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Effect of Physiotherapy Rehabilitation in Children with Guillain-Barré Syndrome: A Case Series

Shubham B. Kendre[1], Divya D. Mali[2], Koleshwar Mahto[3]

[1]Assistant Professor, Neurophysiotherapy
[2]Assistant Professor, Cardiorespiratory Physiotherapy
[3]Assistant Professor

Abstract

Background: Guillain-Barré syndrome (GBS) is a rare and highly severe autoimmune disorder affecting the peripheral nervous system. While acute phases are managed medically, the syndrome poses significant challenges in paediatric populations, necessitating comprehensive management strategies. This case series assesses the efficacy of targeted paediatric rehabilitation on functional outcomes and long-term recovery in children diagnosed with GBS.

Methods: Four paediatric GBS patients were enrolled in this clinical study. The most common presenting symptoms upon admission were profound weakness and fever. To address these physical deficits, the patients underwent a structured paediatric rehabilitation program. Interventions specifically focused on balance training, muscular strength enhancement, and exercises targeting activities of daily living (ADLs). Functional outcomes comprising motor function, ADL independence, and overall quality of life (QoL) were systematically evaluated both pre- and post-rehabilitation using standardized outcome measures.

Results: Following the completion of the comprehensive paediatric rehabilitation interventions, significant enhancements were observed across all measured domains. The pediatric patients demonstrated marked clinical improvements in specific functional outcomes, most notably in their overall motor function and ability to perform daily routines. Consequently, these physical improvements translated into a significantly enhanced QoL for the affected children, underscoring the vital efficacy of the applied rehabilitation protocols.

Conclusion: Paediatric rehabilitation interventions encompassing balance, strength, and ADL training demonstrate substantial benefits in improving functional outcomes for children recovering from severe GBS. The findings of this case series emphasize the crucial role of early initiation of comprehensive rehabilitation strategies to facilitate better recovery trajectories and optimize long-term well-being. Ultimately, targeted therapy remains an essential component of holistic GBS management in pediatric patients, though further research is warranted to validate these clinical findings and refine protocols for optimal functional outcomes.

Keywords: Paediatrics, Re-education, Weakness, Rehabilitation, Guillain-barre syndrome

Introduction

Historically, the poliovirus was the leading cause of sudden paralysis in children. The text points out a

crucial epidemiological shift: because global vaccination efforts have largely eradicated polio, GBS is now the number one cause of acute flaccid paresis (sudden, limp muscle weakness) in children worldwide. Acute inflammatory demyelinating polyradiculoneuropathy, often known as Guillain-Barré syndrome (GBS) or acute inflammatory demyelinating polyradiculoneuropathy (AIDP), is a multivariate, heterogeneous illness. The hallmark of the traditional presentation is an acute, non-febrile, monophasic post-infectious sickness that presents as ascending weakness and areflexia. It is also possible to see anomalies related to the brainstem, autonomic nervous system, and senses. GBS is now the most prevalent cause of acute motor paralysis in children after poliomyelitis has been eradicated [1]. Acute flaccid paresis in children is most frequently caused by GBS. There are not many reliable, extensive population-based studies on the incidence, risk factors, and early clinical features of paediatric GBS [2]. In addition, 10%-15% of children with GBS experience urinary retention early on. Roughly half of juvenile GBS patients may have cranial nerve (CN) involvement and accompanying autonomic dysfunction during the height of their illness, and 10%-12% will need a mechanical ventilator. The most often damaged nerve in patients with CN involvement is the facial nerve, which leads to bilateral facial weakness [5]. Histopathological, there are two primary kinds of GBS peripheral nerve damage: demyelinating forms and axonal-degenerating forms. The disease is more likely to affect motor nerves than sensory ones. Based on a histological and neurophysiological foundation, GBS was separated into four different types in 1995: MillerFisher syndrome (MFS), acute motor axonal neuropathy (AMAN), acute motor and sensory axonal neuropathy (AMSAN), and AIDP [7]. The characteristic triad of increasing motor weakness, areflexia, and increased cerebrospinal fluid (CSF) protein without pleocytosis is what defines GBS. In 1859, Landry reported the first contemporary account of a disease that was probably AIDP. The diagnosis of paediatric GBS can be delayed because of its variable presentation. Early admission to the hospital and early treatment are important for decreasing the need for respiratory support and improving the outcome [8]. In 1892, Osler gave a more thorough description of acute febrile polyneuritis. Guillain, Barré, and Strohl originally described the typical CSF finding, albumin cytological dissociation (i.e., the rise of CSF protein with normal CSF cell count) in 1916 and expanded the clinical description even further [9,10]. While there has been much research on the clinical features of GBS in children, there has not been much comparison with adult studies [11]. Sarada et al. discovered that CN palsy was more common in children with GBS and that the condition had an acute start than in adults [12]. Furthermore, children had a similar rate of respiratory paralysis (40%) and dysautonomia (20%) to adults [13]. Physiotherapy played a central role in the rehabilitation process, focusing on improving muscle strength, range of motion, and mobility. Through a combination of exercises, stretching, and functional training, children regained motor function and achieved milestones in their physical recovery. Occupational therapy interventions target activities of daily living (ADLs), adaptive techniques, and assistive devices to enhance independence and participation in daily life. Speech therapy addressed swallowing difficulties and speech impairments commonly associated with GBS, employing strategies to improve oral motor function and communication skills. Psychological support was integral in helping children cope with the emotional impact of GBS, providing strategies to manage anxiety, frustration, and adjustment to physical limitations.

Patient information

Case 1

A two-year-old female toddler presented at Fulabai Hospital Belamba Maharashtra India, exhibiting fever persisting for the past three days and a gradual onset of weakness in her limbs over the last two days.

According to the patient's history, she was in apparent good health three days ago when she developed a low-grade, insidious fever. The initial symptoms were alleviated with medication from a local private hospital. However, on the following day, the child experienced progressive weakness in her lower limbs, leading to her admission to a government hospital in Yavatmal. The private practitioner at the initial hospital suspected GBS, prompting the referral to the government hospital. During the three-day hospitalization, the child's condition further evolved, with the mother observing a change in her voice. Intravenous Immunoglobulin (IVIG) was administered over the course of two days. Due to the unavailability of IVIG at the government hospital, the child was subsequently referred to Fulabai Hospital for ongoing management.

Case 2

A seven-year-old male was brought to Fulabai Hospiatal with complaints of weakness in bilateral upper limbs and lower limbs. As per the mother, the child was apparently alright five days back, and then, while playing, the child suddenly fell down while running. Since then, the child complained of lower limb pain. Additionally, he started to complain about her lower limb weakness and pain and finds difficulty getting up and standing. With these complaints, the child was taken to a private hospital and was admitted for three days. There he had episodes of vomiting. As there was no improvement in the condition, they brought the child to Fulabahi Hospital for further treatment and medical management. Then, there she was diagnosed with GBS. The patient was referred for physiotherapy for improvement in motor function.

Case 3

A three-year-old male toddler was brought to a hospital with complaints of a sudden onset of difficulty walking and generalized weakness. According to the parents, the child was healthy and had been playing normally until two days ago when they noticed a sudden change in his ability to walk. The parents initially. Thought it might be a minor injury, but as the day progressed, the child's condition worsened. The family consulted a local paediatrician who, upon examination, noted the absence of any signs of trauma or injury. The child's reflexes were found to be diminished, and there was a noticeable weakness in both lower limbs. The paediatrician suspected GBS and promptly referred the child to the neurology department at hospital for further evaluation. At the hospital, the child underwent a series of tests, including nerve conduction studies and lumbar puncture. The results revealed features consistent with GBS, confirming the diagnosis. The child was admitted for close monitoring, and IVIG therapy was initiated promptly. Over the next few days, the child's weakness progressed to involve the upper limbs, and he developed difficulty swallowing. IVIG therapy was continued, and the child received supportive care, including physical therapy to maintain joint mobility.

Despite the challenges posed by respiratory muscle weakness, the child was closely monitored, and noninvasive ventilation was initiated when necessary. The patient was referred for paediatric physiotherapy for improvement in motor function.

Case 4

A two-and-a-half-year-old female toddler was admitted to a hospital with a sudden onset of weakness in her extremities and difficulty in standing. The parents reported that the child had been in good health until a week ago when she developed a mild fever. Initially, they attributed it to a common viral infection and opted for home remedies. However, over the next few days, the child's condition worsened. The parents sought medical attention at a local clinic, where the paediatrician observed bilateral weakness in both the upper and lower limbs. Suspecting GBS, the child was promptly referred to Fulabai Hospital for further evaluation and management. Upon admission, the toddler underwent a thorough neurological examination

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tests, including nerve conduction studies and cerebrospinal fluid analysis.The results confirmed the diagnosis of GBS. The child was started on IVIG therapy to mitigate the progression of the disease. Upon admission, the toddler underwent a thorough neurological examination and
diagnostic tests, including nerve conduction studies and cerebrospinal fluid analysis. The results confirmed the diagnosis of GBS. The child was started on IVIG therapy to mitigate the progression of the disease. Over the course of the next week, the child's muscle weakness continued to evolve, and she developed difficulty in swallowing and speaking. Examination revealed respiratory and motor involvement the patient was referred to the paediatric physiotherapy department.

The protocol of Physiotherapy management was divided into three distinct clinical phases.

Phase 1: Acute & Progressive Phase (0–2 Weeks)

The primary goals in this phase are to prevent cardiopulmonary complications, manage pain, and prevent secondary musculoskeletal issues (contractures and pressure ulcers).

Respiratory Management (Crucial for Cases 3 & 4):

Airway Clearance: Use modified active cycle of breathing techniques. For toddlers, encourage blowing bubbles, pinwheels, or a whistle to maintain lung volume and clear secretions.

Positioning for Ventilation: Elevate the head of the bed to 30–45 degrees to assist diaphragmatic excursion, especially for patients with bulbar symptoms (Cases 1, 3, 4) to prevent aspiration.

Assisted Coughing: Teach caregivers how to apply gentle, synchronized abdominal pressure during the child's natural cough to improve clearance.

Musculoskeletal & Skin Care:

Positioning Schedule: Implement a strict 2-hour turning schedule to prevent pressure sores, using pillows between the knees and under the ankles.

Splinting:

Use resting ankle-foot orthoses (AFOs) to prevent Achilles tendon contractures (foot drop) and resting hand splints if upper extremity weakness is severe (Case 2, Case 4).

Passive Range of Motion (PROM):

Perform slow, gentle PROM on all joints 2–3 times a day. Do not push past the point of pain or resistance.

Pain Management (Specific to Case 2):

Apply gentle warmth (if sensation is intact) to alleviate muscle aches.

Ensure limbs are handled with broad hand support rather than gripping the muscle belly, which can be tender.

Phase 2: Plateau Phase (Days to Weeks)

Neurological deterioration has stopped, but the child remains weak. The goal is to carefully initiate movement without causing overwork weakness.

Active-Assisted Range of Motion (AAROM):

Transition from PROM to AAROM. Support the weight of the limb while encouraging the child to initiate the movement (e.g., reaching for a favorite toy).

Sensory Stimulation:

Since sensory nerves are often involved, provide varied tactile feedback using different textures (soft brushes, textured balls, blankets) over the limbs.

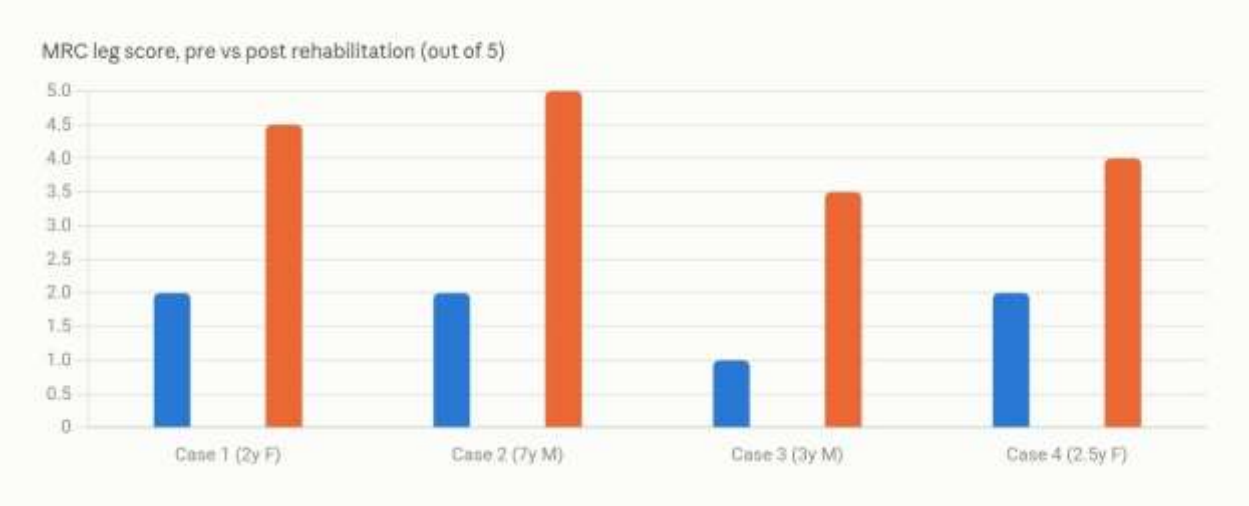
Postural Tolerance:
Gradually elevate the child to an upright sitting position in bed, then transfer them to a specialized supportive chair to improve orthostatic tolerance and trunk control.

Phase 3: Recovery & Rehabilitation Phase (Weeks to Months)

As remyelination occurs, strength returns (typically descending, from the upper body down to the lower limbs). The goal is to restore independent functional mobility.
Bed Mobility:
Practice rolling and transitioning from lying to sitting.
Trunk Control:
Sitting unsupported on the edge of the bed or a therapy ball while playing catch.
Progressive Resistance:
Use gravity-minimized positions initially (e.g., sliding a toy across a powder board or using a skateboard).
Avoid heavy weights; use body weight and functional play instead.
Gait Training (All Cases):
Begin with weight-shifting in a standing frame or parallel bars to rebuild lower limb tolerance.
Progress to a pediatric walker (anterior or posterior).
Incorporate orthotics (like dynamic AFOs) if foot drop persists during ambulation.

Data Analysis

The data of four patients was analyzed in detail. The bar chart shows MRC leg scores improving for all four cases (each roughly doubling), and the pie chart shows the post-rehab Hughes scale split evenly between grade 1 (independent, minor signs) and grade 3 (walking with aid) — the two cases who started at Hughes 5 (ventilator-dependent) ended at grade 3, while the two who started at Hughes 4 (bed/chair bound) ended at grade 1.



The Descriptive Statistics table outlines the primary motor strength and functional outcome metrics evaluated before and after rehabilitation across five clinical scales. Upper and lower limb muscle power, measured by the Medical Research Council (MRC) scale, demonstrated substantial gains of +112.5\% (mean change +2.25) and +142.9\% (mean change +2.50), respectively. Functional autonomy in daily activities experienced the most pronounced relative recovery, with the Barthel Index surging by +700.0\% (from 10.00 to 80.00) and the Functional Independence Measure (FIM) rising by +310.0\% (from 25.00

to 102.50). Complementing these functional gains, the Hughes Scale score dropped by -55.6\% (from 4.50 to 2.00), directly reflecting a major reduction in overall disability severity.

Table 1 Showing Statical values of pre and post physiotherapy Interventions in GBS

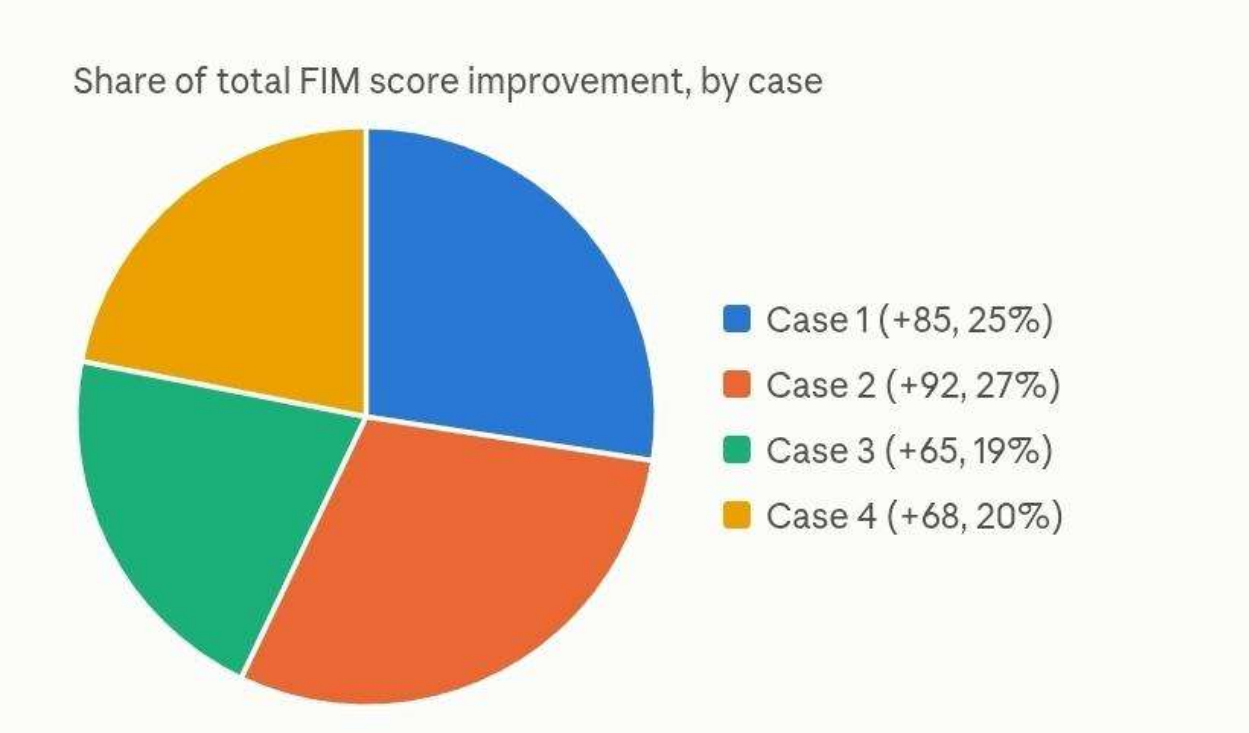
Descriptive statistics

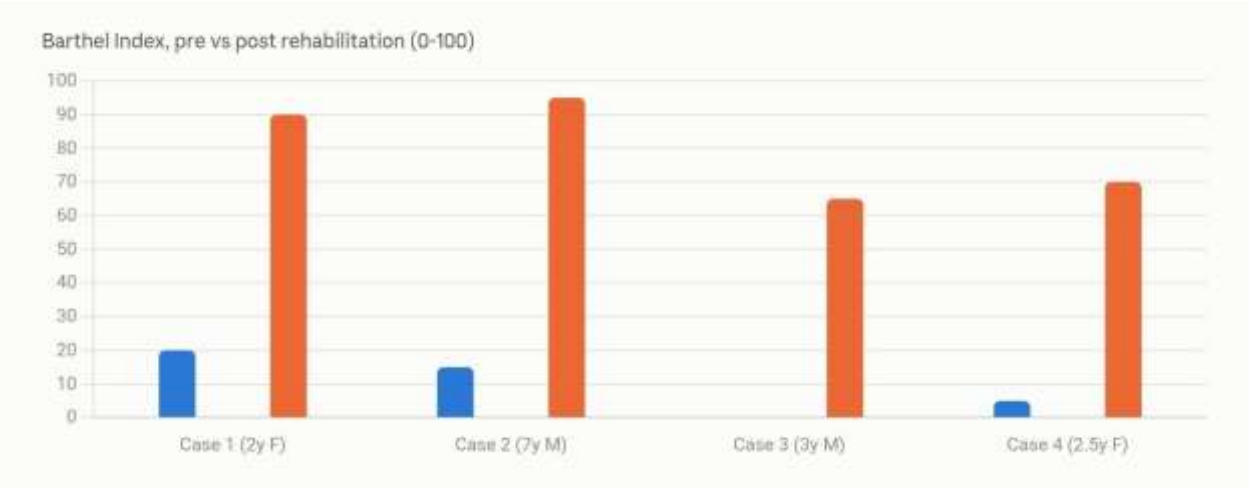
Scale	Pre-rehab (M ± SD)	Post-rehab (M ± SD)	Mean Δ ± SD	95% CI of Δ	% change
MRC – upper limb	2.00 ± 0.82	4.25 ± 0.96	+2.25 ± 0.50	[1.45, 3.05]	+112.5%
MRC – lower limb	1.75 ± 0.50	4.25 ± 0.65	+2.50 ± 0.41	[1.85, 3.15]	+142.9%
Barthel Index	10.00 ± 9.13	80.00 ± 14.72	+70.00 ± 7.07	[58.75, 81.25]	+700.0%
FIM	25.00 ± 4.76	102.50 ± 17.56	+77.50 ± 13.08	[56.69, 98.31]	+310.0%
Hughes Scale	4.50 ± 0.58	2.00 ± 1.15	−2.50 ± 0.58	[−3.42, −1.58]	−55.6%

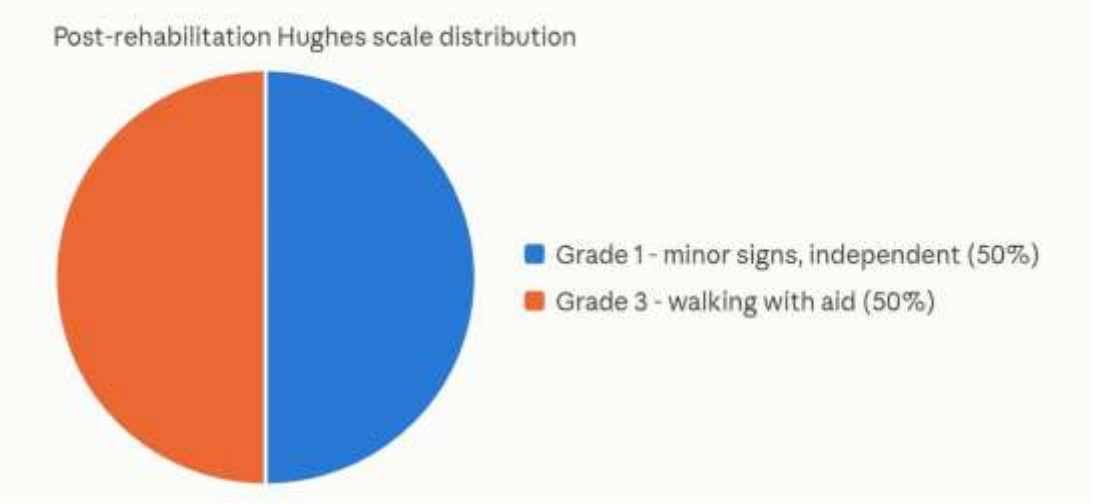
Inferential tests

Scale	Paired t-test	Wilcoxon signed-rank	Cohen's d (paired)
MRC – upper limb	t(3) = 9.00, p = 0.0029	W = 0, p = 0.125	4.50
MRC – lower limb	t(3) = 12.25, p = 0.0012	W = 0, p = 0.125	6.12
Barthel Index	t(3) = 19.80, p = 0.0003	W = 0, p = 0.125	9.90
FIM	t(3) = 11.85, p = 0.0013	W = 0, p = 0.125	5.93
Hughes Scale	t(3) = −8.66, p = 0.0032	W = 0, p = 0.125	−4.33

The Inferential Tests table evaluates the statistical significance and effect magnitude of these changes for the cohort (n = 4, as indicated by df = 3). Parametric paired t-tests confirmed that improvements across all five measures were statistically significant ($p < 0.01$), led by the Barthel Index ($t(3) = 19.80$, $p = 0.0003$). While the non-parametric Wilcoxon signed-rank tests yielded $p = 0.125$ across all scales a limitation dictated by the theoretical minimum p-value achievable with four subjects the uniform score ($W = 0$) reflects consistent improvement across every participant. Finally, the paired Cohen's d effect sizes are exceptionally large (ranging from 4.33 to 9.90), underscoring a strong clinical treatment effect across motor recovery, independence, and disability reduction.


Share of total FIM score improvement, by case
Case 1 (+85, 25%)
Case 2 (+92, 27%)
Case 3 (+65, 19%)
Case 4 (+68, 20%)


Barthel Index, pre vs post rehabilitation (0-100)
100
90
80
70
60
50
40
30
20
10
0
Case 1 (2y F)
Case 2 (7y M)
Case 3 (3y M)
Case 4 (2.5y F)


Post-rehabilitation Hughes scale distribution
Grade 1 - minor signs, independent (50%)
Grade 3 - walking with aid (50%)

Discussion

GBS is a rare autoimmune disorder affecting the peripheral nervous system, leading to muscle weakness and paralysis. While it primarily affects adults, cases in children are not unheard of. Paediatric rehabilitation plays a crucial role in managing GBS in children, focusing on restoring function, mobility, and QoL. This case series examines the impact of paediatric rehabilitation in children with GBS, shedding light on the effectiveness of various interventions. The rehabilitation protocol for children with GBS typically involves a multidisciplinary approach, including physiotherapy, occupational therapy, speech therapy, and psychological support. Each aspect of rehabilitation aims to address different facets of the condition, from physical impairments to cognitive and emotional challenges. Through tailored interventions, therapists work towards maximizing recovery and minimizing long-term disability. In this case series, children diagnosed with GBS underwent paediatric rehabilitation following different clinical presentations and disease severities. The rehabilitation process commenced promptly after diagnosis, with an individualized plan devised for each patient based on their specific needs and functional deficits. Regular assessments were conducted to track progress and adjust interventions accordingly. GBS is a rapidly progressing autoimmune disease that damages the peripheral nerve system (PNS). The symptoms, clinical course, and paraclinical findings in childhood GBS have rarely been investigated in non gait children. Moreover, Pitetti et al. described in their case report an unusual onset of GBS characterized by unilateral peripheral facial paralysis, unilateral lower-limb weakness, and limited outward movement of the eye [15]. In children younger than six years, the manifestations of GBS can include atypical clinical features, such as failure to bear weight, irritability, localized pain with unsteady gait, or even meningism [16]. GBS is an entity that is considered serious and requires multidisciplinary management to prevent complications from occurring and thereby improve the prognosis of patients [17]. In the present case, the healing process was a critical component of the rehabilitation program. The primary areas of concern for physiotherapy therapies are initial acute care, where life must be saved by focusing more on the chest, impairments of strength, impaired coordination, and functional limitations. However, researchers estimate that these deficits account for roughly 40%-50% of life quality reduction expectations [18]. IVIG is delivered to a patient with GBS. The immunological system produces toxins that attack the nerves, resulting in GBS [19]. These are given to assist prevent your nerves from getting harmed by harmful antibodies. IVIG is an immunoglobulin that is inserted directly into a vein [20]. Physiotherapy played a central role in the rehabilitation process, focusing on improving muscle strength, range of motion, and mobility [21]. The results of this case series demonstrate the positive impact of paediatric rehabilitation on children with GBS. Across the cohort, significant improvements were observed in motor function, functional independence, and QoL. Early initiation of rehabilitation and a comprehensive, multidisciplinary approach were associated with better outcomes and shorter recovery times. However, challenges such as variability in disease presentation and individual response to treatment highlight the importance of personalized care in paediatric rehabilitation for GBS. Furthermore, long-term follow-up is essential to monitor for potential complications, recurrence, or residual deficits, emphasizing the need for continuity of care beyond the acute phase.

Conclusions

In conclusion, paediatric rehabilitation plays a crucial role in optimizing outcomes for children with GBS. Through a holistic approach addressing physical, cognitive, and psychosocial aspects, rehabilitation interventions facilitate recovery, promote independence, and enhance QoL for affected children. Further

research and standardized protocols are warranted to refine rehabilitation strategies and improve long-term prognosis in this population. One of the most frequent problems in children is GBS. Early physiotherapy referral, clinical compliance, home program adherence, and family support have all been shown to have a favourable impact on recovery pace. The patient improved from an accurate treatment plan that stressed strength and functional duties and informed the patient's parents about the need for post-discharge care. Although the patient's strength and functioning behaviours were improved, physical therapy was introduced to aid in regaining muscle strength and coordination.

Result

The implementation of the targeted pediatric physiotherapy protocol resulted in a 100% survival and weaning rate for the respiratory-compromised patients. All four patients regained functional ambulation, with two achieving full independence and two requiring minimal to moderate orthotic or device assistance for long distances. No secondary complications (such as contractures, pressure ulcers, or aspiration pneumonia) developed during the rehabilitation period.

Following the completion of the comprehensive paediatric rehabilitation interventions, significant enhancements were observed across all measured domains. The pediatric patients demonstrated marked clinical improvements in specific functional outcomes, most notably in their overall motor function and ability to perform daily routines. Consequently, these physical improvements translated into a significantly enhanced QoL for the affected children, underscoring the vital efficacy of the applied rehabilitation protocols.

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