DOI: 10.7860/JCDR/2026/84271.23293

Research Protocol

Physiotherapy Section

Efficacy of Diagonal Patterns and Progressive Resisted Exercises on Muscle Strength, Functional Recovery, Fatigue and Quality of Life in Guillain-Barré Syndrome: A Protocol for Randomised Controlled Trial

RUSHIKA PIYUSH SHAH[1], IRSHAD QURESHI[2]

ABSTRACT

Introduction: Guillain-Barré Syndrome (GBS) is an acute autoimmune polyradiculoneuropathy, most commonly presenting as Acute Inflammatory Demyelinating Polyradiculopathy (AIDP) variant. It causes symmetrical muscle weakness, sensory disturbances and profound fatigue, leading to significant impairment in daily functioning. Physiotherapy plays vital role in the rehabilitation of GBS, particularly during plateau phase; however, the most effective exercise strategies are yet to be clearly established.

Need of the study: Evidence on the comparative efficacy of Proprioceptive Neuromuscular Facilitation (PNF) and Progressive Resistive Exercise (PRE) in GBS rehabilitation is limited. Identifying which intervention yields superior functional recovery can guide clinical decision-making and approaches alongside standard physiotherapy.

Aim: To evaluate the effectiveness of strengthening exercises using diagonal movement patterns of PNF and PRE on improving muscle strength, enhancing functional recovery, reducing fatigue and improving quality of life in patients with GBS during plateau phase of recovery.

Materials and Methods: A single-centre, registry-based, Randomised Controlled Trial (RCT) will be conducted on 51 patients diagnosed with GBS in the plateau phase at Acharya Vinoba Bhave Rural Hospital (AVBRH), Neuroscience Department, Sawangi, Wardha, India. Planned duration of study is from August 2025 to August 2026. Participants will be randomly allocated (1:1:1 ratio) into three groups: Group-1- PNF with conventional physiotherapy, Group-2- PRE with conventional physiotherapy and Group-3- standard physiotherapy alone. Intervention will be delivered 60 minutes, five days a week, over three months, with intensity individualised to fatigue levels; this study will take place for one year.

Keywords: Acute inflammatory demyelinating polyradiculopathy, Proprioceptive neuromuscular facilitation, Rehabilitation

INTRODUCTION

The GBS is a sudden-onset, autoimmune disorder triggered by an infection, characterised by inflammation and damage to the protective covering (myelin) of peripheral and autonomic nerves. This results in rapid loss of sensory and motor functions [1]. GBS is classified as an acute, inflammatory, post-infectious autoimmune polyneuropathy that leads to demyelination of peripheral and autonomic nerves. The immune response, typically targeting peripheral myelin, is often preceded by bacterial or viral infections, surgeries, vaccinations, lymphomas, or exposure to toxins [2]. In 2009, a global epidemiological comprehensive analysis based primarily on North American and European research revealed that the prevalence of GBS is approximately 1.1 to 1.8 cases per 100,000 annually in adults and 0.6 cases per 100,000 in children (less than 16-year-old) [3]. Another epidemiological investigation conducted in China reported an overall rate of 1.7/100,000 person [4]. GBS is classified into subtypes based on underlying disease mechanism, clinical presentation and neurophysiological characteristics. The most common subtype is AIDP, which is primarily demyelinating in nature and has a favourable prognosis. Acute Axonal Motor Neuropathy (AMAN), a less common variant, involves purely motor axonal damage and tends to have a poorer recovery. When sensory involvement is added, it is referred to as Acute Motor Sensory Axonal Neuropathy (AMSAN). Another distinct subtype, Miller-Fisher Syndrome (MFS) presents as classical triad of ataxia, areflexia and ophthalmoparesis. A more or less complete Tetra Paresis occasionally accompanied by cranial nerve symptoms and respiratory insufficiency is the hallmark of the clinical picture, which is defined by ascending paralysis that starts with weakness and paraesthesia in the legs with elevated protein level in the Cerebrospinal Fluid (CSF) accompanied by normal cellular count [5]. To ensure efficient management, GBS is separated into three stages: Acute/Ascending, second is the Plateau Stage and recovery/descending phase. This study integrates PRE and PNF into standard physiotherapy to optimise rehabilitation in GBS. PRE is known to improve bone density, muscle strength and motor recovery, helping to prevent complications like osteoporosis and fractures. PNF enhances neuromuscular control, range of motion, flexibility and coordination, contributing to more precise and functional movement.

By combining PRE and PNF with conventional physiotherapy, the goal is to improve muscle strength, independence and quality of life in individuals with GBS. This comprehensive rehabilitation strategy aims to reduce fatigue, promote autonomy and support optimal functional recovery.

Primary objective is to compare the effect of PNF and PRE, when combined with conventional physiotherapy, on muscle strength, fatigue and functional recovery in patients with GBS during plateau phase of recovery and the secondary objectives are to evaluate changes in quality of life and functional independence and to compare: Modified Erasmus Guillain-Barré Syndrome Outcome

Score (mEGOS) and muscle strength using Hand-held Dynamometry (HHD) across study groups.

Hypothesis

Null hypothesis (H0): There is no significant difference in muscle strength, fatigue reduction, functional recovery and quality of life among patients receiving PNF, PRE or standard physiotherapy during the plateau phase of GBS.

Alternate hypothesis (H1): There is significant difference in muscle strength, fatigue reduction, functional recovery and quality of life among patients receiving PNF, PRE or standard physiotherapy during the plateau phase of GBS.

REVIEW OF LITERATURE

The GBS is an acute onset, immune mediated neuropathy characterised by demyelination and axonal damage of peripheral and autonomic nerves, leading to rapid and progressive motor weakness, sensory loss and autonomic dysfunction. It remains a significant global health challenge, with particularly high prevalence in India, placing considerable strain on healthcare systems and affecting patients' quality of life and functional independence [6,7].

Physiotherapy plays a crucial role in GBS rehabilitation, aiming to restore motor function, prevent complications and enhance overall recovery [8]. Traditional rehabilitation approaches focus on maintaining joint mobility, preventing contractures and promoting gradual strengthening. However, the addition of specific strengthening strategies, such as diagonal movement patterns and PRE may further improve functional outcomes [8].

A randomised controlled trial conducted by Vidhyadhari BS and Madavi K investigated the effect of PNF techniques on pulmonary function in individuals with GBS. Using a portable electronic spirometer, they demonstrated that PNF techniques effectively enhanced diaphragmatic muscle activity, resulting in improved respiratory performance among GBS patients [9].

Similarly, Shah N et al., reported that supervised, tailored exercise programs led by physiotherapists significantly reduced fatigue and improved muscle strength and quality of life compared to unsupervised home-based programs in patients with chronic GBS. Their findings highlight the essential role of consistent, guided physiotherapy in optimising recovery and promoting functional independence [10].

Given the profound impact of motor deficits on daily functioning and quality of life, further research is needed to establish evidence-based, comprehensive strengthening protocols for GBS rehabilitation. The present study aims to address this gap by comparing PNF patterns and PRE with conventional physiotherapy. The findings are expected to provide valuable insights into improving muscle strength, reducing fatigue and enhancing functional outcomes in GBS patients, thereby reinforcing the importance of structured physiotherapy interventions in clinical practice.

MATERIALS AND METHODS

This study will be a single-centre, three-arm, parallel-group, non-inferiority with a single-blinded (participant-blinded) design with 1:1:1 allocation ratio conducted at AVBRH hospital India over a three-month intervention period per participant. Planned duration of study is from August 2025 to August 2026; the intervention will be conducted at AVBRH Wardha, over a planned duration of three months per participant. The protocol has received ethical approval (Ref.no. DMIHER (DU)/IEC/2025/631) and is registered with Clinical Trials Registry–India (CTRI) (CTRI/2025/04/083925).

Inclusion and exclusion criteria: Adult (>18 years) clinically diagnosed with GBS as per the American academy of family physicians' criteria [11], showing subacute weakness with reduced or absent reflexes and currently in the plateau phase of recovery will be included. Participants must maintain for Peripheral Oxygen Saturation (SpO_2) on room air, have mild respiratory symptoms, muscle weakness and provide written informed consent. Those in acute phase, requiring ventilatory support, or with cranial nerve/autonomic involvement, ongoing infection, trauma, or cardiovascular abnormalities will be excluded.

Sample size calculation: Sample size determination will be conducted utilising G* power, referencing the mean difference in Modified Medical Research Council score (MMRC) from preceding RCT that evaluated home-based versus individually tailored supervised exercise program in patients with chronic GBS [10]. The analysis yielded a required sample size of 51 patients (17 patients per group), which will be inflated by 10% to accommodate potential participant withdrawals. By using following formula:

$$n1 = n2 = n3 = 3\frac{(Z_\alpha + Z_\beta)^2\sigma^2}{(\delta)^2}$$

Primary variable (MMRC)

Mean ± SD. (Pre) result on (MMRC scale) = 35 ± 5

Mean ± SD. (Post) result on (MMRC scale) = 44 ± 6

Difference = 10

Standard deviation = 14

$$N = n1 = n2 = n3 = 3\frac{(1.96 + 0.84)^2(14)^2}{(10)^2}$$

Considering 10% dropout = 4.6

Revised sample size = 46+5 (rounded from 4.6) = 51

Sample size in each group = 51/3 = 17 subjects in each group

Notations:

$Z\alpha$ = 1.96 considering CI at 95%

$Z\beta$ = 0.84 = Power at 80%

Participants will be randomly allocated using computer-generated randomisation sequence into three groups (17/group): Group-1- PNF with conventional physiotherapy, Group-2- PRE with conventional physiotherapy and Group-3- standard physiotherapy alone. Each session (60 min, 5 days/week for 3 months) will be labelled under "neuromuscular physiotherapy program" to maintain blinding. Outcome measure- Manual Muscle Testing (MMT), Fatigue Severity Scale (FSS), 36-Item Short Form Health Survey (SF-36), Functional Independence Measure (FIM), HHD and mEGOS will be assessed at baseline, three weeks, five weeks post intervention.

Upon completion, result will be shared with participants and caregivers through written handouts and feedback sessions. The outcomes of this study will be disseminated through presentations at Conferences and publications in peer reviewed journals. Additionally, the finding will be shared internally with the institutional medical and scientific communities to enhance clinical understanding and inform future rehabilitation strategies. The study will follow Consolidated Standards of Reporting Trials (CONSORT) 2025 guidelines for reporting randomised trials, including a detailed flow diagram [12].

Trial setting: The trial will be conducted at a tertiary-care teaching hospital in Central India. Patients from medicine and neurology wards, along with their caregivers, will be recruited. A multidisciplinary team comprising a neurologist, physiotherapist and nurse will administer the intervention and monitor progress. All assessments and treatments will be performed within the hospital to ensure protocol adherence, patient safety and consistent supervision

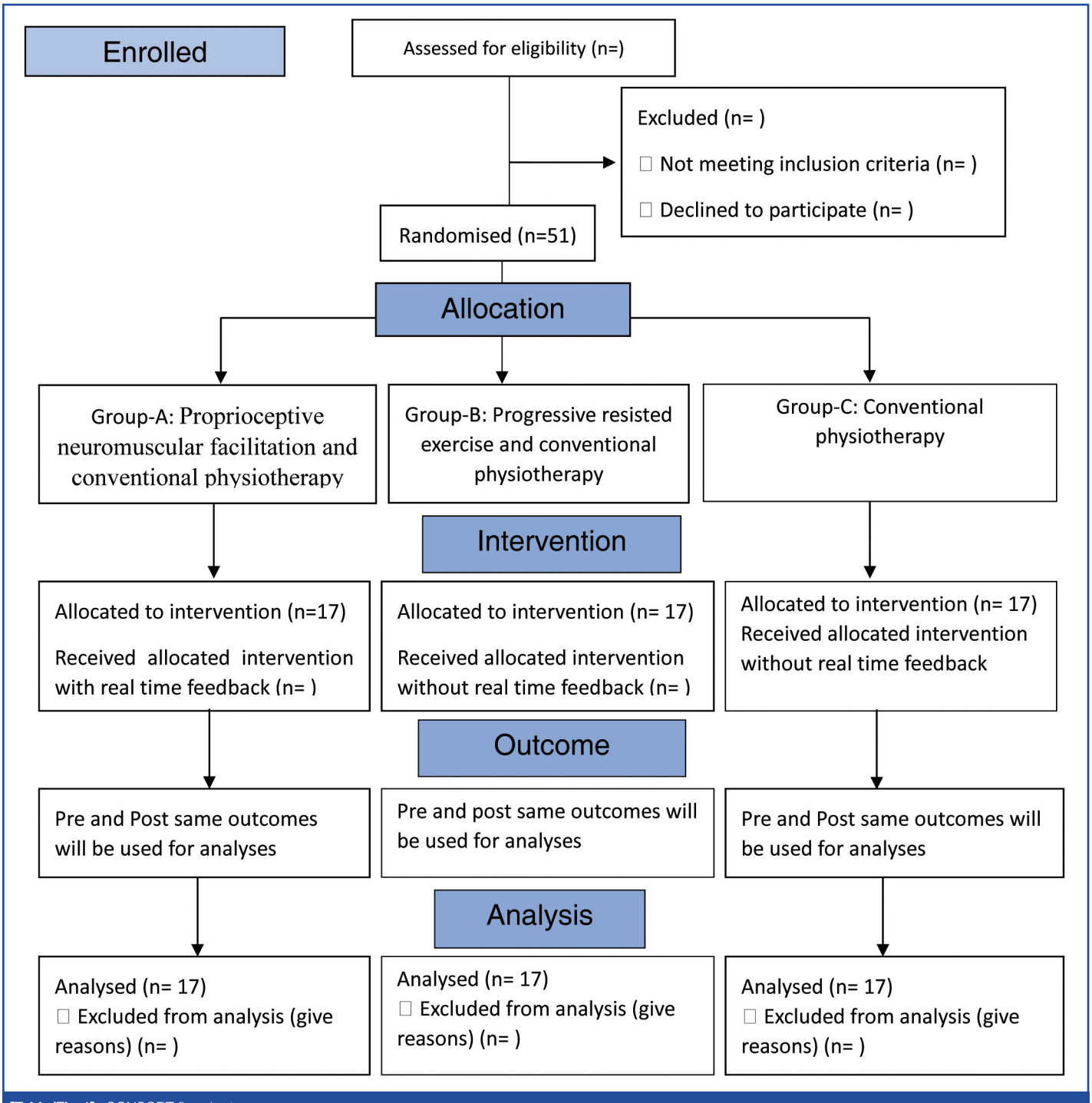
Randomisation, Allocation Concealment, Blinding: This is single-blinded (participant-blinded) study in which the participants will remain unaware of their group allocation. Blinding will be maintained by providing all groups with structured physiotherapy sessions of identical duration, frequency and setting. Although the specific content of the interventions will vary, the therapies will be delivered by trained physiotherapists in standardised and consistent manner, without revealing the nature of intervention to

participants. Each session, labelled under the "neuromuscular physiotherapy program" to maintain blinding, will last 60 min/day, conducted five days/week throughout the intervention period. To reduce performance bias, Verbal instructions, therapist interaction and therapy environments will be kept uniform across all groups, thereby minimising perceived difference in treatment. Participant will be randomly allocated to one of the three groups using a computer-generated randomisation sequence. Allocation will follow a 1:1:1 ratio and will be implemented through a simple random sampling technique to ensure equal probability of assignment. Group allocation will be concealed in sequentially numbered, opaque, sealed envelopes prepared by an independent researcher not involved in participant recruitment or intervention delivery. Before recruitment begins, the randomisation sequence will be generated by an independent researcher who is not associated with enrollment or intervention administration. The randomisation process will be unrestricted, ensuring unbiased group assignment. The flowchart illustrating the CONSORT is presented in [Table/Fig-1].

Study Procedure

The Procedure of Physiotherapist Training and Treatment Credibility: The physiotherapist delivering the interventions will undergo standardised pretrial training to ensure consistency and treatment fidelity. Training will be conducted by senior neuro-rehabilitation experts through a workshop covering theoretical concepts and practical application of PNF and PRE techniques, including hands on session and protocol familiarisation. Throughout the study, treatment sessions will be monitored for adherence and continuous feedback will be provided. The physiotherapist will document each session's content, participant demographics and training details. Interventions will be administered alongside conventional physiotherapy; senior physiotherapists will periodically observe sessions across all groups to ensure protocol compliance and evaluate treatment quality and outcomes.

Treatment Groups: The primary investigator will deliver all interventions as per approved protocol to ensure uniformity and accuracy. All



[Table/Fig-1]: CONSORT flowchart.

participants will receive standard supportive care, including nursing care, nutrition and prescribed medications. Participants developing complications will be withdrawn and provided appropriate care, while others will continue unless they voluntarily opt out. Participants may continue prescribed medications and supplements but will be asked to avoid other therapies during the trial.

Intervention Group-1 [Table/Fig-2,3]

PNF adjunct to conventional therapy:

Extremities	Diagonal patterns	Rationale	Dosage
D1 and D2 for upper extremity	F-ABD-ER	Functional multi-planner movement. Enhances proprioceptive inputs and neuromuscular reeducation	Frequency: 2-3 times/week Duration: 2-4 sets/ exercise session Intensity: 3-5 reps/ set
	E-ADD-IR		
	F-ADD-ER		
	E-ABD-IR		
D1 and D2 for lower extremity	F-ABD-IR		
	E-ADD-ER		
	F-ADD-ER		
	E-ABD-IR		

[Table/Fig-2]: Diagonal pattern.
F-ABD-ER:Flexion – Abduction – External Rotation

Sr No	Technique	Rationale	Dosage
1.	Perioral stimulation	Enhances thoracic expansion. Improves neuromuscular control of breathing mechanics. Enhances overall ventilatory efficacy	Duration: 5-10 sec Frequency: 3-5 reps, 2-3 times a day or according to the need of the subject.
2.	Vertebral stretch high and low		
3.	Intercostal stretch		
4.	Anterior stretch- lifting posterior basal area		
5.	Co-contraction of abdomen		
6.	Manual pressure		
7.	Breathing in supine side lying and prone		
8.	Diaphragmatic facilitation		

[Table/Fig-3]: Chest wall PNF techniques.

Intervention Group-II

PRE adjunct to conventional physiotherapy

The Delorme technique-based PRE progression plan is oulined in [Table/Fig-4]. TheraBand and free weights will be selected based on the individual requirement; TheraBand-based rehabilitation is detailed in [Table/Fig-5]. Conventional physiotherapy is outlined below in [Table/Fig-6].

Outcome Measures

Primary outcome of the study will include MMT, FSS, SF-36, FIM. The secondary outcomes will comprise the mEGOS and HHD readings. All outcome measures will be assessed at baseline, three weeks, five weeks and post intervention.

Primary Outcome Measures

MMT (MRC)- MMT scale has 5 grades ranging from 0 to 5 the MRC sum score ranges from 0 that is no evidence of contractility (complete paralysis) to 60 (normal strength) [13,14].

Extremity	Muscle groups	Dosage	Progression
Upper extremity	Shoulder – Flx, Ext, Abd, Add, IR and ER.	10 reps x 1 set	Yellow → Red → Green → Blue → Black → Silver → Gold
Lower extremity	Elbow- Flx, Ext		
	Wrist- Flx, Ext		
	Finger- Flx, Ext, Abd, Add		
	Hip- Flx, Ext, Abd, Add, IR and ER		
	Knee- Flx, Ext		
	Ankle- PF, DF, invertors and evertors		
	Toe- Flx, Ext, Abd, Add		
Trunk	Core group of muscle		

[Table/Fig-5]: Rehabilittion using TheraBand.

FSS: FSS has nine statements that describe the impact of fatigue on daily life. Each item is scored from 1 (strongly disagree) to 7 (strongly agree), the final score is calculated as the mean value of 9 items, providing an overall measure of fatigue severity scale [15].

SF36: SF-36 evaluates eight health concepts, including physical functioning, role activities due to physical health, bodily pain, general health perceptions, vitality, social functioning, role activities due to emotional problems and mental health [16,17].

FIM: The total FIM score ranges from 18 to 126, with higher scores indicating greater functional independence [18-20].

Secondary Outcome Measures

mEGOS: The mEGOS is a validated prognostic tool used to estimate the likelihood of functional disability in patients with GBS, particularly the inability to walk independently at four weeks, three months and six months following disease onset [21,22].

HHD: The HHD allows capturing the maximum force released by an individual or muscle group over a fixed resistance during maximal voluntary contraction [23,24].

STATISTICAL ANALYSIS

Sample will be collected in compliance with the study protocol and filed based on all relevant traits, all participants randomised into the study will be included in the final analysis. Data tabulation will be performed using Microsoft excel and statistical analysis will be conducted using the software Statistical Package for Social Sciences (SPSS) version 29.0, GraphPad prism and R statistical software. Demographic variables such as age, gender, days of hospitalisation will be recorded. Outcome variables such as SF-36 and HHD reading will be presented using continuous statistics and will be expressed as mean ± standard deviation. Variables such as MMT, FSS, FIM and mEGOS will be presented using descriptive statistics, with categorical tabulation for frequency and percentage. The normality of outcome variables will be assessed using Kolmogorov-Smirnov test, Repeated measure Analysis of Variance (ANOVA) will be used for between-group analysis to study group, time, groupxtime interaction. Statistical significance will be set at

Joint	Target group	Intervention				Dosage
Shoulder	Flexors	1st week	2nd week	3rd week	4th week	2-3 sets of 6 to 12 reps of 6 to 12 rm 100 lifts 5 times weekly, progress 10 rm daily
		10 lifts with 50% of 10 rm	10 lifts with 55%of 10 rm	10 lifts with 60% of 10 rm	10 lifts with 65% of 10 rm	
		10 lifts with 75% of 10 rm	10 lifts with 80% of 10 rm	10 lifts with 85% of 10 rm	10 lifts with 90% of 10 rm	
		10 lifts with 100% of 10 rm	10 lifts with 100% of 10 rm	10 lifts with 100% of 10 rm	10 lifts with 100% of 10 rm	
For elbow, wrist, hip, knee and ankle	10 rm will be calculated for each muscle group and progression will be done according to Delorme technique.					

[Table/Fig-4]: PRE progression using Delorme technique, TheraBand

S. No.	Goals	Intervention	Dosage	Rationale
1.	To alleviate pain	Transcutaneous Electrical Nerve Stimulation (TENS)	10 minutes per day Frequency: 60-100Hz Pulse: 60-100 microsec Mode: Modulated	TENS is a non invasive, pain-relieving modality that works by interrupting pain signals to the brain.
2.	To prevent contracture	Stretching	3 sets with 30 sec of hold	Stretching helps maintain flexibility and prevent contractures
3.	To improve strength	Isometric exercises, rhythmic stabilisation and bridging	10 reps with 5 sec holds	Isometrics exercises strengthen muscles while rhythmic stabilisation improves muscle stability and control. Bridging exercises targets core and hip muscles, essential for stability and mobility
4.	To Improve endurance	Walking	According to the endurance level of patient	Walking is a functional exercise that improves cardiovascular endurance, muscle strength and mobility. Tailoring the exercise to the patient's endurance level ensures safety and effectiveness
5.	To improve functional independence	Supine side lying, Side-lying to sit, sit stand transitions	10 reps with 1 set	Practicing these transitions helps patients develop the skill and strength needed for daily activities, promoting functional independence
6.	To maintain Range of Motion (ROM)	Active assisted exercises for B/L upper limb and lower limb	10 reps with 2 sets	Active assisted exercises preserve joint mobility, reduce stiffness and enhance muscular strength and flexibility.
7.	To improve lung capacity	Diaphragmatic breathing exercise, thoracic expansion	10 reps x 1 set	Diaphragmatic breathing exercises strengthen the diaphragm
8.	To improve balance and coordination	Multidirectional reach outs, Frenkel's exercise	10 min/day.	Multidirectional reach outs challenge balance and coordination, while Frenkel exercises improve proprioception, balance and motor control. These exercises help patients develop stability and functional mobility

[Table/Fig-6]: Conventional physiotherapy.

p<0.05, assuming 95% of confidence level. For non-parametric data, Chi-square test, Fisher's-exact test and Friedmans test will be used.

Acknowledgement

The author gracefully acknowledges the support of all individuals involved in the study.

Authors' contribution: RS conceptualise and designed the study, IQ will allocate, oversees intervention and assisted with manuscript review and contributed to reviewing and editing final draft. All authors approved the final manuscript.

REFERENCES

[1] Shah N, Shrivastava M, Kumar S, Rai N. Comparison of the outcomes of home based and supervised individually designed exercise programme amongst the patients in chronic phase after Guillain–Barré syndrome: Study protocol for a randomized controlled trial. Int J Clin Trials. 2018;5(1):60-66. Doi:10.18203/2349-3259.ijct20180132
[2] Adams RD, Victor M, Ropper AH. Principles of neurology. 6th ed. New York (NY): McGraw-Hill; 1998.
[3] Malek E, Salameh J. Guillain–Barré syndrome. Semin Neurol. 2019;39(5):589-95.
[4] Shah N, Shrivastava M. Role of physiotherapy in Guillain–Barré syndrome: A narrative review. Int J Health Sci Res. 2015;5(9):529.
[5] Löffel NB, Rossi LN, Mumenthaler M, Lotschg J, Ludin HP. The Landry–Guillain–Barré syndrome: Complications, prognosis and natural history in 123 cases. J Neurol Sci. 1977;33(1–2):71-79. Doi: 10.1016/0022-510X(77)90183-6
[6] Neharika PJ, Kanase SB, Varadharajulu G. Current evidences of physiotherapy on functional mobility in Guillain-Barré syndrome. Int J Health Sci Res. [Internet]. [cited 2025 Nov 7]. Available from: https://doi.org/10.48047/z8x0cs91.
[7] de Oliveira da Silva K, de Moura Araújo G, de Andrade DA. The contribution of physiotherapy in the treatment of patients with Guillain-Barré. Res Soc Dev. 2022;11(15):e334111536920. Doi: 10.33448/rsd-v11i15.36920.
[8] Kiper P, Chevrot M, Godart J, Cieślik B, Kiper A, Regazzetti M, et al. Physical exercise in Guillain-Barré syndrome: A scoping review. J Clin Med. 2025;14(8):2655. Doi: 10.3390/jcm14082655
[9] Vidhyadhari BS, Madavi K. Influence of Proprioceptive Neuromuscular Facilitation Techniques on diaphragm muscle activity and pulmonary function in subjects with Guillain–Barré syndrome. Indian J Physiother Occup Ther. 2015;9:24-28. Doi: 10.5958/0973-5674.2015.00047.7
[10] Shah N, Shrivastava M, Kumar S, Nagi RS. Supervised, individualised exercise reduces fatigue and improves strength and quality of life more than unsupervised home exercise in people with chronic Guillain–Barré syndrome: A randomised trial. J Physiother. 2022;68(2):123-29. Doi: 10.1016/j.jphys.2022.03.007. PMID:35396175.
[11] Newswanger DL, Warren CR. Guillain-Barré syndrome. Am Fam Physician. 2004;69(10):2405-10.
[12] Hopewell S, Chan AW, Collins GS, Hróbjartsson A, Moher D, Schulz KF, et al. CONSORT 2025 Statement: Updated guideline for reporting randomised trials. BMJ. 2025;388:e081123. https://dx.doi.org/10.1136/bmj-2024-081123.
[13] Ciesla N, Dinglas V, Fan E, Kho M, Kuramoto J, Needham D. Manual muscle testing: A method of measuring extremity muscle strength applied to critically ill patients. J Vis Exp. 2011;(50):2632. Doi: 10.3791/2632. PMID:21505416.
[14] Baschung Pfister P, de Bruin ED, Sterkele I, Maurer B, de Bie RA, Knols RH. Manual muscle testing and hand-held dynamometry in people with inflammatory myopathy: An intra- and interrater reliability and validity study. PLoS One. 2018;13(3):e0194531. Doi: 10.1371/journal.pone.0194531.
[15] Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The Fatigue Severity Scale: Application to patients with multiple sclerosis and systemic lupus erythematosus. Arch Neurol. 1989;46(10):1121-23. Doi: 10.1001/archneur.1989.00520460115022. PMID: 2803071
[16] Wu Q, Chen Y, Zhou Y, Zhang X, Huang Y, Liu R. Reliability, validity, and sensitivity of the Short-Form 36 Health Survey (SF-36) in patients with sick sinus syndrome. Medicine (Baltimore). 2023;102(24):e33979. Doi: 10.1097/MD.0000000000033979. PMID:37327281.
[17] Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473-83. PMID: 1593914.
[18] Granger CV, Hamilton BB, Keith RA, Zielezny M, Sherwin FS. Advances in functional assessment for medical rehabilitation. Top Geriatr Rehabil. 1986;1(3):59-74.
[19] Ottenbacher KJ, Hsu Y, Granger CV, Fiedler RC. The reliability of the Functional Independence Measure: A quantitative review. Arch Phys Med Rehabil. 1996;77(12):1226-32. Doi: 10.1016/S0003-9993(96)90184-7. PMID:8976303.
[20] Chumney D, Nollinger K, Shesko K, Skop K, Spencer M, Newton RA. Ability of the Functional Independence Measure to accurately predict functional outcome of a stroke-specific population: A systematic review. J Rehabil Res Dev. 2010;47(1):17-29. Doi: 10.1682/JRRD.2009.08.0140. PMID: 20437324.
[21] Doets AY, Lingsma HF, Walgaard C, Islam B, Papri N, Davidson A, et al. Predicting outcome in Guillain–Barré syndrome: International validation of the Modified Erasmus GBS Outcome Score. Neurology. 2022;98(5):e518-e532. Doi: 10.1212/WNL.0000000000013139. PMID:34937789.
[22] Xue G, Zhang Y, Wang R, Yang Y, Wang H, Li J, et al. Construction and evaluation of a prognostic prediction model based on the mEGOS score for patients with Guillain–Barré syndrome. Front Neurol. 2023;14:1303243. Doi: 10.3389/fneur.2023.1303243. PMID:38099064.
[23] Kolber MJ, Cleland JA. Strength testing using hand-held dynamometry. Phys Ther Rev. 2005;10(2):99-112. Doi: 10.1179/108331905X55730.
[24] Kolber MJ, Beekhuizen K, Cheng MS, Fiebert IM. The reliability of hand-held dynamometry in measuring isometric strength of the shoulder internal and external rotator musculature using a stabilization device. Physiother Theory Pract. 2007;23(2):119-24. Doi: 10.1080/09593980701213032. PMID: 17530541.

PARTICULARS OF CONTRIBUTORS:
1. Junior Resident, Department of Neurophysiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra, India.
2. Professor, Department of Neurophysiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Rushika Piyush Shah,
Junior Resident, Department of Neurophysiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra-442107, India.
E-mail: rushikashah004@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Sep 29, 2025
- Manual Googling: Dec 08, 2025
- iThenticate Software: Dec 10, 2025 (3%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Sep 13, 2025**
Date of Peer Review: **Oct 16, 2025**
Date of Acceptance: **Dec 12, 2025**
Date of Publishing: **May 01, 2026**