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Community-based screening and physiotherapy intervention for lower back pain with radiculopathy in a rural population

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Abstract
Background: One of the main causes of disability in the globe is lower back pain with radiculopathy (LBPR), which is frequently caused by compression or irritation of the lumbar nerve roots. Due to physically demanding jobs, a lack of knowledge about ergonomics, delayed diagnosis, and difficult access to physiotherapy services, rural populations are especially vulnerable. Through early screening, education, and exercise-based treatment, community-based physiotherapy interventions can aid in the reduction of impairment.
Methodology: Between July 15 and July 24, 2025, a community-based interventional study was carried out at Tugalpur, Greater Noida, Uttar Pradesh. Participating in the program were twenty adults between the ages of 25 and 55 who complained of lower back discomfort, either with or without radiating symptoms. The Oswestry Disability Index (ODI), Visual Analog Scale (VAS), and Straight Leg Raise (SLR) test were used for baseline and post-intervention evaluations. Over the course of five community visits, participants received physical therapy instruction, ergonomic training, posture correction techniques, neural mobilization, and core strengthening exercises.
Results: Participants' pain and functional impairment significantly improved after the intervention. The proportion of individuals with ODI scores higher than 40% dropped from 70% to 25%. Positive SLR results decreased from 55% to 20%, whereas participants with VAS scores higher than 6 decreased from 75% to 30%. Additionally, participants reported increased knowledge of safe lifting practices, symptom treatment, and posture correction.
Conclusion: In rural areas, lumbar radiculopathy-related pain and disability can be considerably reduced by community-based physiotherapy screening and educational initiatives. In underprivileged populations, early detection, ergonomic awareness, and exercise-based physiotherapy management can improve quality of life and functional independence.

Keywords: Lumbar radiculopathy, lower back pain, physiotherapy, rural population, community rehabilitation, ergonomics, disability

Introduction

One of the most prevalent musculoskeletal conditions affecting people of all ages, lower back pain (LBP) is now acknowledged as a significant cause of disability globally. Because it involves compression, irritation, or inflammation of spinal nerve roots, usually in the lumbar area, lower back pain associated with radiculopathy is one of the most incapacitating types of low back pain. In addition to symptoms like numbness, tingling, weakness, sensory abnormalities, and decreased functional mobility, lumbar radiculopathy is marked by radiating pain into the lower leg. Daily living activities, professional performance, and general quality of life can all be severely hampered by these symptoms.

The most common causes of lumbar radiculopathy include degenerative spinal changes, spinal stenosis, lumbar disc herniation, and chronic mechanical stress. People who engage in physically demanding jobs, repetitive lifting, extended bending, awkward postures, and vocations requiring persistent spinal loading are frequently affected by the ailment. Because daily tasks like farming, lifting heavy loads, sitting on uneven surfaces, and prolonged squatting put significant mechanical stress on the lumbar spine, rural communities are more vulnerable.

Low back pain still has a significant socioeconomic impact on people all over the world. Recent clinical guidelines state that lumbar radiculopathy is linked to higher healthcare utilization, lower physical performance, absenteeism from work, and poor productivity (Zhou *et al*., 2024) [11]. The burden is exacerbated in rural communities because to the lack of access to evidence-based rehabilitation, ergonomic education, and physiotherapy treatments. Due to financial dependence and a lack of knowledge about proper management techniques, many people continue to work despite ongoing symptoms.

Musculoskeletal complaints are frequently disregarded in underprivileged rural areas until they worsen to the point where they restrict mobility and independence. Red-flag signs include intense radiating pain, bowel or bladder problems, and growing weakening are not well recognized, which might delay early action and worsen the prognosis. Chronic pain and incapacity are also exacerbated by reliance on uncontrolled treatment practices and limited access to rehabilitation programs.

The value of physiotherapy in the conservative treatment of lumbar radiculopathy has been emphasized in a number of studies. Pain reduction and improved functional outcomes have been demonstrated by exercise therapy, neural mobilization, posture correction, ergonomic change, and

patient education (Arslan and Ülger, 2025) [2]. Since conservative physiotherapy management improves mobility, lessens handicap, and strengthens self-management techniques without requiring surgery, it is currently advised as a first-line option for lumbar radiculopathy (Thoomes *et al*., 2023) [10].

A successful strategy for treating musculoskeletal diseases in rural areas is community-based rehabilitation programs. Through screening, education, preventive awareness, and early physiotherapy intervention, these programs aid in bridging the gap between underprivileged communities and healthcare providers. These treatments are especially crucial in low-resource environments where access to healthcare is restricted and musculoskeletal conditions are often underdiagnosed.

The current community connect study was carried out in Tugalpur, Greater Noida, Uttar Pradesh, to identify people with lower back pain who had symptoms associated to radiculopathy and to offer physiotherapy-based care and education. Following a brief community rehabilitation program that included ergonomic education, posture correction, neural mobilization, and exercise therapy, the study sought to assess changes in pain intensity, impairment, and neurological symptoms.

Review of Literature

Ülger *et al*., (2025)- The efficacy of exercise-based physiotherapy therapies in treating lumbar disc herniation, one of the most frequent causes of lumbar radiculopathy, was examined in a systematic review by Arslan and Ülger (2025) [2]. The review examined several approaches to therapeutic exercise, such as strengthening protocols, stretching regimens, and stabilizing exercises. The authors came to the conclusion that in people with lumbar radiculopathy, systematic physiotherapy interventions greatly enhance pain intensity, spinal posture, functional mobility, and quality of life. Individualized exercise regimens are crucial for long-term symptom management and recurrence prevention, according to the analysis.

Zhou *et al*., (2024) [11]- A worldwide comparison of clinical practice recommendations for the treatment of low back pain was conducted by Zhou *et al*. in 2024 [11]. Their results demonstrated that the best first-line therapy strategy for lumbar radiculopathy is still conservative care. International guidelines strongly advised exercise therapy, patient education, manual therapy, ergonomic adjustment, and physiotherapy-led rehabilitation. Additionally, the authors stressed the need of patient-centered rehabilitation and early intervention in lowering chronic impairment.

Thoomes *et al*., (2023) [10]- A Delphi study on conservative physiotherapy care techniques for lumbar radiculopathy was carried out by Thoomes *et al*. in 2023 [10]. Expert consensus on stage-based rehabilitation procedures based on symptom intensity and duration was used in the study. Neural mobilization, progressive strengthening exercises, posture correction, and pain education were among the customized physiotherapy interventions that the authors suggested. Their results showed that managing symptoms with physical therapy enhances functional outcomes and slows the development of chronic impairment.

Rakesh *et al*., (2024) [7]- In patients with lumbar radiculopathy, Rakesh (2024) [7] examined the efficacy of neural flossing techniques and McKenzie exercises. The study showed that both therapeutic strategies greatly enhanced spinal mobility and decreased discomfort. However, in the early stages of recovery, McKenzie exercises resulted in a marginally quicker improvement in symptoms. The results validate the effectiveness of exercise-based physical therapy in treating lumbar nerve root irritation and enhancing functional recovery.

Shekhawat *et al*., (2023) [8]- The combined effects of neural mobilization and core strengthening activities in individuals with radiating low back pain were assessed in a systematic review conducted by Shekhawat and Tiwari (2023) [8]. Combined physiotherapy therapies significantly reduce pain intensity, neural stress, and functional impairment, according to the review. While neural mobilization treatments increased nerve mobility and decreased radiating sensations, core strengthening activities improved spinal stability.

Mullerpatan *et al*., (2021) [6]- In Maharashtra, India, Mullerpatan *et al*. (2021) [6] examined the prevalence of spinal pain in rural and tribal communities. The authors found that poor posture, insufficient ergonomic awareness, and repetitive physical labor all contributed to a high prevalence of musculoskeletal illnesses. The study also found obstacles to healthcare access, such as lack of rehabilitation programs, budgetary constraints, and transportation issues. The results highlighted the significance of preventative healthcare practices and community-based rehabilitation programs for rural communities.

Mesa-Castrillon *et al*., (2024) [5]- A systematic study and meta-analysis comparing the prevalence of musculoskeletal pain in rural and urban populations was carried out by Mesa-Castrillon *et al*. in 2024 [5]. Due to work-related stress and a lack of access to evidence-based medical care, the study discovered that musculoskeletal diseases were extremely common among people living in rural areas. To lessen the burden of musculoskeletal impairment in underprivileged communities, the authors suggested focused public health initiatives and physiotherapy awareness campaigns.

Manotham *et al*., (2024)- In order to avoid work-related musculoskeletal problems among rural workers, Manotham *et al*. (2024) assessed the efficacy of a community-based participatory educational program. Following an educational intervention, the study found that posture correction techniques, ergonomic awareness, and preventive behaviors significantly improved. These results confirm the benefits of community-based physiotherapy education in lowering musculoskeletal risk factors and encouraging long-term behavioral change.

Huh *et al*., (2025) [4]- summarized recent recommendations regarding pain management interventions for low back pain with radiculopathy and concluded that multimodal conservative rehabilitation approaches are highly beneficial. As crucial elements of all-encompassing rehabilitation, they recommended exercise therapy, neural mobilization, education, and ergonomic correction.

Objectives

- To identify those who have lumbar radiculopathy symptoms.
- To use standardized outcome measures to evaluate pain and functional impairment.
- To inform participants about red-flag symptoms, ergonomics, and posture adjustment.
- To present techniques for managing symptoms that are based on physiotherapy.
- To assess changes in pain and impairment both before and after the intervention.

Methodology

Between July 15 and July 24, 2025, this community-based interventional study was carried out at Tugalpur, Greater Noida, Gautam Buddha Nagar, Uttar Pradesh. The purpose of the study was to identify people who had lower back pain linked to symptoms of radiculopathy and to provide physiotherapy-based education and intervention in a rural community context.

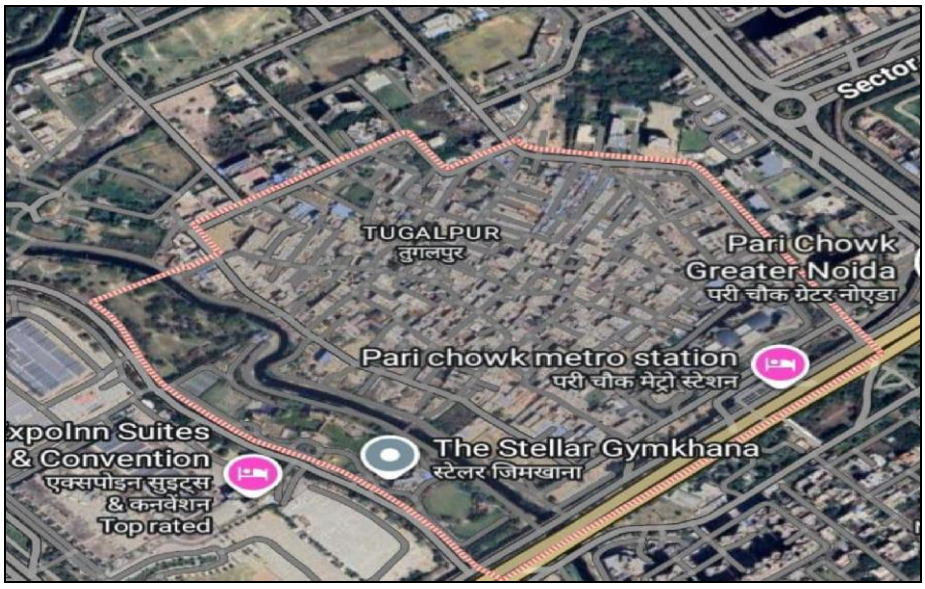
20 persons between the ages of 25 and 55, both male and female, took part in the study. The program included people who complained of lower back discomfort, whether or whether their symptoms radiated to their lower limbs. Before taking part in the study, participants were told about its goals and methods, and their verbal agreement was acquired. The study did not include participants with recent spinal surgery, severe neurological diseases, fractures, traumatic spinal injuries, or unstable medical conditions.

Interaction with locals, participant recruiting, and rapport-building were all part of the first community visits. In-person interactions were used for the baseline evaluation, which involved gathering clinical history, symptom assessment, and demographic information. The Oswestry handicap Index (ODI) was used to assess functional handicap associated with lower back pain, the Visual Analog Scale (VAS) was used to measure pain severity, and the Straight Leg Raise (SLR) test was used to screen for neural involvement.

Participants attended physiotherapy education and intervention sessions spread across several visits after the baseline assessment. The goal of the educational sessions was to raise awareness of lumbar radiculopathy's causes, symptoms, prevention, and treatment. Participants received instruction on red-flag symptoms, ergonomic adjustments, posture correction, and safe movement techniques for everyday tasks like lifting, bending, extended sitting, and farming-related labor.

Neural mobilization activities, core strengthening exercises, stretching exercises, and posture correction techniques were all part of the physiotherapy-based therapeutic program. To guarantee appropriate exercise performance, both individual and group demonstrations were given. To increase comprehension and promote commitment to at-home exercise, educational leaflets in plain language were also given out.

In order to answer participant questions, reevaluate exercise performance, and promote the continuation of physiotherapy management techniques, reinforcement sessions were held at follow-up visits. The same outcome measures were used for post-intervention evaluation at the end of the intervention period to assess improvements in neurological symptoms, functional impairment, and pain severity. Feedback from participants on how the program improved their symptoms and raised their awareness was also documented.



Map- Tugalpur, Gautam Buddha Nagar, Greater Noida, Uttar Pradesh- 201310

Evidence of Visit

Data description

Total participants- 20

The degree of impairment linked to lower back pain and its impact on functional activities were evaluated using the Oswestry impairment Index (ODI). Sections on pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social activities, traveling, and daily functional performance make up the ODI. Greater disability is indicated by higher scores in each part, which range from 0 to 5.

Pain intensity was measured using the Visual Analog Scale (VAS), which has a range of 0 to 10, with 0 denoting no pain and 10 denoting the worst possible agony. By measuring radiating symptoms during passive leg elevation, the Straight Leg Raise (SLR) test was utilized to detect neural stress and lumbar nerve root irritation.

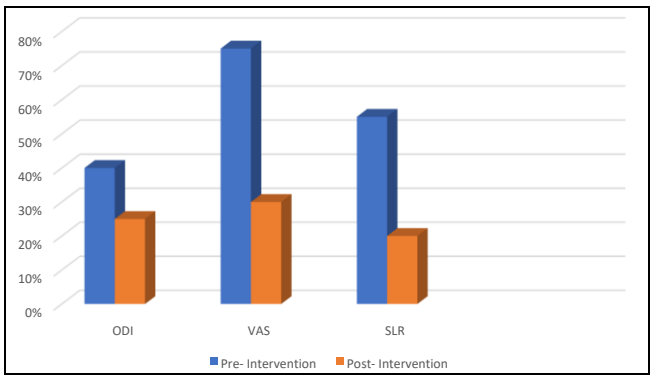
Participants List

Total No. of Participants: 20

S. No.	Participant Name	Age	Gender	ODI Pre (%)	ODI Post (%)	VAS Pre	VAS Post	SLR Pre	SLR Post
1.	Durga	35	Female	52	32	8	4	+	-
2.	Priya	26	Female	48	30	7	3	+	-
3.	Saru	39	Female	44	24	8	4	+	-
4.	Lakhipriya	42	Female	46	28	7	4	+	-
5.	Nayantara	54	Female	58	38	9	5	+	-
6.	Lakshmi	36	Female	42	26	7	4	+	-
7.	Purnima	44	Female	54	42	8	6	+	+
8.	Shalu	28	Female	60	46	9	7	+	+
9.	Gayatri	46	Female	50	34	8	5	+	-
10.	Seema	36	Female	56	44	9	7	+	+
11.	Rita	45	Female	48	36	7	5	+	-
12.	Manju	55	Female	62	48	9	8	-	+
13.	Began	26	Male	44	28	7	4	-	-
14.	Prabhat	38	Male	52	40	8	6	-	-
15.	Dinesh	45	Male	46	32	7	5	-	-
16.	Gaurav	30	Male	38	24	6	3	-	-
17.	Ramshankar	34	Male	36	22	5	2	-	-
18.	Manish	37	Male	34	20	5	2	-	-
19.	Ranjit	45	Male	32	18	4	2	-	-
20.	Manohar	53	Male	28	16	4	1	-	-

Interpretation of Findings

- The number of participants with ODI scores higher than 40% decreased from 14 (70%) in the pre-intervention assessment to 5 (25%) in the post-intervention assessment.
- The number of individuals with VAS ratings higher than six decreased from 15 (75%) prior to intervention to 6 (30%) following intervention.
- Straight Leg Positive Raising results decreased from 11 participants (55%) before the intervention to 4 participants (20%) after it.
- These results show that after community-based physiotherapy intervention, pain intensity, functional impairment, and neurological symptoms all improved.



Pre and Post Intervention Findings in Percentage

Discussion

The current community-based study assessed the efficacy of physiotherapy-led screening, education, and management for people with radiculopathy-related lower back pain in a rural population. Following a brief community rehabilitation program, the study's results showed clinically significant improvements in pain intensity, impairment levels, and neurological symptoms.

Risk factors related to profession and lifestyle make rural populations especially susceptible to musculoskeletal problems. Lumbar spine stress and nerve root irritation are greatly increased by activities including heavy lifting, prolonged bending, farming-related labor, awkward sitting positions, and repetitive lifting. Many participants in the current study claimed that radiating lower back pain made it difficult for them to carry out daily tasks like walking, prolonged sitting, carrying objects, and sustaining productivity at work.

The improvement in functional independence and decrease in disability related to lower back pain were demonstrated by the decrease in ODI scores after the intervention. Similarly, a significant improvement in pain intensity following a physiotherapy-based intervention was indicated by a decrease in VAS scores. Improved lumbar nerve mobility and a decrease in neural tension were reflected in improved SLR results.

Previous research on the conservative treatment of lumbar radiculopathy supports these conclusions. Exercise-based rehabilitation greatly reduces pain and improves functional results in cases of lumbar disc herniation, according to Arslan and Ülger (2025) [2]. Similarly, Shekhawat and Tiwari (2023) [8] found that in those with lumbar radiculopathy, combining neural mobilization with strengthening exercises effectively lowers radiating symptoms and disability.

Education, posture correction, neural mobilization, ergonomic guidance, and exercise therapy were the main physiotherapy methods employed in this study. These treatments focused on preventing aggravating mechanical stress as well as managing symptoms. While core strengthening and posture correction may have improved spinal stability and movement control, neural mobilization exercises probably helped to enhance nerve mobility and lessen radiating discomfort.

A significant part of the recovery approach was educational intervention. At first, several participants showed a lack of knowledge of posture correction, ergonomics, and warning signs of lumbar radiculopathy. Participants reported better comprehension of safe lifting techniques, good sitting posture, spinal protection techniques, and exercise adherence after multiple educational sessions and demonstrations.

Participant engagement and comprehension were enhanced by the use of instructional brochures in the local language and hands-on demonstrations. Rural communities frequently experience literacy-related obstacles that hinder their ability to understand medical information. Thus, straightforward explanations, regular demonstrations, and culturally relevant communication techniques become crucial for successful community rehabilitation.

The results of this study also support the findings of Mullerpatan *et al*. (2021) [6], who stressed the significance of community-based physiotherapy awareness programs and the high prevalence of spine pain among rural Indian people. In a similar vein, Mesa-Castrillon *et al*. (2024) [5] found that job stress and restricted access to healthcare contribute to a greater musculoskeletal burden in rural communities.

Due to occupational dependency and restricted access to healthcare, a significant finding of the study was that many individuals continued their physically demanding activities while experiencing severe symptoms. This emphasizes how crucial early physiotherapy screening and preventive rehabilitation strategies are in rural areas. Early intervention may stop the development of severe disability, chronic pain, and long-term functional deterioration.

In underprivileged settings, community-based rehabilitation programs offer a practical and economical way to improve musculoskeletal health. Through self-management education and preventive awareness, these initiatives empower people while also improving symptom control. The burden of musculoskeletal disability in rural areas may be considerably decreased by including physiotherapy services into primary healthcare and community outreach initiatives.

The current study had some limitations despite the encouraging results. Because of the short sample size, the results' generalizability was limited. There was no long-term follow-up, and the intervention was brief. Furthermore, long-term functional outcomes and objective imaging results were not evaluated. To improve the evidence for community-based physiotherapy rehabilitation for lumbar radiculopathy, future research should incorporate comparison intervention groups, longer follow-up periods, and larger sample numbers.

Overall, the current study demonstrates how well community therapies supervised by physiotherapists can improve pain, disability, awareness, and functional independence in rural people with radiculopathy and lower back pain.

Conclusion

Early screening, education, ergonomic training, and exercise-based intervention can significantly reduce pain and impairment associated with lower back pain and lumbar radiculopathy in rural populations, as this community-based physiotherapy program showed.

Participants' knowledge of safe mobility practices, posture correction, and physiotherapy-based self-management strategies increased as a result of the intervention. Effective screening and symptom monitoring in a community context was made possible by the adoption of straightforward assessment instruments including ODI, VAS, and SLR.

Initiatives for community physiotherapy can be an accessible and affordable way to lessen the load of neuromusculoskeletal illnesses in marginalized communities. Early diagnosis, functional independence, and general quality of life could all be enhanced by extending such programs to more rural and semi-urban areas.

Summary

In a rural community in Tugalpur, Greater Noida, the current community-based study assessed the efficacy of physiotherapy-led screening, education, and intervention for people with radiculopathy-related lower back pain. Twenty individuals were evaluated both before and after the intervention using the Oswestry Disability Index (ODI), Visual Analog Scale (VAS), and Straight Leg Raise (SLR) test. Through several community visits, the program offered posture correction, neural mobilization, ergonomic education, and core strengthening exercises. Neural symptoms, functional impairment, and pain intensity all showed discernible improvements after the intervention. The results indicate that in underprivileged rural populations, community-based physiotherapy programs can be crucial in raising awareness, encouraging self-management, and lowering disability associated with lumbar radiculopathy.

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