

Physiotherapy Rehabilitation in Erythema Nodosum Leprosum Associated with Leprosy: A Case Report

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Abstract

Background: Erythema nodosum leprosum (ENL) is a type 2 leprosy reaction that may affect the skin, peripheral nerves, and musculoskeletal system, causing pain, sensory and motor impairment, restricted range of motion (ROM), and functional limitations. Evidence on physiotherapy management during active ENL remains limited.

Objective: To describe the clinical changes following physiotherapy management in a patient with active ENL associated with leprosy.

Methods: A 32-year-old man with ENL associated with leprosy was hospitalized at Dr. Tadjuddin Chalid General Hospital, Makassar. Assessment included pain, muscle strength, ROM, sensory function, static balance, and functional independence using the Visual Analogue Scale, Manual Muscle Testing, Semmes-Weinstein Monofilament, Single Leg Stand Test, and Barthel Index. The patient received three physiotherapy sessions comprising ROM exercises, stretching, strengthening, bridging, sensory re-education, grasping, sitting balance, and activities of daily living training.

Results: Pain decreased at rest (2 to 0), pressure (8 to 5), and movement (6 to 4). Improvements were observed in left wrist flexion (40° to 60°), extension (20° to 50°), right ankle dorsiflexion (7° to 15°), and plantarflexion (20° to 25°). The Barthel Index increased from 72 to 91. Single Leg Stand duration increased from 8 to 13 seconds on the right and 11 to 20 seconds on the left. MMT and sensory findings remained unchanged.

Conclusion: Clinical improvements were observed after three physiotherapy sessions; however, effectiveness cannot be established due to the single-case design, short observation period, and concurrent medical treatment.

Keywords

Activities of Daily Living; Erythema Nodosum Leprosum; Leprosy; Physical Therapy Modalities

Introduction

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* that primarily affects the skin and peripheral nerves. The organism has a particular affinity for macrophages in the skin and Schwann cells in peripheral nerves, which may result in sensory, motor, and autonomic impairment. Despite the substantial reduction in disease prevalence following the implementation of multidrug therapy (MDT), new cases continue to be reported, particularly in tropical and endemic regions.¹ In 2023, all 23 global priority countries for leprosy reported data to the World Health Organization (WHO), with India, Brazil, and Indonesia remaining among the countries reporting the highest numbers of new cases.¹ The continued occurrence of new cases, including cases among children in endemic regions, indicates that transmission remains an important public health concern.^{1,2} Therefore, early diagnosis, appropriate treatment, disability prevention, and comprehensive rehabilitation remain important components of leprosy management.³ Consistent with this approach, the WHO Global Leprosy Strategy 2021–2030 emphasizes interruption of transmission, prevention of disability, and reduction of stigma and discrimination associated with the disease.²

Leprosy reactions are acute or subacute inflammatory episodes resulting from immunological responses to *M. leprae* or its antigens. These reactions may occur before, during, or after MDT and represent an important cause of nerve impairment, morbidity, and disability among individuals affected by leprosy.⁴ If not recognized and appropriately managed, inflammatory nerve involvement may lead to sensory loss, muscle weakness, deformity, and permanent functional limitations that can affect independence and quality of life.⁵ Clinically, leprosy reactions include type 1 reactions, also known as reversal reactions, type 2 reactions or erythema nodosum leprosum (ENL), and the Lucio phenomenon. These conditions differ in their immunopathogenesis, clinical manifestations, and therapeutic management.⁴

ENL is a type 2 leprosy reaction and a multisystem immunological complication that occurs predominantly in patients with lepromatous leprosy and, less frequently, in those with borderline lepromatous leprosy. The condition has been reported more frequently in patients with a high bacterial index and may involve several organ systems.⁶ Its clinical manifestations may include painful skin and subcutaneous lesions, peripheral edema, fever, nerve dysfunction, arthritis, lymphadenitis, orchitis, and involvement of other organs, including the eyes and upper respiratory tract.⁶ Consequently, the clinical burden of ENL extends beyond cutaneous manifestations. Persistent inflammation and nerve involvement may contribute to sensory and motor impairment, joint stiffness, reduced range of motion (ROM), muscle weakness, deformity, and subsequent limitations in daily activities.^{5,6}

The consequences of ENL may therefore involve multiple domains of functioning. In addition to physical symptoms, the condition can affect mobility, self-care, work-related activities, and social participation. Management of ENL generally includes medical treatment to control inflammatory activity, with systemic corticosteroids commonly used and other pharmacological options considered according to the clinical condition and safety considerations.⁶ However, disease control alone does not necessarily address all functional consequences associated with peripheral nerve impairment, musculoskeletal limitations, and reduced activity

performance. Comprehensive leprosy management consequently includes disability assessment, early identification of nerve impairment, self-care, prevention of secondary complications, rehabilitation, and support for continued participation in daily life.^{3,5,7}

Rehabilitation is particularly relevant when patients experience concurrent impairment across several body systems. In patients with ENL, skin involvement may coexist with sensory disturbances, muscle weakness, joint contracture, restricted ROM, impaired postural control, and reduced functional capacity. These problems may interact and contribute to activity limitations, particularly when pain, sensory loss, and musculoskeletal impairment occur simultaneously.^{9,10} Physiotherapy assessment and intervention should therefore consider the relationship between impairments in body functions and structures, activity limitations, and potential restrictions in participation. Such an approach may assist clinicians in identifying treatment priorities and selecting interventions that are appropriate to the patient's clinical presentation and tolerance.

Although rehabilitation is recognized as part of comprehensive leprosy management, published literature on ENL has predominantly focused on epidemiology, clinical manifestations, immunopathogenesis, diagnosis, and pharmacological management. Clinical descriptions specifically addressing physiotherapy management during active ENL remain limited, particularly in patients presenting with concurrent integumentary, sensory, motor, and musculoskeletal impairments together with limitations in daily activities.⁷ This represents an important clinical gap because the presence of multiple impairments may require physiotherapists to modify assessment procedures, treatment selection, exercise intensity, positioning, and safety considerations according to the patient's skin condition and overall clinical status.¹¹ A more structured description of clinical assessment, identification of physiotherapy problems, intervention planning, and observed outcomes may therefore provide useful information for rehabilitation practice in this complex clinical context.

The clinical contribution of this case report lies in its integrated description of physiotherapy management in a patient with active ENL presenting with multisystem functional impairment.¹² Rather than evaluating the effectiveness of a specific intervention, this report documents the clinical process from physiotherapy assessment and identification of priority problems to intervention selection and observation of changes in pain, ROM, muscle strength, sensory function, balance, and functional independence during the rehabilitation period.¹² The report also considers the clinical context in which rehabilitation was delivered, including extensive skin involvement and concurrent medical treatment. Accordingly, the observed changes are presented descriptively and should not be interpreted as evidence of a causal effect of physiotherapy.

This case report therefore aims to describe the physiotherapy management of a hospitalized patient with ENL associated with leprosy, including the assessment of relevant impairments, identification of priority physiotherapy problems, selection of individualized interventions, and changes in available clinical outcomes during the rehabilitation period. By documenting the relationship between clinical findings, physiotherapy problems, intervention strategies, and observed outcomes, this report is intended to contribute a structured clinical description of rehabilitation practice for patients with ENL and complex functional impairment.

Methods

This case report was prepared in accordance with the CARE guidelines for the reporting of clinical cases.¹³ The report describes a 32 year old man with erythema nodosum leprosum (ENL) associated with leprosy who received inpatient care at Dr. Tadjuddin Chalid General Hospital, Makassar. Primary clinical data were obtained through patient history taking, clinical observation, and physiotherapy examination. Secondary data were obtained from available medical records and clinical documentation during hospitalization. The observation period extended from February 24 to February 27, 2026.

The diagnosis of ENL had been established by the medical team before physiotherapy assessment. The clinical manifestations documented in the available records included pruritus, erythematous rash extending from the face to the extremities, fever, and generalized weakness. Detailed diagnostic investigations supporting the diagnosis of ENL were not available in the medical records used for this report; therefore, no additional diagnostic findings were inferred or reconstructed. The patient's medical history began in 2021. In 2023, he was diagnosed with leprosy and subsequently completed a one year course of multidrug therapy (MDT). In October 2025, pruritus, erythematous rash involving the face and extremities, fever, and generalized weakness recurred, after which he was diagnosed with ENL and received medical treatment. During the physiotherapy observation period, MDT and corticosteroid therapy continued without documented changes. The temporal sequence of the clinical history, hospitalization, physiotherapy sessions, and final assessment is summarized in Table 1.

Table 1. Timeline of the clinical course and physiotherapy management

Time	Clinical course
2023	Diagnosed with leprosy and initiated MDT
2023 to 2024	Completed approximately one year of MDT
October 2025	Recurrent pruritus, generalized erythematous rash, fever, and weakness; diagnosed with ENL and received medical treatment
February 24, 2026	Hospitalized; baseline physiotherapy assessment and first physiotherapy session
February 25, 2026	Second physiotherapy session
February 27, 2026	Third physiotherapy session and final assessment

This report used clinical data obtained during routine physiotherapy services conducted as part of clinical education at Dr. Tadjuddin Chalid General Hospital, Makassar. It involved one individual and did not include participant recruitment or experimental intervention outside routine clinical care. According to the institutional practice described in the available documentation, separate research ethical approval was not obtained and no ethical approval number was available. Patient confidentiality was maintained throughout manuscript preparation. Informed consent for the use of clinical information and publication of the case report was obtained from the patient.

At the time of physiotherapy assessment, the patient reported difficulty moving during daily activities and occupational tasks involving lifting. Static inspection was performed with the patient in the supine position. An intravenous line was present in the left hand. The face appeared erythematous with a moon face appearance, while the ears were erythematous and thickened. Digits III to V of the left hand were positioned in semiflexion, accompanied by thenar and hypothenar muscle atrophy. The skin was dry, scaly, desquamated, and hyperpigmented. Bullae were present on the face and extremities, with several lesions remaining open. Additional findings included reduced sensation in the left hypothenar and interdigital regions, weakness of the intrinsic hand muscles, contracture involving the flexor digitorum superficialis and flexor digitorum profundus, and restricted movement of the left fingers and ankle. Difficulties with functional activities were also identified.

Physiotherapy outcomes included pain intensity, muscle strength, joint range of motion (ROM), sensory function, static balance, and functional independence. Pain intensity was assessed using the Visual Analogue Scale (VAS) under resting, pressure,

and movement conditions. Muscle strength was evaluated using Manual Muscle Testing (MMT), and joint ROM was measured using a universal goniometer. Sensory function was assessed using the Semmes Weinstein Monofilament (SWM), focusing on the clinically affected areas identified during the initial examination. Static balance was assessed using the Single Leg Stand Test, and functional independence was assessed using the Barthel Index. Mobility outcomes such as walking speed and walking distance were not included because corresponding quantitative data were unavailable. Therefore, mobility was considered part of the clinical problem assessment rather than an independently quantified primary outcome.

All outcome measures were obtained at baseline before the first physiotherapy session (T0) and repeated after the third session (T3) using the same clinical procedures. The VAS, universal goniometer, Single Leg Stand Test, SWM, MMT, and Barthel Index were selected because they provided clinically relevant measures of the patient's pain, musculoskeletal function, sensory impairment, balance, and functional independence.

The clinical findings were organized using the International Classification of Functioning, Disability and Health (ICF) framework to establish a structured relationship between impairments, activity limitations, contextual factors, intervention targets, and available outcomes. At the level of body functions and structures, the patient presented with pain, sensory impairment involving the left hand and lower extremities, restricted ROM, muscle weakness, thenar and hypothenar atrophy, finger flexor contracture, and extensive skin involvement. Activity limitations included reduced performance of daily activities and impaired use of the left hand. Participation restrictions involved difficulty performing occupational and social activities. Relevant environmental factors included inpatient care, ongoing MDT and corticosteroid therapy, and the unavailability of electrotherapy equipment for use in the inpatient setting. Personal factors included male sex, age of 32 years, previous completion of MDT, and productive working age. The ICF mapping is presented in Table 2 as the basis for the clinical reasoning process.

Table 2. ICF based physiotherapy problem mapping

ICF component	Clinical findings and implications
Body functions and structures	Pain, sensory impairment, restricted ROM, muscle weakness, muscle atrophy, finger flexor contracture, and extensive skin lesions
Activity limitations	Reduced independence in daily activities, impaired left hand function, and difficulty performing functional tasks
Participation restrictions	Difficulty performing occupational and social activities
Environmental factors	Inpatient care, ongoing MDT and corticosteroid therapy, and limited availability of electrotherapy
Personal factors	Male, 32 years old, previous MDT completion, and productive working age

The intervention programme consisted of three physiotherapy sessions on February 24, 25, and 27, 2026. Each session lasted approximately 25 to 35 minutes and was delivered by a physiotherapist at Dr. Tadjuddin Chalid General Hospital. Exercise selection was based on the initial physiotherapy findings. Because of multiple bullae and open skin lesions, all exercises were performed at a submaximal intensity and were modified according to the patient's tolerance and clinical condition. Excessive loading, direct pressure, and unnecessary friction over affected areas were avoided. The patient's clinical response and tolerance were monitored during each session. The programme included passive and active ROM exercises, stretching, strengthening exercise, bridging exercise, grasping exercise, sensory re education, mobility training, sitting balance exercise, and activities of daily living training.

Passive and active ROM exercises were performed bilaterally at the ankle, wrist, and fingers. The programme included ankle dorsiflexion and plantarflexion, inversion and eversion, wrist flexion and extension with radial and ulnar deviation, and finger flexion, extension, abduction, adduction, and opposition. The prescribed dose was three sets of 10 repetitions. Stretching targeted the flexor digitorum superficialis and flexor digitorum profundus and was performed for 15 to 30 seconds for two repetitions. Strengthening of the intrinsic hand muscles used an elastic resistance band at a submaximal intensity. Resistance was selected according to the patient's observable muscle contraction, MMT findings, and exercise tolerance, with a prescribed dose of two sets of eight repetitions. This approach was intended to avoid assigning an unsupported numerical loading intensity while still documenting the basis for dose selection.

Bridging exercise was performed in the supine position with the knees flexed. The patient lifted the pelvis from the bed toward alignment of the trunk and thighs before returning slowly to the starting position. The exercise was prescribed for two sets of eight repetitions and targeted trunk and pelvic muscle activation relevant to transfer and postural stability. Grasping exercise was performed in sitting with the forearm supported and the wrist maintained in a neutral position. The patient actively opened and closed the hand around a therapy ball, maintaining the grasp for five seconds before controlled release, for two sets of six repetitions. Sensory re education involved tactile stimulation of the left hand and both feet using different textures and identification of the location and type of touch for approximately five to seven minutes. The intervention was selected to address the documented sensory impairment, although short term sensory change was not assumed.

Functional mobility training progressed through bed mobility, supine to sitting transfer, sitting at the edge of the bed, sit to stand, and controlled return to sitting. One set of eight repetitions was performed according to patient tolerance. Sitting balance exercise was conducted at the edge of the bed with both feet supported on the floor. The patient practiced maintaining upright sitting, anterior, posterior, and lateral weight shifting, and reaching in different directions for two sets of 10 repetitions. Activities of daily living training consisted of five to seven minutes of simulated functional tasks, including eating, drinking, simple personal hygiene, dressing, and hand use for grasping, holding, and moving light objects. Detailed procedures and doses are presented in Table 3 to support intervention reproducibility.

The same general intervention framework was maintained across the three sessions. No structured progression, fixed rest interval, or predetermined stopping threshold was documented in the available clinical record. Accordingly, these parameters were not retrospectively added. Exercise position and dose could be modified according to tolerance and skin condition. No adverse events or clinical responses requiring discontinuation of the intervention were documented during the three sessions. The patient was reported to tolerate the programme well. There was no follow up assessment beyond T3, and a systematic patient perspective was not available in the clinical documentation.

Results

The clinical findings are presented descriptively to document changes observed between the baseline assessment before the first physiotherapy session (T0) and the final assessment after the third session (T3). Because this report describes a single patient without a control condition, the results do not establish a causal relationship between the physiotherapy programme and the observed changes. The patient continued to receive concurrent medical management during the observation period; therefore, changes in clinical status should be interpreted within the overall context of inpatient care and the natural course of ENL.^{6,14}

At baseline, the patient presented with a complex combination of integumentary, sensory, motor, and musculoskeletal impairments. Clinical observation identified erythematous skin changes, bullae, and several open lesions involving the face and extremities. The patient also presented with thenar and hypothenar muscle atrophy, semiflexion of digits III to V of the left hand, reduced sensation in selected areas, weakness of the intrinsic hand muscles, contracture of the flexor digitorum superficialis and flexor digitorum profundus, and restricted movement of the left wrist, fingers, and right ankle. Peripheral nerve involvement in leprosy can result in sensory impairment, motor weakness, pain, and subsequent disability or deformity.¹⁵ These impairments were accompanied by difficulty performing daily activities and functional tasks requiring hand use and movement. The baseline findings therefore reflected limitations across several domains, including body functions and structures and activity performance.

Pain intensity was assessed using the Visual Analogue Scale (VAS) under three clinical conditions: at rest, during pressure, and during movement. At T0, the patient reported a VAS score of 2 at rest, 8 during pressure, and 6 during movement. Following the three physiotherapy sessions, the corresponding scores were 0, 5, and 4. The largest absolute reduction was observed in pain during pressure, which decreased by 3 points. Pain during movement decreased by 2 points, whereas resting pain decreased by 2 points to a score of 0. These findings indicate that lower pain scores were documented at T3 across all three assessment conditions. However, because pain may fluctuate according to inflammatory activity, medication, wound status, activity, and the overall clinical course, these changes cannot be attributed exclusively to physiotherapy.

Changes in joint ROM were observed in the left wrist and right ankle. At T0, left wrist flexion was 40° and extension was 20°. At T3, wrist flexion increased to 60°, while extension increased to 50°. Therefore, the observed change was 20° for flexion and 30° for extension. Right ankle dorsiflexion increased from 7° at baseline to 15° at the final assessment, whereas plantarflexion increased from 20° to 25°. These findings suggest an increase in the available ROM of the affected joints during the observation period. The changes were considered descriptively in relation to the patient's initial stiffness and movement limitation. Nevertheless, no minimal clinically important difference or other predefined threshold for clinically meaningful change was applied. Consequently, the observed numerical changes should not be interpreted as proof of clinical effectiveness or as evidence that the intervention alone produced the improvement.¹⁵

Muscle strength was assessed using Manual Muscle Testing (MMT). The available findings did not demonstrate a change in MMT grade between T0 and T3. In particular, muscle weakness involving the intrinsic muscles of the left hand remained present after the intervention period. This finding is important because it demonstrates that not all assessed outcomes changed during the three session observation period. The absence of a measurable change in muscle strength may reflect the short duration of the intervention, the underlying peripheral nerve involvement, the patient's overall clinical condition, or other factors that could not be separated within a single case observation. Therefore, strengthening exercise was documented as part of the intervention programme, but the results do not demonstrate a measurable increase in MMT during the reported period.

Sensory function was assessed in the clinically affected areas using the Semmes Weinstein Monofilament examination. At baseline, reduced sensation was identified in the left hypothenar and interdigital regions, with additional sensory impairment documented in the lower extremities. The same general pattern of sensory impairment remained at T3, and no measurable change in sensory findings was documented during the three sessions. Similar to the MMT findings, the absence of short term change in sensory status should not be interpreted as intervention failure or effectiveness. Instead, it indicates that sensory impairment remained clinically detectable within the limited observation period. Given the neurological involvement associated with leprosy and ENL, sensory recovery may not occur over a short period of inpatient physiotherapy, particularly when peripheral nerve impairment has been present before the rehabilitation programme.

Static balance was evaluated using the Single Leg Stand Test. At T0, the patient maintained single leg standing for 8 seconds on the right side and 11 seconds on the left side. At T3, the duration increased to 13 seconds on the right and 20 seconds on the left. The observed increase was therefore 5 seconds on the right and 9 seconds on the left. These results indicate improved test performance at the final assessment compared with baseline. The difference between the two sides remained evident, although both sides demonstrated a longer standing duration at T3. As with the other outcomes, these findings are reported as observed changes over time. Repeated exposure to the test, variation in pain, changes in general condition, and concurrent medical treatment may also have influenced the final performance.

Functional independence was assessed using the Barthel Index. The baseline score was 72, indicating that the patient required some assistance in performing selected activities of daily living. At T3, the score increased to 91. The observed increase of 19 points indicates a higher level of independence at the final assessment. This finding was consistent with the clinical focus of the rehabilitation programme, which included functional movement and activities of daily living training. However, individual Barthel Index items were not reported as separate quantitative outcomes in the available data. Therefore, it is not possible to determine which specific activities contributed most to the increase in the total score. The improvement in the total score should consequently be interpreted as an observed change in overall functional independence rather than evidence of improvement in every individual activity domain.

The principal outcomes are summarized in Table 4 to provide a concise comparison between T0 and T3. The table presents only outcomes for which baseline and final assessment data were available. Outcomes without corresponding quantitative pre and post data were not added retrospectively.

Table 4. Changes in clinical outcomes from baseline to final assessment

Outcome	T0	T3	Observed change
VAS at rest	2	0	Decreased by 2 points
VAS during pressure	8	5	Decreased by 3 points
VAS during movement	6	4	Decreased by 2 points
Left wrist flexion	40°	60°	Increased by 20°
Left wrist extension	20°	50°	Increased by 30°
Right ankle dorsiflexion	7°	15°	Increased by 8°
Right ankle plantarflexion	20°	25°	Increased by 5°
Single Leg Stand, right	8 s	13 s	Increased by 5 s
Single Leg Stand, left	11 s	20 s	Increased by 9 s
Barthel Index	72	91	Increased by 19 points
MMT	No documented change	No documented change	Unchanged
Sensory function	Hypoesthesia in affected areas	No documented change	Unchanged

Abbreviations: MMT, Manual Muscle Testing; T0, baseline assessment before the first physiotherapy session; T3, assessment after the third physiotherapy session; VAS, Visual Analogue Scale.

As summarized in Table 4, the most apparent numerical changes during the observation period were found in pain intensity, selected joint ROM measurements, static balance performance, and the total Barthel Index score. In contrast, muscle strength and sensory findings remained unchanged. This variation across outcomes highlights the heterogeneous clinical response observed during a short period of inpatient rehabilitation. The findings should therefore be interpreted as a descriptive clinical profile rather than as a uniform improvement across all domains.

The intervention programme was completed over three sessions. According to the available clinical documentation, the patient tolerated the prescribed exercises and no adverse events requiring discontinuation or modification of the programme were recorded. The absence of documented adverse events should be interpreted as the absence of recorded events during the observation period rather than confirmation that the intervention was risk free. Safety considerations remained particularly relevant because the patient had bullae and open skin lesions. Exercise procedures were therefore adapted to avoid unnecessary pressure, friction, or excessive loading of affected areas and were performed according to the patient's tolerance.

No follow up assessment was available beyond the final evaluation after the third physiotherapy session. Consequently, the persistence of the observed changes, delayed recovery, deterioration, or subsequent functional progression could not be determined. Similarly, no standardized patient perspective was documented during the observation period. The results are therefore limited to the clinical outcomes recorded between T0 and T3 and should not be extrapolated beyond this short inpatient period.

Overall, the findings document changes in several available clinical outcomes following three physiotherapy sessions within a broader programme of inpatient and medical management. Lower pain scores, increased ROM in selected joints, longer Single Leg Stand duration, and a higher Barthel Index score were observed at T3, whereas MMT grades and sensory findings remained unchanged. Given the single case design, brief observation period, absence of a control condition, and concurrent MDT and corticosteroid therapy, these findings demonstrate temporal clinical changes only and cannot determine whether the observed outcomes resulted from physiotherapy, medical treatment, the natural course of ENL, or a combination of these factors.

Discussion

This case report describes the clinical course of a patient with erythema nodosum leprosum (ENL) associated with leprosy who presented with a combination of integumentary, sensory, motor, and musculoskeletal impairments accompanied by limitations in daily activities. During the observation period, changes were documented in pain intensity, selected joint range of motion (ROM), static balance performance, and functional independence, whereas muscle strength and sensory findings remained unchanged. These findings should be interpreted as temporal clinical changes observed during a short period of inpatient rehabilitation rather than as evidence of the effectiveness of physiotherapy. The patient continued to receive concurrent medical management, including multidrug therapy (MDT) and corticosteroid treatment, and the respective contributions of physiotherapy, medical treatment, rest, wound care, and the natural course of ENL cannot be separated in a single case report.

ENL is a complex inflammatory reaction that may involve the skin, peripheral nerves, joints, and other organ systems.¹⁻⁶ In the present case, the clinical presentation extended beyond dermatological manifestations and included bullae, open skin lesions, sensory impairment, muscle atrophy, weakness, contracture, restricted ROM, pain, and reduced functional independence. This combination illustrates the importance of considering functioning as an interaction between impairments in body functions and structures and their consequences for activity performance.^{16,10} The International Classification of Functioning, Disability and Health (ICF) framework was therefore useful for organizing the clinical reasoning process.^{10,17,18} At the body functions and structures level, pain, sensory impairment, weakness, contracture, and restricted ROM were identified as relevant impairments. These problems were associated with difficulties in hand use and daily activities, while occupational and social activities represented potential participation concerns.¹⁰

Pain scores decreased under resting, pressure, and movement conditions during the observation period. The greatest numerical reduction was observed during pressure, followed by movement and resting conditions. From a clinical perspective, lower pain levels may have been associated with greater tolerance for movement and participation in the rehabilitation programme. However, pain reduction cannot be attributed specifically to physiotherapy. ENL is characterized by inflammatory activity, and pain may be influenced by changes in the inflammatory process, corticosteroid treatment, analgesic medication when administered, rest, wound care, and other components of inpatient management.^{7,19,17} The observed reduction in pain should therefore be interpreted cautiously as part of the overall clinical course rather than as a direct treatment effect.

Changes were also observed in the ROM of the left wrist and right ankle. Left wrist flexion increased from 40° to 60°, while extension increased from 20° to 50°. Right ankle dorsiflexion increased from 7° to 15°, and plantarflexion increased from 20° to 25°. Restricted movement at baseline was clinically relevant because the patient also presented with contracture, muscle weakness, skin involvement, and difficulty performing functional activities.^{19,17} ROM exercises and stretching were selected to address these impairments and to facilitate movement within the patient's tolerance. Nevertheless, the observed changes cannot be interpreted as evidence that the exercise programme alone produced the improvement. Reduced pain, changes in tissue irritability, spontaneous variation in clinical status, positioning during hospitalization, and repeated movement during daily care may also have influenced joint mobility.

Static balance performance, assessed using the Single Leg Stand Test, increased on both sides. The duration increased from 8 to 13 seconds on the right and from 11 to 20 seconds on the left. The observed changes may indicate improved performance during the test; however, they should not be interpreted as proof of a sustained improvement in balance capacity. The intervention programme included sitting balance, bridging, and functional mobility exercises that were selected to address postural control and movement transitions.¹¹ Repeated exposure to the test may also have influenced performance. In addition, variation in pain, fatigue, confidence, and general clinical condition could have contributed to differences between the baseline and final assessments. A longer observation period and repeated standardized assessments would be required to determine whether these changes were maintained.

The Barthel Index increased from 72 at baseline to 91 after the third session, indicating a higher level of recorded functional independence at the final assessment. This finding is clinically relevant because the rehabilitation programme included functional movement and activities of daily living training.^{10,11} The observed increase should nevertheless be interpreted at the level of the total score because detailed pre and post data for each individual Barthel Index item were not available. Consequently, it cannot be determined which specific activities contributed most to the change. Functional improvement may also have been influenced by the patient's changing medical condition, reduced pain, assistance from healthcare providers, adaptation to the inpatient environment, and repeated performance of daily tasks. The result therefore reflects an observed change in overall functional independence during the observation period rather than a confirmed effect of a specific physiotherapy intervention.

In contrast to the changes observed in pain, ROM, balance performance, and the Barthel Index, no change was documented in Manual Muscle Testing (MMT) or sensory function. These findings are important because they demonstrate that clinical changes were not uniform across all domains. Peripheral nerve impairment associated with leprosy may persist despite short term changes in pain or joint mobility, and recovery of muscle strength or sensory function may require a longer period or may depend on the severity and chronicity of neurological involvement.^{16,21} The absence of measurable change during three sessions also emphasizes the importance of avoiding selective reporting of only favourable outcomes. In this case, both changed and unchanged outcomes were retained to provide a more balanced description of the patient's clinical status.

The intervention programme combined ROM exercise, stretching, strengthening, bridging, grasping, sensory re education, balance exercise, functional mobility training, and activities of daily living training. The selection of multiple interventions reflected the patient's multidimensional clinical presentation rather than a single isolated impairment. This approach is consistent with the need for rehabilitation planning that links assessment findings to specific functional targets.^{10,17,20} However, because several interventions were delivered concurrently, the contribution of any individual component cannot be identified. The programme was also adapted to the patient's tolerance and skin condition because bullae and open lesions created additional safety considerations. Avoiding unnecessary pressure and friction over affected areas was clinically important, and the programme was performed at a submaximal intensity.

Literature concerning leprosy has extensively described disability prevention, peripheral nerve impairment, self care, and functional rehabilitation.^{5,7,8} However, reports specifically describing detailed physiotherapy management during active ENL remain comparatively limited.²² The present case therefore contributes a clinical description of how physiotherapy assessment and intervention may be organized when ENL is accompanied by simultaneous skin involvement, sensory impairment, muscle weakness, restricted movement, and reduced functional independence. Its contribution is descriptive rather than confirmatory. The case does not demonstrate that the intervention programme is effective, nor does it establish that similar changes will occur in other patients with ENL.

Several limitations should be considered when interpreting these findings. First, this was a single case report without a control condition; therefore, causal inference cannot be made. Second, the observation period was limited to three physiotherapy sessions, and no longer term follow up was available. Third, concurrent MDT and corticosteroid therapy may have contributed to changes in pain, inflammatory activity, and overall clinical condition.^{16,23} Other aspects of inpatient management, including rest, nursing care, wound management, and repeated daily activity, may also have influenced the observed outcomes. Fourth, not all functional outcomes initially relevant to the patient's clinical presentation were supported by quantitative pre and post data. Objective measures of walking speed, walking distance, and detailed mobility performance were unavailable. Similarly, detailed changes in individual activities of daily living and participation were not consistently documented.¹⁰ Fifth, no systematic patient perspective was available, limiting understanding of the patient's subjective experience of the rehabilitation programme.

Despite these limitations, the case has practical implications for physiotherapy management. In patients with ENL and complex functional impairment, assessment should extend beyond a single body system and include pain, sensory status, motor function, ROM, balance, functional independence, skin condition, and safety considerations. The ICF framework may assist in linking impairments with activity limitations and participation restrictions in people affected by leprosy. Intervention planning should also consider the patient's skin condition and overall medical status, particularly in the presence of painful skin lesions, bullae, ulceration, and ongoing inflammatory activity associated with ENL.^{7,24} In such circumstances, treatment selection and exercise dose may need to be modified according to tolerance and coordinated with the broader medical management plan.

Overall, this case documented lower pain scores, increased ROM in selected joints, longer Single Leg Stand duration, and a higher Barthel Index score after three physiotherapy sessions, while muscle strength and sensory findings remained unchanged. These observations illustrate that changes across functional domains may be heterogeneous during a short period of rehabilitation. Because the patient received concurrent medical treatment and the report involved only one individual, the findings should be interpreted as a description of clinical changes over time rather than evidence of physiotherapy effectiveness. Further reports with more detailed longitudinal follow up, standardized functional outcomes, clearer documentation of concurrent treatment, and systematic reporting of patient perspectives may help strengthen the evidence base for rehabilitation management in patients with ENL.

Conclusion

This case report describes the physiotherapy management of a 32 year old patient with erythema nodosum leprosum (ENL) associated with leprosy who presented with integumentary, sensory, motor, and musculoskeletal impairments accompanied by limitations in daily functioning. The patient presented with pain, bullae and open skin lesions, sensory impairment, muscle weakness and atrophy, contracture, restricted range of motion (ROM), impaired balance performance, and reduced functional independence.

Following three physiotherapy sessions, clinical changes were observed in several available outcomes. Pain scores decreased under resting, pressure, and movement conditions. Increased ROM was documented in the left wrist and right ankle, while Single Leg Stand performance increased on both sides. The Barthel Index score increased from 72 to 91. In contrast, no measurable changes were documented in Manual Muscle Testing grades or sensory function, indicating that changes were not uniform across all assessed domains.

The intervention programme included ROM exercises, stretching, strengthening, bridging, grasping, sensory re education, balance exercise, functional mobility training, and activities of daily living training. Exercise selection and implementation were adapted to the patient's clinical condition, particularly the presence of bullae and open skin lesions.

These observations should not be interpreted as evidence of physiotherapy effectiveness or a causal relationship between the intervention and the observed outcomes. The report involved a single patient, a short observation period, and no control condition. Concurrent multidrug therapy, corticosteroid treatment, other aspects of inpatient care, and the natural course of ENL may also have influenced the patient's clinical status.

Therefore, this case provides a descriptive account of physiotherapy management and clinical changes observed during a short rehabilitation period in a patient with ENL. The findings cannot be generalized to other patients with ENL. Further studies with longer follow up, standardized functional outcomes, and more rigorous designs are needed.

Author Contribution

Agil Nabila: Conceptualization, methodology, investigation, data curation, formal analysis, visualization, writing original draft, and writing review and editing.

Andi Rahmانيar P: Conceptualization, methodology, supervision, validation, writing review and editing.

Masfufah: Investigation, clinical supervision, validation, data verification, and writing review and editing.

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Conflict of Interest Statement

The authors declare that they have no competing interests or conflicts of interest related to the publication of this case report.

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Ethics Statement

This case report was based on clinical data obtained during routine physiotherapy services and clinical education at Dr. Tadjuddin Chalid General Hospital, Makassar. The report involved a single patient and did not include participant recruitment or experimental intervention outside routine clinical care. According to the available institutional documentation, separate ethical approval was not obtained and no ethical approval number was available. Patient confidentiality and anonymity were maintained throughout the preparation of this manuscript. Informed consent for the use of clinical information and publication of this case report was obtained from the patient.

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