hospitals. If specific complications are linked to prolonged stay, targeted nursing protocols can be implemented. The findings will thus serve as a vital tool for hospital administrators and department heads in strategic planning and quality improvement initiatives.

There is a scarcity of robust, multi-center Ethiopian data on GBS management outcomes. This study from a premier teaching hospital will contribute a significant dataset to the national body of evidence. The results can inform the development of context-appropriate national clinical guidelines or care protocols for GBS, which are currently lacking. By highlighting system-level barriers (e.g., cost and access to IVIG, ICU capacity), the study can also provide evidence for advocacy towards policymakers and health insurance entities regarding the essential nature of these resources for treating neurological emergencies.

2. Objectives

2.1 General Objective

To assess the treatment outcomes and identify the factors affecting mortality and functional recovery among Guillain-Barré Syndrome (GBS) patients admitted to the Neurology ward and Intensive Care Unit (ICU) of St. Paul's Hospital Millennium Medical College (SPHMMC) and Zewditu memorial Hospital (ZMH), Addis Ababa, Ethiopia.

2.2 Specific Objectives

To determine the in-hospital mortality rate and the proportion of patients with poor functional recovery (Hughes Functional Grading Scale ≥ 3) at discharge among GBS patients admitted to SPHMMC and ZMH.

To assess the association between different factors and poor GBS treatment outcomes (mortality and poor functional recovery).

3. Methodology

3.1. Study Design

A multicenter retrospective follow-up study was conducted.

3.2. Study Area

The study was conducted at St. Paul's Hospital Millennium Medical College (SPHMMC) and Zewditu memorial hospital (ZMH), located in Addis Ababa, Ethiopia. SPHMMC is one of the largest public tertiary teaching and referral hospitals in the country, serving a large population from Addis Ababa and receiving complex cases from all regional states. The hospital has dedicated neurology wards and a multidisciplinary Intensive Care Unit (ICU) that manage critical neurological conditions, including Guillain-Barré Syndrome.

ZMH is one of the oldest and largest public tertiary referral hospitals in the country, serving a vast population from the capital and receiving complex cases from various regions. The hospital has a dedicated neurology referral clinic and an intensive care unit (ICU) that manage critical neurological conditions, including Guillain-Barré syndrome.

3.3. Population

Source Population: All adult patients (age ≥ 18 years) diagnosed with Guillain-Barré Syndrome (GBS) and admitted to the neurology ward or ICU of SPHMMC and ZMH.

Study Population: All adult patients diagnosed with GBS and admitted to SPHMMC or ZMH

during the five-year study period from September 2020, to August 2025, who meet the eligibility criteria.

3.4. Eligibility Criteria

3.4.1 Inclusion Criteria:

Patients aged 18 years and above.

Patients admitted to SPHMMC or ZMH with a primary diagnosis of GBS as per the treating neurologist, based on the established clinical criteria (progressive motor weakness, areflexia/hyporeflexia) with supporting investigations (CSF albuminocytological dissociation and/or nerve conduction study findings).

Patients with complete medical records containing key data on admission, treatment, and discharge outcomes.

3.4.2 Exclusion Criteria:

Patients with an alternative final diagnosis (e.g., myasthenia gravis, chronic inflammatory demyelinating polyneuropathy, spinal cord lesion) documented before discharge.

Patients who were transferred to another facility before a definitive outcome (death or discharge) could be determined at SPHMMC or ZMH.

3.5 Sample Size and sampling procedure

3.5.1 Sample Size Determination

The required sample size was determined using the single population proportion formula.

Proportion (p) of 0.32 is taken for the key variable from previous study conducted in a similar resource limited setting, with a 95% confidence level ($Z = 1.96$) and a margin of error (d) of 5% (0.05).

The initial sample size (n) is calculated as:

$$n = \frac{(Z\alpha/2)^2 * P(1 - P)}{d^2}$$

Substituting the values:

$$n = (1.96)^2 * (0.32 * 0.68) / (0.05)^2$$

$$n = (3.8416) * (0.2176) / 0.0025$$

$$n = 0.8359 / 0.0025$$

$$n = 334.4$$

Therefore, the minimum calculated sample size (n) is 335.

Since the total number of GBS cases at SPHMMC and ZMH over a given period (05 years) might be a finite number (≈ 400), we can apply a finite population correction formula

$$n_{final} = \frac{n}{1 + \frac{(n-1)}{N}} = \frac{335}{1 + \frac{334}{400}} = \frac{335}{2.496} = 182.5$$

After accounting for a potential non-response rate of 10%, the final minimum required sample size is:

$$\text{Final } n \approx 202$$

3.5.2 Sampling Method and Procedure

All eligible cases of Guillain-Barré syndrome presenting during the study period were included using a consecutive sampling technique. Given the relatively small number of GBS cases, no sampling frame or interval was applied. Instead, every patient who fulfilled the inclusion criteria was recruited sequentially as they appeared in the study setting until the end of the study period.

3.6. Study Variables

Dependent Variables:

In-hospital mortality: Death (Yes/No).

Poor functional recovery at discharge: Defined as a Hughes Functional Grading Scale (HFGS)

Independent Variables:

Age, Sex, Residence, Antecedent illness within 4 weeks (diarrhea, upper respiratory tract infection, other), comorbidities (HIV status, Diabetes Mellitus, Hypertension), Hughes Functional Grading Scale (HFGS) score at admission, Presence of bulbar palsy, Presence of autonomic dysfunction (labile BP, arrhythmia), Electrophysiological subtype (AIDP, AMAN, AMSAN, equivocal) from NCS report, time from symptom onset to hospital admission (in days) Specific immunotherapy received, time from admission to initiation of specific immunotherapy , ICU admission during hospitalization, requirement of mechanical ventilation, Occurrence of major in-hospital complications.

3.7. Operational Definitions

Guillain-Barré Syndrome (GBS): an acute, immune-mediated polyradiculoneuropathy characterized progressive, symmetrical limb weakness with loss of reflexes, in the absence of an identifiable alternative cause (6).

Hughes Functional Grading Scale (HFGS): A standardized scale used to assess the disability level of GBS patients (23).

In-Hospital Mortality: Death from any cause occurring during the index admission for GBS management at SPHMMC and ZMH, as documented in the patient's final medical record.

Antecedent Illness: Any documented infection or illness occurring within 4 weeks prior to the onset of neurological symptoms of GBS. This was categorized as diarrheal illness, upper respiratory tract infection (fever, cough, sore throat), or other (13).

Autonomic Dysfunction: The documented presence of at least one of the following in the patient's chart during admission, attributed to GBS: sustained sinus tachycardia (>100 bpm) or bradycardia (<60 bpm) without other cause, labile hypertension (systolic BP >160 mmHg) or hypotension (systolic BP <90 mmHg), or cardiac arrhythmia requiring intervention (24).

Bulbar Palsy: Clinical documentation of dysphagia (difficulty swallowing), dysarthria (slurred speech), or facial/ocular muscle weakness attributed to GBS (25).

3.8. Data Collection Methods and Procedure

Trained data collectors extracted the following information using a structured data abstraction form:

Demographic Details: Age, sex, residence, and socioeconomic status.

Clinical Parameters: Date of symptom onset, Antecedent illness, Comorbidities, HFGS at admission, Presence of bulbar palsy/autonomic dysfunctions protein and cell count, Nerve Conduction Study report summary and subtype.

Treatment Details: Date of admission, Date of first immunotherapy, Type of immunotherapy, ICU admission, Mechanical ventilation, Duration of ventilation.

In-Hospital Course and Outcome: Occurrence and type of complications, HFGS at discharge, Discharge status [alive/dead], Total length of hospital stay.

Data Quality Assurance: Regular data quality checks was performed to ensure accuracy, consistency, and completeness. Any discrepancies or missing data was addressed by cross-referencing with additional records or excluding incomplete cases if necessary.

3.9. Data Analysis Plan

Descriptive Statistics:

Categorical variables (e.g., sex, antecedent illness, mortality) presented as **frequencies and percentages**.

Continuous variables (e.g., age, time to admission) was checked for normality using visual inspection (histograms) and statistical tests (Shapiro-Wilk). Normally distributed data was summarized as mean and standard deviation (SD), while non-normally distributed data was summarized as median and interquartile range (IQR).

Bivariate Analysis:

Chi-square test (or Fisher's exact test for expected cell counts <5) was used for categorical independent variables.

Independent samples t-test (for normally distributed data) or Mann-Whitney U test (for non-normal data) was used for continuous independent variables.

Variables with a p-value of less than 0.25 in the bivariate analysis was considered candidate variables for inclusion in the multivariable regression models to control for potential confounders.

Multivariable Analysis:

Logistic Regression was employed to identify factors independently associated with the binary outcomes.

All candidate variables from the bivariate analysis were entered into the initial multivariable logistic regression model.

Model fitness was checked using the Hosmer-Lemeshow goodness-of-fit test (a p-value > 0.05 indicates a good fit).

Multicollinearity between independent variables was assessed using the Variance Inflation Factor (VIF).

The final model was built using backward stepwise elimination, retaining variables with a p-value < 0.05 as statistically significant independent predictors.

The strength of the associations was presented as Adjusted Odds Ratios (AOR) with their corresponding 95% Confidence Intervals (CI).

4. Ethical Considerations

Ethical approval was obtained from the institutional review board of St. Paul's Hospital Millennium Medical College (SPHMMC), and permission was secured from the hospital administration to access patient records.

All patient data was handled with strict confidentiality.

Identifiable information (e.g., names, addresses, and medical record numbers) was anonymized to protect patient privacy.

No personal identifiers was included in the final analysis or publication.

5. Results

Baseline Characteristics of the Study Population

A total of 50 patients with Guillain-Barré syndrome were included in the analysis. The mean age was 35.2 years (SD 15.0, median 31.5, IQR 18). The majority were male (78%, n=39) and resided in urban areas (66%, n=33). The most frequent preceding infection was upper respiratory tract infection (URTI, 30%) followed by diarrheal illness (38%). Hypertension was present in 28% of patients, while diabetes was uncommon (4%). Cranial nerve involvement was documented in 34%, autonomic dysfunction in 34%, respiratory failure in 56%, and 52% required mechanical ventilation. Supportive care alone was given to 78% of patients; only 16% received intravenous immunoglobulin (IVIG) and 6% underwent plasmapheresis. Nerve conduction studies were not done in many patients; AMAN was not observed, but AMSAN was present in 10% (Table 1).

Table 1: Baseline characteristics of GBS patients (N=50)

Characteristic	Total (N=50)
Age (years), mean (SD)	35.2 (15.0)
Male sex, n (%)	39 (78)
Rural residence, n (%)	17 (34)
Preceding URTI, n (%)	15 (30)
Preceding diarrheal illness, n (%)	19 (38)
Hypertension, n (%)	14 (28)
Diabetes mellitus, n (%)	2 (4)
Cranial nerve involvement, n (%)	17 (34)
Autonomic dysfunction, n (%)	17 (34)
Respiratory failure, n (%)	28 (56)

Characteristic	Total (N=50)
Mechanical ventilation, n (%)	26 (52)
Treatment – IVIG, n (%)	8 (16)
Treatment – Plasmapheresis, n (%)	3 (6)
Treatment – Supportive only, n (%)	39 (78)
AMSAN subtype, n (%)	5 (10)
CSF protein (mg/dL), mean (SD)	117.2 (14.7)

In-hospital Mortality

Overall, 8 patients (16%) died during hospital stay. When comparing survivors (n=42) and non-survivors (n=8), the mean age was similar (34.6 vs 38.5 years, $p=0.496$ by univariate logistic regression). No significant differences were observed for sex, residence, preceding URTI, hypertension, or diabetes in bivariate analysis (Table 2). However, higher GBS disability score at admission was significantly associated with increased odds of death (crude OR 5.48 per 1-point increase, 95% CI 1.13–26.58, $p=0.035$). preceding diarrheal illness was more common among non-survivors (26.3% vs 9.7%, $p=0.132$) and mechanical ventilation was strongly associated with mortality (crude OR 8.47, 95% CI 0.96–75.08, $p=0.055$). Notably, all patients who died had respiratory failure; thus, the effect of respiratory failure could not be estimated separately because it perfectly predicted mortality (all 8 deaths occurred in patients with respiratory failure).

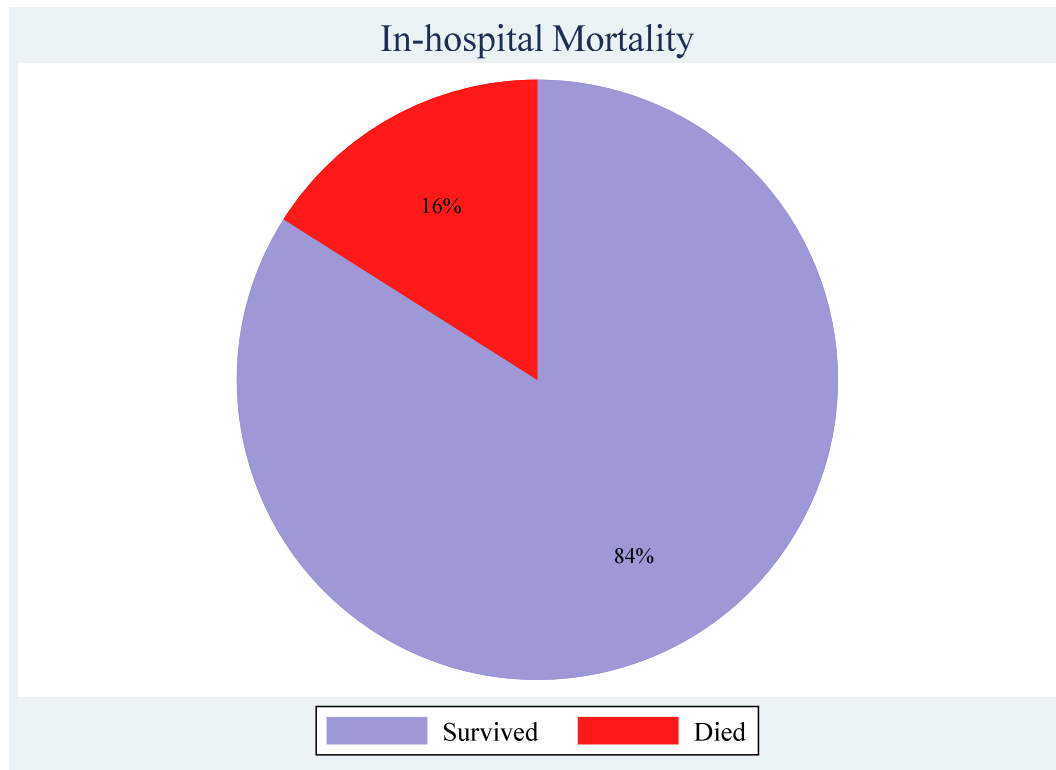


Table 2: Bivariate comparison of survivors and non survivors

Variable	Survived (n=42)	Died (n=8)	COR (95% CI)	p-value
GBS disability score at admission (per 1 point)			5.48 (1.13–26.58)	0.035
Age (years), mean (SD)	34.6 (14.3)	38.5 (19.2)	1.02 (0.97–1.07)	0.496
Male sex, n (%)	32 (76.2)	7 (87.5)	2.19 (0.24–19.99)	0.488
Rural residence, n (%)	14 (33.3)	3 (37.5)	1.20 (0.25–5.76)	0.820
Preceding URTI, n (%)	13 (31.0)	2 (25.0)	0.74 (0.14–4.04)	0.736
Preceding diarrheal illness, n (%)	14 (33.3)	5 (62.5)	3.33 (0.69–16.00)	0.132
Hypertension, n (%)	13 (31.0)	1 (12.5)	0.32 (0.04–2.86)	0.307
Diabetes mellitus, n (%)	1 (2.4)	1 (12.5)	5.86 (0.33–104.0)	0.181
Mechanical ventilation, n (%)	18 (42.9)	8 (100)	8.47 (0.96–75.08)	0.055
IVIG treatment, n (%)	7 (16.7)	1 (12.5)	0.71 (0.08–6.76)	0.769

Multivariable Analysis

To identify independent predictors of in-hospital mortality, a multivariable logistic regression model was constructed including age, residence, preceding diarrheal illness, hypertension, mechanical ventilation, and IVIG treatment. The model was statistically significant (likelihood ratio $\chi^2=16.31$, $p=0.022$, pseudo $R^2=0.371$). After adjustment, preceding diarrheal illness remained a significant predictor of mortality (adjusted OR 11.88, 95% CI 1.08–130.58, $p=0.043$). Mechanical ventilation was also independently associated with markedly increased odds of death (adjusted OR 44.78, 95% CI 1.94–1035.80, $p=0.018$). Age, residence, hypertension, and IVIG treatment were not significant in the final model (Table 3).

Table 3: Multivariable logistic regression for in hospital mortality

Variable	Adjusted OR	95% CI	p-value
Age (per year)	1.07	0.97–1.17	0.167
Rural residence	5.89	0.52–66.81	0.152
Preceding diarrheal illness	11.88	1.08–130.58	0.043
Hypertension	0.09	0.00–3.60	0.198
Mechanical ventilation	44.78	1.94–1035.80	0.018
IVIG treatment	0.37	0.02–6.22	0.493

Functional Recovery at Discharge

At hospital discharge, only 2 patients (4%) achieved good functional recovery (GBS Disability Score ≤ 2), while 48 (96%) had poor recovery (score ≥ 3 or death). Because of the extreme imbalance, no further statistical analysis was performed for this outcome.

Functional Recovery at Three Months

Three-month follow-up data were available for 18 patients (36% of the cohort). Among these, 11 patients (61.1%) had good recovery (score 0-2) and 7 (38.9%) had poor recovery (score 3-6), including 3 deaths (16.7%).

Bivariable analyses were performed to explore factors associated with poor recovery at 3 months. Due to the small sample size, multivariable analysis was not conducted. Although none of the associations reached statistical significance, trends were observed suggesting that older age (mean 40.1 vs 33.5 years, $p=0.32$), preceding diarrheal illness (57.1% vs 36.4%, $p=0.63$), and mechanical ventilation (71.4% vs 45.5%, $p=0.38$) were more common among patients with poor recovery. However, the small sample size limits statistical power of these findings.

6. Discussion

Mortality in the Ethiopian Context and Comparison with Global Data

The 16% mortality observed in our cohort is consistent with the 14–19% range reported from other Ethiopian tertiary centers (20–22) and with the broader LMIC average of 10–30% (2,16). In contrast, mortality in high-income countries is typically below 5% (5,11). This disparity underscores the profound impact of healthcare system capabilities on GBS outcomes. In our setting, the high mortality is likely driven by delays in diagnosis and treatment, limited access to immunomodulatory therapies, and constraints in intensive care resources. The fact that all deaths occurred in patients who required mechanical ventilation – and that mechanical ventilation was the strongest independent predictor – supports the notion that the quality and availability of respiratory support are critical determinants of survival (5,15).

Predictors of Poor Outcome

Preceding Diarrheal Illness: Patients with a preceding diarrheal illness had nearly 12-fold higher odds of death after adjustment for other factors. This finding aligns with the literature linking *Campylobacter jejuni* infection to the axonal subtype of GBS, which is associated with more severe initial weakness, slower recovery, and higher rates of residual disability (13). Although we did not have microbiological confirmation, the strong association between diarrheal prodrome and mortality in our cohort is clinically important. It suggests that in resource-limited

settings where immunomodulatory therapy is often unavailable, patients with antecedent diarrhea may represent a particularly high-risk subgroup requiring intensified monitoring and early respiratory support. Our finding adds to the evidence that gastrointestinal prodromes are not merely epidemiological markers but true prognostic indicators in LMICs.

Mechanical Ventilation and Respiratory Failure: All patients who died required mechanical ventilation, and the need for ventilation was the strongest independent predictor of mortality (adjusted OR 44.78). This is not surprising because respiratory failure is the most common life-threatening complication of GBS, occurring in 20–30% of patients in high-income settings (5). In our cohort, 56% had respiratory failure and 52% required ventilation – a much higher proportion than reported in Western series, reflecting either more severe disease at presentation or a higher threshold for ICU admission. The fact that 8 of 26 ventilated patients died (31% mortality among ventilated patients) is comparable to LMIC data but higher than the 15–20% mortality reported in well-resourced ICUs (15,16). This discrepancy likely reflects limited availability of advanced monitoring, higher rates of ventilator-associated complications (pneumonia, sepsis), and possibly delayed intubation. Our findings reinforce the critical importance of early recognition of respiratory compromise, timely intubation, and optimal ventilator management in reducing GBS mortality in Ethiopia.

Admission GBS Disability Score as a Predictor: Higher GBS disability score at admission was associated with increased mortality (crude OR 5.48 per 1-point increase, $p=0.035$). This is consistent with systematic reviews that identify high clinical severity at presentation as a key determinant of poor prognosis (9,10). The Hughes Functional Grading Scale is a simple bedside tool that can help clinicians identify high-risk patients early. In resource-limited settings where electrophysiology and biomarkers are often unavailable, the admission disability score may be a practical triage tool to prioritize intensive monitoring or limited immunomodulatory therapy. However, this association was not independently significant in the multivariable model (where mechanical ventilation and preceding diarrhea dominated), due to collinearity – severe disability at admission strongly predicts subsequent ventilation.

Poor Functional Recovery at Discharge and Improvement by Three Months

Only 2 patients (4%) had good functional recovery at discharge. This extremely low rate reflects the natural history of GBS, where recovery typically begins weeks to months after the nadir (8). In high-income settings, most patients are still disabled at discharge but improve with rehabilitation. Our 3-month follow-up data (available for 18 patients) showed that 61% achieved good recovery (score 0-2), and 37.5% of those who were poor at discharge improved to good by three months. This is encouraging because it demonstrates that even without widespread access to IVIG or plasmapheresis, many patients can regain independent walking with supportive care and time. Nevertheless, 39% remained with poor recovery (including three deaths), highlighting the substantial long-term burden of disability. The absence of a dedicated multidisciplinary rehabilitation service at most Ethiopian hospitals likely contributes to suboptimal functional outcomes (8).

The Role of Specific Immunomodulatory Therapy

Only 16% of our patients received IVIG and 6% plasmapheresis, whereas the majority (78%) received supportive care alone. This reflects the reality of LMICs where these expensive therapies are often unavailable, delayed, or unaffordable (15). In our multivariable model, IVIG use was not significantly associated with lower mortality (adjusted OR 0.37, 95% CI 0.02–6.22), but the wide confidence interval and small number of treated patients (n=8) preclude any firm conclusion. Randomized controlled trials have established the efficacy of IVIG and PLEX when given within two weeks of onset (7), but in routine Ethiopian practice, delays in diagnosis, referral, and procurement likely diminish their real-world effectiveness.

7. Limitations:

The relatively small sample size, due to the rarity of Guillain–Barré syndrome (GBS), limits the statistical power of this study. With only 50 participants and 8 mortality events, the study may be underpowered to detect statistically significant.

03-month follow-up was available for only 18 patients (36%), introducing potential selection bias. Patients who returned may have been either sicker (more likely to seek care) or healthier (more likely to travel). Thus, the 61% good recovery rate at 3 months may not be generalizable.

Nerve conduction studies were not done for many patients (classified as “not done”), limiting our ability to analyze the prognostic impact of axonal vs demyelinating subtypes

We did not measure socioeconomic status, distance to hospital, or quality of ICU nursing care – factors that likely influence outcomes in LMICs.

Our findings apply to patients admitted to large referral hospitals in Addis Ababa and may not represent GBS patients in rural areas or smaller facilities.

8. Conclusion

In this cohort of GBS patients admitted to two Addis Ababa referral hospitals, the in-hospital mortality rate was 16% – similar to previous Ethiopian reports but higher than in high-income countries. Preceding diarrheal illness and the need for mechanical ventilation were independent predictors of death. A higher GBS disability score at admission was also associated with mortality. Functional recovery at discharge was almost universally poor, but by three months, 61% of followed patients had achieved good recovery, indicating that meaningful improvement occurs even with supportive care alone. These findings highlight the critical importance of early identification of high-risk patients, timely respiratory support, and efforts to improve access to immunomodulatory therapy in resource-limited settings.

Our study provides institution-specific evidence to guide clinical decision-making and resource allocation at SPHMMC and Zewditu Memorial Hospital, and it underscores the urgent need for interventions to reduce GBS-related mortality and disability in Ethiopia.

9. Recommendations

Clinicians should recognize that a preceding diarrheal illness and the need for mechanical ventilation are strong independent predictors of in-hospital mortality. Patients presenting with these features warrant intensified monitoring for respiratory compromise and early referral for intensive care. The GBS disability score at admission should be routinely calculated to facilitate risk stratification, and those with scores of four or higher should be prioritized for intensive care unit admission and considered for immunomodulatory therapy where available. Given that all deaths occurred among ventilated patients, adherence to evidence-based bundles for preventing ventilator-associated pneumonia, sepsis, and thromboembolism is essential.

Hospital administrators and the Ethiopian Ministry of Health should invest in additional capacity building and procurement systems for intravenous immunoglobulin and plasmapheresis to minimize delays, and a risk-stratified approach to prioritizing these therapies for high-risk patients.

Future prospective multicenter studies with larger sample sizes are needed to validate the predictors identified in this study and to assess the real-world effectiveness of intravenous immunoglobulin in Ethiopia. Through these measures, the persistently high mortality and disability associated with GBS in Ethiopian referral hospitals may be reduced.

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11. Annexes

11.1 Questioner Tool.

Study ID: _____

Data Collector's Initials: _____

Date of Data Abstraction: //_____

Section 1: Socio-demographic Data

1.1. Age at admission (in years): _____ years

1.2. Sex:

- ☐ Male
- ☐ Female

1.3. Residence:

- ☐ Urban
- ☐ Rural

Section 2: Clinical Presentation and History

2.1. Date of onset of neurological weakness (dd/mm/yyyy): //_____

2.2. Date of admission at SPHMMC or ZMH (dd/mm/yyyy): //_____

2.3. Antecedent illness within 4 weeks before onset (check all that apply):

- ☐ Diarrhea
- ☐ Upper Respiratory Tract Infection (fever, cough, sore throat)
- ☐ Other (specify) _____

2.4. Known Comorbidities (check all that apply):

- ☐ HIV positive
- ☐ Diabetes Mellitus
- ☐ Hypertension
- ☐ Other chronic illness (specify) _____

2.5. Hughes Functional Grade (HFGS) at admission: (Refer to notes on first neurologic assessment)

- Healthy
- Minor symptoms, can run
- Able to walk 5m without assistance, cannot run
- Able to walk 5m with assistance (walker/stick/person)
- Bedridden or chair-bound
- Requires assisted ventilation

2.6. Specific Neurological Features Documented at Admission:

2.6a. Bulbar Palsy (dysphagia, dysarthria, facial weakness):

- No
- Yes

2.6b. Autonomic Dysfunction (labile BP, arrhythmia, sustained tachycardia >100/bradycardia <60):

- No
- Yes

Section 3: Diagnostic Findings

3.1. Cerebrospinal Fluid (CSF) Analysis:

3.1a. CSF Protein Level (mg/dL): _____ mg/dL (If recorded)

3.1b. CSF White Cell Count (cells/ μ L): _____ cells/ μ L (If recorded)

3.1c. Albuminocytological Dissociation (High Protein, Normal Cell Count)?

- No (Cell count >5 or protein normal)
- Yes
- CSF not done
- Result incomplete

3.2. Was NCS performed?

- No → Skip to 3.3
- Yes

3.2a. Electrophysiological Subtype (from final NCS report impression):

- Acute Inflammatory Demyelinating Polyneuropathy (AIDP)
- Acute Motor Axonal Neuropathy (AMAN)
- Acute Motor-Sensory Axonal Neuropathy (AMSAN)
- Equivocal / Inexcitable / Unclassified
- Subtype not specified in report

Section 4: Treatment Details

4.1. Immunotherapy Received (check all that apply):

- Intravenous Immunoglobulin (IVIG)
- Therapeutic Plasma Exchange (PLEX)
- Both IVIG and PLEX
- None

4.2. If IVIG or PLEX given

Date of first dose/first session (dd/mm/yyyy): //_____

4.3. Was the patient admitted to the Intensive Care Unit (ICU)?

- No
- Yes

4.4. Did the patient require invasive mechanical ventilation?

- No
- Yes

If yes, 4.4a. Duration of ventilation: _____ days

Section 5: In-Hospital Course and Outcome

5.1. Major Complications During Admission (check all that apply):

- Pneumonia (new infiltrate on CXR + clinical signs)
- Sepsis (documented diagnosis)
- Symptomatic Pulmonary Embolism (radiologically confirmed)
- Cardiac Arrest (documented)
- None of the above

5.2. Total Length of Hospital Stay (LOS):

Date of discharge/death (dd/mm/yyyy): //_____

LOS (in days): _____ days (calculated)

5.3. Hughes Functional Grade (HFGS) at Discharge (from last documented neurologic exam before discharge or death):

- Healthy
- Minor symptoms, can run
- Able to walk 5m without assistance
- Able to walk 5m **with assistance**
- Bedridden or chair-bound
- Requires assisted ventilation
- Dead
- Not documented

5.4. Discharge Status:

- Alive (Discharged home or to another facility)
- Dead (In-hospital mortality)