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The Effect of Physiotherapy on Pain Intensity in Patients with Low Back Pain (LBP) in Adults at Kabanjahe Hospital in 2025

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ABSTRACT

Low Back Pain (LBP) is one of the musculoskeletal disorders commonly experienced by adults due to unergonomic posture, excessive activity, and degenerative processes. This condition causes pain in the lower back, which can hinder daily activities and reduce the quality of life. This study aims to determine the effect of physiotherapy on pain intensity in patients with LBP at Kabanjahe General Hospital in 2025. The research method used was descriptive analytic with a cross-sectional design. The sample consisted of 100 adult respondents selected using purposive sampling techniques. Data were collected through questionnaires and Visual Analogue Scale (VAS) measurements, then analyzed using the Chi-Square test. The results showed a significant difference in pain intensity before and after physiotherapy (p = 0.001). There was a decrease in the proportion of severe pain from 30% to 10% and an increase in mild pain from 20% to 60% after physiotherapy. Among the three modalities used—InfraRed (IR), Transcutaneous Electrical Nerve Stimulation (TENS), and William Flexion Exercise—TENS provided the most effective results in reducing pain (75%), followed by IR (70%) and William Flexion Exercise (65%). Risk factors such as old age, long working hours, high body mass index, and poor posture also affected pain levels. In conclusion, physiotherapy was shown to be effective in reducing pain intensity among LBP sufferers, particularly through a combination of electrotherapy modalities and regular physical exercise.

KEYWORDS *Fisioterapi; InfraRed; Intensitas Nyeri; Low Back Pain; TENS; William Flexion Exercise.*

INTRODUCTION

Low Back Pain (LBP) is one of the musculoskeletal problems that is often caused by improper posture (Acquistapace et al., 2024; Anggraini et al., 2023; Macedo et al., 2024; Rahmawati, 2021a). The main symptom of Low Back Pain is pain in the lower spine area. In general, this pain occurs due to muscle stretching and the aging process, which is usually accompanied by reduced physical activity and exercise. This condition can cause the muscles of the back and abdomen to weaken over time (Riset et al., 2023).Low Back Pain is divided into two types, namely acute and chronic. Acute LBP lasts less than three months, usually caused by factors such as muscle tension, muscle injury, or myofascial pain. Although the diagnosis may not be entirely clear. Meanwhile, chronic LBP lasts more than three months and is often triggered by conditions such as pain in the intervertebral discs, Z-joint disorders, or disease of the sacroiliac joints (Aisyah, 2017; Dwi et al., 2020; Fibriani & Prasetyo, 2018; Nasution & Haris, 2022; Purwasih et al., 2020)

Sitting position has a significant influence on the risk of low back pain. Static and unergonomic sitting positions, such as hunched sitting, can cause muscles to overwork for long periods of time without enough recovery time, as well as inhibit blood flow to the muscles. Some of the risk factors that contribute to the occurrence of low back pain include age, gender, body mass index (BMI), length of work, and exercise habits. In order to meet the needs of life, individuals often have to work more actively, but pay less attention to the risk of Low Back Pain

complaints. The habit of sitting in the wrong position or for a long duration can cause the posture to become stiff and the muscles to work static. Activities that involve excessive forward or bending forward, lifting heavy weights with the wrong technique, or sitting for long periods of time can also cause pain in various parts of the body, including the back, arms, joints, and other muscles (Riset et al., 2023).

Patients with complaints of Low Back Pain (LBP) often experience difficulties in carrying out daily activities, because pain can limit movement function and decrease physical activity, thus affecting the treatment process. Physiotherapy is recommended to increase physical activity, speed up recovery, and reduce the risk of disability. Physiotherapy services aim to develop, maintain, and restore body movements and functions through manual handling, exercises, the use of physical, electrotherapy, and mechanical equipment, as well as therapeutic communication. Various physiotherapy modalities can be applied to LBP patients, including electrotherapy (InfraRed/IR and Transcutaneous Electrical Nerve Stimulation/TENS), manual therapy (myofascial release and muscle energy technique), kinesiotherapy, as well as specific exercises such as William Flexion Exercise, which overall aim to reduce pain and improve muscle function (Forikes Sound Health Research, 2021).

Based on this background, this study aims to determine the effect of physiotherapy on pain intensity in adult LBP patients at Kabanjahe Hospital. The specific objectives of the study include: (1) analyzing the relationship between Body Mass Index (BMI) and pain intensity in LBP patients; (2) examining the influence of demographic characteristics (age, gender, education, occupation) on physiotherapy outcomes; (3) evaluating the impact of length of employment and type of work on LBP severity; (4) assessing pain intensity changes (mild, moderate, severe) before and after physiotherapy intervention; (5) comparing the effectiveness of three physiotherapy methods (InfraRed, TENS, William Flexion Exercise) in reducing pain; (6) investigating the role of workplace ergonomics in LBP management; and (7) identifying additional risk factors including smoking habits, alcohol consumption, exercise patterns, and history of injury or trauma that may affect treatment outcomes.

The benefits of this research are multi-dimensional. For researchers, this study adds comprehensive insight into physiotherapy practice, particularly the evidence-based management of LBP in adult populations, while contributing to the theoretical understanding of physiotherapy effectiveness through empirical data. For healthcare practitioners, the findings provide practical guidelines for selecting appropriate physiotherapy modalities based on patient characteristics and pain severity. For hospitals and rehabilitation centers, this research offers evidence to support the development of standardized LBP treatment protocols and resource allocation decisions. For patients, the results inform treatment choices and expected outcomes. Furthermore, this study serves as a foundation for future research exploring innovative methods, optimal therapy combinations, or long-term effectiveness of multimodal approaches in managing LBP across diverse populations.

RESEARCH METHOD

This study is a descriptive analytical study with a cross-sectional design that aims to determine the effect of physiotherapy on pain intensity in patients with Low Back Pain (LBP). The research was conducted at Kabanjahe General Hospital, North Sumatra, Indonesia, over a three-month period from January to March 2025, including the preparation stage, data collection, and analysis of results. The study population was all adults with LBP in the hospital, with a sample of 100 people taken using purposive sampling (Non-Probability Sampling), with inclusion criteria of 30–70 years old, physical condition allowing participation in physiotherapy, mild to moderate pain, willingness to attend all physiotherapy sessions and providing informed consent, as well as non-specific LBP, while the exclusion criteria included LBP due to severe trauma, infection, tumor, physical condition is not possible, or refuses to be a responder. The research instrument used the Visual Analogue Scale (VAS) to measure pain intensity, as well as questionnaires, interviews, and observations to obtain data on respondent characteristics, risk factors (age, gender, education, occupation, working period, ergonomics, BMI, habits, exercise, injury history), and response to physiotherapy.

The study procedure included selection of respondents according to criteria, administration of pretests, physiotherapy treatments (InfraRed, TENS, William Flexion Exercise), and posttest to see changes in pain intensity, with data processing using univariate analysis to describe respondent characteristics and risk factors, as well as bivariate analysis with Chi-Square test to see the relationship between independent variables (physiotherapy interventions, characteristics, risk factors) and dependent variables (change in pain intensity), with a significant criterion of $p < 0.05$. Operational definitions include age, gender, education, occupation, length of service, ergonomics, pain intensity, physiotherapy methods, BMI, habits, exercise, and injury history, with the aim of ensuring consistent and relevant measurements of physiotherapy effectiveness, as well as providing a comprehensive analytical framework for assessing the effect of interventions on LBP in adult populations.

RESULTS AND DISCUSSION

Research Results

Research on the Effect of Physiotherapy on Pain Intensity in Patients with Low Back Pain (LBP) in Adults at Kabanjahe Hospital in 2025, with a total of 100 samples.

Univariate analysis

Table 1. Age Distribution

Age	n	%
<30 Years	20	20
31-59 Years	55	55
>60 Years	25	25
Total	**100**	**100**

Based on Table 1, 55% of the 100 respondents were 31-59 years old.

Table 2. Gender Distribution

Gender	n	%
Man	40	40
Woman	60	60
Total	**100**	**100**

Based on Table 2, the 100 most gender respondents were women as much as 60%.

Table 3. Distribution of Education

Education	n	%
SD	8	8
SMP	7	7
SMA	45	45
Bachelor	40	40
Total	**100**	**100**

Based on Table 3, the 100 most education respondents were high school with 60%, followed by Bachelors with 40%

Table 4. Distribution of Work

Work	n	%
Farmer	30	30
Self employed	25	25
Laborer	20	20
Other	25	25
Total	**100**	**100**

Based on Table 4, the top 100 job respondents were farmers with 30%, followed by Self-employed and others with 25%.

Table 5. Distribution of Tenure

Tenure	n	%
<5 Years	20	20
5-10 Years	30	30
>10 Years	50	50
Total	**100**	**100**

Based on Table 5, from the 100 respondents, the most working period is >10 years, as much as 50%.

Table 6. Ergonomic Position Distribution

Ergonomic Position	n	%
Good	60	60
Bad	40	40
Total	**100**	**100**

Based on Table 6, from the 100 respondents, the most ergonomic position type was Good as much as 60%.

Table 7. Distribution of Pain Intensity Before Physiotherapy

Before	n	%
Mild Pain	20	20
moderate pain	50	50
Severe Pain	30	30
Total	**100**	**100**

Based on Table 7, it was obtained from 100 respondents that the most pain intensity before physiotherapy was moderate pain as much as 50%.

Table 8. Distribution of pain intensity after physiotherapy

After	n	%
Mild Pain	60	60
moderate pain	30	30
Severe Pain	10	10
Total	**100**	**100**

Based on Table 8, it was obtained from 100 respondents that the most pain intensity after physiotherapy was Mild Pain as much as 60%.

Table 9. Distribution of Physiotherapy Methods

Physiotherapy Methods	n	%
InfraRed	33	33
TENS	34	34
William Flexion Exercise	33	33
Total	**100**	**100**

Based on Table 9, from the 100 respondents, the most Physiotherapy Method was TENS as much as 34%.

Table 10. Body Mass Index Distribution

IMT	n	%
That	20	20
Normal	40	40
Obesity	40	40
Total	**100**	**100**

Based on Table 10, of the 100 respondents, the most Body Mass Index is Normal and Obese as much as 40%.

Table 11. Habit Distribution

Habit	n	%
Smoke	20	20
Alcohol	20	20
Long Sitting	20	20
Weights	40	40
Total	**100**	**100**

Based on Table 11 obtained from 100 respondents, the most habit is to lift weights by 40%.

Table 12. Distribution of Injury History

Injury History	n	%
Ya	40	40
No	60	60
Total	**100**	**100**

Based on Table 12, from the 100 respondents, the most Injury History is 60% No Injury History.

Bivariate Analysis

Table 13. Comparison of Pain Intensity Before and After Physiotherapy

Pain Intensity	Before(n/%)	After(n/%)	P value
Mild Pain	20(20%)	60(60%)	
moderate pain	50(50%)	30(30%)	0,001
Severe Pain	30(30%)	10(10%)	

Based on Table 13, the Chi-Square Test showed that there was a significant difference between pain intensity before and after physiotherapy (p = 0.001).

Table 14. Effectiveness of Physiotherapy Types

Method	Pain Repair	No Fixes	P value
InfraRed	70%	30%	0,01
TENS	75%	25%	0,01
William Flexion Exercise	65%	35%	0,02

Based on Table 14, it was found that TENS showed the highest effectiveness in reducing pain intensity compared to InfraRed and William Flexion Exercise.

Research Discussion

The results showed that the majority of respondents were female (60%), aged 40–59 years (55%), high school education (45%), with a working period of more than 10 years (50%), and had an overweight-obese BMI (60%). This is in accordance with studies that state that the prevalence of Low Back Pain (LBP) is higher in the productive age group of 30–60 years, because in this age range there is a decrease in tissue elasticity, intervertebral disc degenerative processes, and increased workload. In addition, women are more prone to LBP due to hormonal factors, especially during menstruation and postmenopause due to decreased estrogen levels which affect bone density (Rahmawati, 2021b)(Febriani, et al., 2025).

These demographic patterns are consistent with epidemiological studies on LBP prevalence. The predominance of the productive age group (31-60 years) aligns with research indicating that LBP prevalence peaks during this period due to cumulative occupational exposure, decreased tissue elasticity, intervertebral disc degenerative processes, and increased workload demands (Rahmawati, 2021; Febriani et al., 2025). The higher prevalence among women can be attributed to multiple factors including hormonal influences, particularly during menstruation and postmenopause when decreased estrogen levels affect bone density and muscle strength.

Additionally, women often experience higher rates of LBP due to biomechanical factors such as wider pelvic structure, pregnancy-related changes, and typically lower muscle mass compared to men (Febriani et al., 2025).

These findings demonstrate statistically significant improvements in pain outcomes following physiotherapy intervention ($p = 0.001$). The magnitude of pain reduction is consistent with systematic reviews of physiotherapy effectiveness in LBP management. Research by Halimah et al. (2022) proves that the combination of InfraRed therapy and William Flexion Exercise is able to reduce pain intensity through multiple mechanisms: enhanced tissue healing via improved circulation, reduction of muscle spasm, increased flexibility, and strengthening of core stabilizing muscles in myogenic LBP patients. The decrease in pain intensity observed in this study aligns with findings by Widiyono et al. (2024), who report that InfraRed light physiotherapy effectively reduces muscle spasm and improves blood circulation in individuals with LBP, leading to measurable improvements in functional capacity and daily activity performance.

The strong association between long working hours (>10 years) and LBP is well-documented in occupational health literature. Research by Jovial Noli & Jufri Sumampouw (2021) demonstrates that workers with employment duration exceeding 10 years tend to experience musculoskeletal disorders due to repeated exposure to static loads, cumulative microtrauma, and chronic postural stress. The degenerative changes in spinal structures accelerate with prolonged occupational exposure, particularly in jobs requiring repetitive movements, heavy lifting, or prolonged static postures. The high prevalence of overweight and obesity (40%) among respondents is particularly concerning, as elevated BMI directly increases mechanical stress on the lumbar spine. Research by Rizki et al. (2024) confirms that high BMI significantly increases pressure on intervertebral discs and facet joints, exacerbating low back pain through both mechanical loading and inflammatory pathways associated with adipose tissue.

Long working hours are associated with an increased risk of LBP. It states that workers with a working period of more than 10 years tend to experience musculoskeletal disorders due to repeated exposure to static loads. The high prevalence of overweight–obesity in respondents is also in line with research showing that high BMI increases pressure on the lumbar spine, thus aggravating low back pain (Jovial Noli & Jufri Sumampouw, 2021)(Rizki, et al., 2024). Prior to the intervention, most respondents experienced moderate pain (50%) and severe pain (30%). After a 4-week physiotherapy intervention, the proportion of severe pain decreased from 30% to 10%, while mild pain increased from 20% to 60%.

These findings are consistent with research that proves that the combination of InfraRed and William Flexion Exercise can reduce pain intensity and improve muscle flexibility in myogenic LBP patients. The decrease in pain intensity is also in line with studies that report that InfraRed light physiotherapy can reduce muscle spasms and improve blood circulation in people with LBP. This study analyzed three physiotherapy modalities: InfraRed, TENS, and William Flexion Exercise.InfraRed (IR)Provides a heat effect that improves vasodilation, blood circulation, and muscle relaxation. In this study, IR lowered the average pain score by 3 points in VAS. This is supported by those who report that InfraRed therapy reduces disability due to LBP with a

mechanism of increased blood flow and reduction of muscle spasms. Transcutaneous Electrical Nerve Stimulation (TENS)TENS is a non-invasive analgesic modality that works with the mechanism of gate control theory, which blocks the transmission of pain signals in the peripheral nervous system.

In this study, TENS showed the highest effectiveness with an average reduction in pain score of 3.7 points. These results are consistent with studies showing that TENS is effective in acute and chronic pain, both myogenic and neuropathic. William Flexion ExerciseThis exercise strengthens the core muscles and improves flexibility, thus preventing the long-term recurrence of LBP. The study found that Williams' exercise lowered his pain score by an average of 2.6 points. These results support research that says that William's exercise is effective in reducing pain, especially when combined with electrotherapy modalities. Overall, the results of this study confirm that TENS is most effective in lowering pain intensity, while the combination of William Flexion Exercise with electrotherapy provides long-term benefits on muscle strength and recurrence prevention.(Halimah et al., 2022)(Widiyono et al., 2024)(Sari et al.,2023)(Halimah et al., 2022a).

InfraRed (IR) Therapy: InfraRed radiation provides deep penetrating heat that induces therapeutic effects through multiple physiological mechanisms. The thermal energy promotes vasodilation of blood vessels, enhancing local blood circulation and oxygen delivery to affected tissues. This increased perfusion facilitates removal of metabolic waste products and inflammatory mediators while promoting tissue healing. Additionally, the heat effect reduces muscle spasm through decreased gamma motor neuron activity and increased viscoelastic properties of connective tissues. In this study, IR therapy reduced the average VAS pain score by 3 points. These findings are strongly supported by research from Widiyono et al. (2024), who report that InfraRed therapy significantly reduces disability scores related to LBP through mechanisms of enhanced blood flow, reduction of muscle spasms, and modulation of pain perception at the spinal cord level. The thermal effects also increase tissue extensibility, making subsequent manual therapy or exercise more effective.

Transcutaneous Electrical Nerve Stimulation (TENS): TENS is a non-invasive neuromodulatory technique that achieves analgesia primarily through the gate control theory of pain, originally proposed by Melzack and Wall. Low-frequency TENS stimulates large-diameter Aβ nerve fibers, which inhibit nociceptive transmission from smaller C fibers at the dorsal horn of the spinal cord, effectively "closing the gate" to pain signals. Additionally, TENS may trigger endogenous opioid release, providing systemic analgesia. In this study, TENS demonstrated the highest effectiveness among all modalities, with an average VAS pain score reduction of 3.7 points. These results corroborate extensive research by Gerhanawati & Siwi (2024) and Purwasih et al. (2020), showing that TENS is effective for both acute and chronic pain conditions, regardless of whether the pain is myogenic (muscle-origin) or neuropathic (nerve-origin). The versatility of TENS in addressing multiple pain mechanisms makes it particularly valuable in LBP management, where pain often has mixed aetiologies. The non-pharmacological nature of TENS also makes it an attractive option for patients seeking to avoid medication side effects or those with contraindications to analgesic drugs.

William Flexion Exercise: This therapeutic exercise program focuses on strengthening core musculature (particularly abdominal and gluteal muscles), improving lumbosacral flexibility, and reducing mechanical stress on posterior spinal structures through controlled lumbar flexion movements. The exercises work on multiple levels: strengthening the anterior trunk muscles to provide better spinal support, stretching tight hip flexors and lumbar extensors, improving trunk stability, and reducing excessive lumbar lordosis that often contributes to LBP. The study found that William Flexion Exercise reduced average pain scores by 2.6 points on the VAS. While showing slightly lower immediate pain reduction compared to electrotherapy modalities, these results strongly support research by Halimah et al. (2022) and Sari et al. (2023), which demonstrate that Williams' exercise program is particularly effective in providing long-term benefits. The exercise component addresses underlying biomechanical dysfunctions rather than merely treating symptoms, thereby preventing LBP recurrence. When combined with electrotherapy modalities, William Flexion Exercise provides synergistic benefits: immediate pain relief from electrical modalities allows patients to perform exercises more effectively, while the exercises address root causes for sustained improvement.

Overall, the comparative analysis of these three modalities reveals important clinical implications. TENS provides the most effective immediate pain relief, making it ideal for acute pain management and initial treatment phases. InfraRed therapy offers excellent preparation for other interventions by improving tissue quality and reducing protective muscle spasm. William Flexion Exercise, while showing slightly lower immediate pain reduction, provides crucial long-term benefits by addressing biomechanical dysfunction and preventing recurrence. The evidence strongly suggests that an integrated, multimodal approach combining these therapies yields optimal outcomes: TENS for rapid symptom control, InfraRed for tissue preparation and pain modulation, and William Flexion Exercise for long-term functional restoration and prevention. This combination approach addresses multiple pathophysiological mechanisms underlying LBP, providing comprehensive management that extends beyond symptomatic relief to functional recovery and secondary prevention.

CONCLUSION

The study at Kabanjahe Hospital found that physiotherapy significantly reduced pain intensity in patients with Low Back Pain (LBP), shifting from moderate-severe to predominantly mild pain after treatment. Among the applied modalities—InfraRed, TENS, and William Flexion Exercise—TENS was most effective in alleviating pain, while William Flexion Exercise supported muscle strengthening and recurrence prevention. Pain improvement was slower in patients with risk factors such as aging, long working duration, obesity, poor work ergonomics, smoking, and prior trauma. Optimal outcomes were achieved when physiotherapy was combined with lifestyle modifications like improved ergonomics, physical activity, and weight control. Hospitals are encouraged to implement integrated physiotherapy programs, while patients should maintain regular exercises and healthy habits. Future research should explore long-term outcomes of combined physiotherapy and lifestyle interventions to determine their sustained effects on pain relief and functional recovery.

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