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Original Article

A Quasi-Experimental Trial of Daily Versus Alternate-Day Plasmapheresis in the Management of Guillain-Barré Syndrome in a Tertiary Neurology Center

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Abstract

Objectives: To evaluate clinical outcomes, recovery trajectory, and operational advantages of consecutive-day versus alternate-day plasmapheresis schedules in patients with Guillain–Barré syndrome (GBS) managed in a high-volume public neurology ward.

Methods: This quasi-experimental study enrolled 80 adults meeting Brighton Criteria levels 1–3. Participants were allocated non-randomly into two equal groups receiving either consecutive-day or alternate-day plasmapheresis, five sessions each. Primary outcomes included improvement on the Hughes Disability Scale (HDS) at four weeks and length of hospitalization. Secondary outcomes included time to ambulation, ventilator requirement, complications, and estimated system-level cost reduction. Statistical analysis used chi-square and t-tests with significance at $p<0.05$.

Results: Neurological improvement at four weeks did not differ significantly between the daily and alternate-day groups (72.5% vs. 75%; $p=0.78$). However, consecutive-day therapy significantly reduced length of hospital stay (9.2±2.1 vs. 14.8±3.4 days; $p<0.001$) and enabled earlier ambulation ($p=0.03$). Ventilation needs and complication rates were comparable. Estimated resource utilization showed approximately a 21% reduction in system expenditure with the daily regimen.

Conclusion: Daily plasmapheresis offers clinical outcomes equivalent to alternate-day therapy while markedly decreasing hospital stay and resource consumption. In overburdened public-sector hospitals, a consecutive-day protocol provides a more efficient and practical treatment strategy without compromising patient safety.

Keywords: Guillain–Barré syndrome, plasmapheresis, quasi-experimental study

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Introduction

Guillain–Barré syndrome (GBS) is a rapidly progressive immune-mediated polyradiculoneuropathy that remains a major cause of acute flaccid paralysis globally. Despite advances in neurocritical care, GBS continues to impose a considerable burden on health systems, particularly in low and middle-income countries where intensive care resources are limited. Plasma exchange (plasmapheresis) and intravenous immunoglobulin (IVIG) are the two established disease-modifying therapies, with comparable efficacy across multiple clinical trials.[1] In many public hospitals, however, IVIG is prohibitively expensive, making plasmapheresis the primary therapeutic option.[2]

Clinical practice varies regarding how frequently plasmapheresis sessions should be administered. Some centers employ alternate-day schedules, while others use daily regimens. Although both approaches achieve immune modulation, alternate-day therapy prolongs overall treatment duration and may extend inpatient stay. This is a critical issue in high-load government hospitals where bed scarcity, patient turnover pressure, and delayed admissions are persistent operational challenges.[3] Recent studies have suggested that condensed plasmapheresis schedules may shorten hospitalization without affecting neurological recovery.[4-6] However, evidence

from South Asian public-sector settings remains scarce, and most available studies originate from high-resource environments where system constraints differ substantially.

The Punjab Institute of Neurosciences (PINS), one of the busiest neurology centers in Pakistan, routinely manages a large volume of GBS cases. In such environments, understanding how treatment scheduling affects resource utilization is equally important as evaluating clinical outcomes. A quasi-experimental design was therefore selected to reflect real-world allocation practices, where treatment schedules are often influenced by machine availability, staffing, and ward capacity rather than strict randomization.

This study aimed to compare consecutive-day and alternate-day plasmapheresis with respect to clinical outcomes, length of hospitalization, functional recovery, complications, and system-level efficiency. The findings aim to guide both clinicians and hospital administrators in optimizing GBS management in high-burden public hospitals.

Methods

This was a single-center, prospective, quasi-experimental study conducted in the Neurology Ward of the Punjab Institute of Neurosciences (PINS), Lahore, a tertiary public hospital with a high volume of neuromuscular cases. The quasi-experimental design was selected to reflect real-world clinical allocation, where treatment scheduling is influenced by bed availability, machine access, and staffing rather than strict randomization.

The study received approval from the Institutional Review Board of PINS (IRB No. 2125/IRB/ PINS/ Approval/2025). Written informed consent was obtained from all participants or their legal guardians. All procedures adhered to the Declaration of Helsinki and institutional guidelines.

Adults aged 18–70 years with a clinical diagnosis of Guillain–Barré syndrome fulfilling Brighton Criteria levels 1–3, symptom onset within 14 days, and an indication for plasmapheresis as assessed by a consultant neurologist were included in the study. Participants were excluded if they had received IVIG or plasmapheresis for the current GBS episode, had severe cardiac instability, active sepsis or uncontrolled systemic infection, pre-existing severe peripheral neuropathies, incomplete data, or withdrew before completing five sessions.

Participants were non-randomly allocated in a 1:1 ratio into two groups based on machine availability, ward scheduling, and clinician discretion, consistent with quasi-experimental methodology. Group A underwent five sessions of plasmapheresis on five consecutive days, while Group B received five sessions on alternate days over ten days. Allocation followed a structured log maintained by an independent coordinator to ensure transparency and minimize selection bias without implying randomization.

All patients underwent five sessions of plasma exchange using standard therapeutic apheresis procedures, with an exchange volume of 40–50 ml/kg per session. Vascular access was established through a central venous catheter or femoral line, and replacement fluid consisted of isotonic saline and 5% albumin. Continuous monitoring of cardiac rhythm, blood pressure, and autonomic parameters was performed. Supportive care included deep vein thrombosis prophylaxis, autonomic surveillance, physiotherapy, and respiratory monitoring.

The primary outcomes were neurological improvement at four weeks, defined as a ≥1-point improvement on the Hughes Disability Scale (HDS), and the length of hospital stay in days. Secondary outcomes included time to independent ambulation, ventilator requirement, complication rate (hypotension, bleeding, line infections, and allergic reactions), and economic impact measured as the estimated reduction in bed-days and associated system costs.

Demographic and clinical data were recorded using a structured proforma. HDS scoring was performed by trained neurology residents blinded to treatment frequency. The length of hospital stay was calculated from admission to discharge, and complications were recorded prospectively during each session.

Data were analyzed using SPSS version 26. Continuous variables were compared using the independent t-test, while categorical variables were analyzed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 80 patients meeting eligibility criteria were enrolled, with 40 assigned to the consecutive-day group and 40 to the alternate-day group. No participant discontinued treatment or was lost to follow-up.

Baseline Characteristics

Baseline demographic and clinical characteristics were comparable between the two groups (Table 1). Mean age, sex distribution, initial Hughes Disability Scale (HDS) scores, GBS variant distribution, and time to presentation showed no statistically significant differences.

Primary Outcomes include Neurological Improvement at 4 weeks, ≥ 1-point improvement on the HDS was observed 72.5% in the daily group and 75% in the alternate-day group with insignificant difference ($p = 0.78$). The mean length of hospitalization differed significantly ($p < 0.001$) as in daily group, it is 9.2 ± 2.1

days while in alternate-day group it remained 14.8 ± 3.4 days.

The daily regimen shortened hospital stay by 5.6 days on average.

Table 1: *Baseline Characteristics of Participants*

Variable	Plasmapheresis		p-value
	Daily (n = 40)	Alternate Day(n=40)	
Age (years, mean ± SD)	44.3±12.1	45.8 ± 11.6	0.62
Male (%)	62.5	60.0	0.82
HDS at admission (mean ± SD)	3.9 ± 0.6	4.0 ± 0.5	0.57
AIDP variant (%)	72.5	70.0	0.79
Time to presentation (days, mean ± SD)	6.1 ± 2.2	6.4 ± 2.5	0.58

Table 2: *Primary Outcomes at Four Weeks*

Outcome	Daily Regimen	Alternate - Day Regimen	p-value
≥1-point HDS improvement (%)	72.5	75.0	0.78
Length of stay (days)	9.2 ± 2.1	14.8 ± 3.4	<0.001

Patients receiving consecutive-day treatment achieved independent ambulation earlier than those on the alternate-day schedule, with a mean time of 12.4 ± 3.1 days in the daily group compared to 15.9 ± 4.2 days in the alternate-day group (p = 0.03). Ventilator requirement was 17.5% in the daily group and 20% in the alternate-day group, showing no statistically significant difference (p = 0.78). The frequency of procedure-related complications was also comparable between groups, occurring in 12.5% of patients in the daily group and 15% in the alternate-day group (p = 0.71), with mild hypotension and catheter-site infections being the most common events. The estimated system cost per patient, calculated from bed occupancy, nursing hours, and consumables, was PKR 34,000 for the daily regimen and PKR 43,000 for the alternate-day regimen (p < 0.01), reflecting a 21% reduction in system expenditure with the daily schedule.

Table 3: *Secondary Outcomes*

Outcome	Daily Regimen	Alternate - Day Regimen	p-value
Time to independent ambulation (days)	12.4 ± 3.1	15.9 ± 4.2	0.03
Ventilator requirement (%)	17.5	20.0	0.78
Complications (%)	12.5	15.0	0.71
Estimated system cost per patient (PKR)	34,000	43,000	<0.01

Discussion

This quasi-experimental study showed that daily plasmapheresis provides similar neurological recovery compared to alternate-day therapy, but with important operational benefits. Although both groups demonstrated comparable improvement in strength at four weeks, the daily group achieved earlier ambulation and significantly shorter hospital stay.

In a high-burden public hospital like PINS, reducing admission duration by even a few days can help decrease overcrowding and improve service access for new patients. These findings align with recent studies reporting that compressed plasmapheresis schedules may reduce hospitalization without affecting safety or treatment response.[6-8] The safety profile in both groups was similar, which supports the use of daily therapy in centers where rapid turnover is required. Recent international literature from 2019–2024 also highlights the importance of optimizing plasmapheresis scheduling for efficiency and cost-effectiveness, especially in lower-resource settings.[9-12]

Strengths of this study include its practical design, real-world setting, and standardized treatment protocol. Limitations include non-random group allocation, single-center design, and a modest sample size. Future multicenter Pakistani data could help confirm these findings and support evidence-based protocol development.

Conclusion

Daily plasmapheresis is clinically equivalent to alternate-day therapy but offers shorter hospital stay and earlier functional recovery. In resource-constrained neurology centers, daily treatment appears to be the more efficient option.

Ethical Approval: The IRB/EC approved this study via letter no. 2125/IRB/PINS/Approval/2025 dated April 15, 2025.

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Authors' Contribution

RI: Conception.

MZ, SWUH: Design of the work.

FS, QY, SF: Data acquisition, analysis, or interpretation.

FS, QY, SF, SWUH: Draft the work.

RI, MZ: Review critically for important intellectual content.

All authors approve the version to be published.

All authors agree to be accountable for all aspects of the work.

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