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# ELECTROTHERAPY MEETS MUSCULOSKELETAL CARE: A CLINICAL EVALUATION OF SHORTWAVE DIATHERMY FOR LOW BACK PAIN

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## ABSTRACT

***Background:*** *Low back pain (LBP) remains one of the leading musculoskeletal conditions causing disability and work absenteeism worldwide. Non-pharmacological management strategies, including Shortwave Diathermy (SWD), are increasingly applied in clinical practice.*

***Objective:*** *To assess the effect of Shortwave Diathermy on pain intensity and functional disability in patients with low back pain at a physiotherapy rehabilitation center in Swabi.*

***Methods:*** *This quasi-experimental study was conducted at the Health & Wellness Physio Rehab Center, Swabi, with 32 participants aged 25 years and above. Pain intensity and disability were measured using the Visual Analog Scale (VAS) and the Oswestry Low Back Pain Disability Questionnaire (ODI), respectively. Participants received a 4-week intervention protocol of Shortwave Diathermy combined with conventional physiotherapy. Pre- and post-treatment scores were analyzed using descriptive statistics, normality tests, and paired sample tests.*

***Results:*** *The study included 22 males (68.8%) and 10 females (31.3%), with the majority aged 46 years and above (78.1%). Pre-treatment, most participants (68.8%) reported severe pain (VAS 7– 10), and 65.6% were classified as crippled (ODI 61–80%). Following treatment, VAS scores improved from a mean of 2.59 (± 0.66) to 1.21 (± 0.42), and ODI scores from 3.59 (± 0.61) to 1.41 (± 0.50). The paired samples test revealed highly significant improvements ($p < 0.001$) in both pain and disability scores.*

***Conclusion:*** *Shortwave Diathermy, combined with conventional physiotherapy, effectively reduces pain and functional disability in patients with low back pain. It is a valuable adjunctive modality in musculoskeletal rehabilitation, especially in community-based physiotherapy setups.*

## Introduction

Low back pain (LBP) is one of the most prevalent musculoskeletal conditions worldwide, affecting approximately 60-80% of individuals at some stage in their lives. [01] It remains a leading cause of disability and work absenteeism globally, contributing substantially to healthcare costs and reduced quality of life. [02] While low back pain can affect individuals of all ages, its prevalence increases significantly in middle-aged and older adults. [03] The condition can arise from a variety of mechanical, degenerative, or inflammatory causes, with nonspecific low back pain accounting for nearly 90% of all cases. [04] Risk factors associated with LBP include sedentary lifestyles, poor posture, obesity, smoking, psychological stress, and occupational hazards involving repetitive lifting or prolonged sitting. [05] Conservative management, including patient education, exercise therapy, and physical modalities like Shortwave Diathermy and TENS, remains the first-line approach in managing nonspecific low back pain. [06] Several studies have demonstrated that incorporating physiotherapeutic interventions significantly improves pain relief, functional outcomes, and patient satisfaction. [07] In recent years, electrotherapy

techniques such as Shortwave Diathermy have gained popularity for their ability to provide deep tissue heating, reduce muscle spasm, and enhance tissue repair. [08] However, despite its widespread use, the clinical evidence for the efficacy of diathermy in chronic low back pain remains variable, indicating the need for further region-specific and controlled trials. [09, 10] Collectively, these findings highlight the importance of early diagnosis, evidence-based physiotherapy management, and patient-centered care in addressing the global burden of low back pain. [11, 12] Low back pain (LBP) is one of the most prevalent and disabling musculoskeletal disorders globally, affecting approximately 80% of individuals at some stage in their lives. [13-15] In Pakistan, the burden of LBP is significant due to lifestyle factors, poor ergonomics, and inadequate access to early rehabilitative care.

Management of low back pain involves a combination of pharmacological, physical, and behavioral approaches. Among physical modalities, Shortwave Diathermy (SWD) is a widely used deep heat therapy technique that operates at a frequency of 27.12 MHz. It penetrates soft tissues, increasing blood circulation, reducing muscle spasm, and promoting tissue repair through thermal effects. [16] While SWD has long been
a staple in physiotherapy practice, the evidence supporting its standalone or adjunctive effectiveness in treating nonspecific low back pain remains mixed and underexplored in local clinical settings. [17]

Therefore, this study was designed to evaluate the impact of Shortwave Diathermy, when combined with conventional physiotherapy, on pain intensity and functional disability in patients with nonspecific low back pain. The outcomes were assessed using validated clinical tools: the Visual Analog Scale (VAS) for pain and the Oswestry Low Back Pain Disability Questionnaire (ODI) for functional status. This research aimed to fill a regional evidence gap by documenting clinical outcomes from a physiotherapy rehabilitation center in Swabi, Pakistan.

## Methodology

### Study Design & Setting

A quasi-experimental study was conducted at Health & Wellness Physio Rehab Center, Swabi between March and May 2025.

### Participants

32 adult patients aged 25 years and above with nonspecific low back pain were recruited.

**Inclusion Criteria:**

- Aged 25 years and above
- Nonspecific mechanical low back pain of at least 3 weeks duration

**Exclusion Criteria:**

- Specific spinal pathologies (fractures, infections, malignancies)
- Neurological deficits
- Contraindications for SWD (pregnancy, pacemaker, metallic implants)

### Intervention

All participants underwent a 4-week treatment program involving:

- **Shortwave Diathermy** (continuous mode, 27.12 MHz, 20 min/session)
- **Conventional physiotherapy** including lumbar Mobilization, SLR stretching, Bridging exercise.

### Outcome Measures

- **Visual Analog Scale (VAS)** for pain intensity
- **Oswestry Low Back Pain Disability Questionnaire (ODI)** for functional disability

### Statistical Analysis

Data were analyzed using SPSS 27. Normality was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Pre- and post-treatment differences were assessed via Paired Samples Test, with significance set at $p < 0.05$.

## Results

The study comprised a total of 32 participants, with a gender distribution of 22 males, accounting for 68.8% of the sample, and 10 females, representing 31.3%. The majority of participants, 25 out of 32 (78.1%), were aged 46 years or above. A smaller proportion, 5 participants (15.6%), fell within the 36–45 years age group, while only 2 participants (6.3%) were aged between 25 and 35 years.

At baseline, pain severity assessed through the Visual Analog Scale (VAS) revealed that 3 participants (9.4%) reported mild pain, while 7 participants (21.9%) reported moderate pain. A significant majority, 22 participants (68.8%), presented with severe pain, indicating that most individuals began the study with considerable discomfort. Similarly, the Oswestry Disability Index (ODI) scores before treatment demonstrated substantial functional impairment. None of the participants fell within the minimal disability category (0–20%). Two participants (6.3%) exhibited moderate disability (21–40%), while 9 participants (28.1%) reported severe disability (41–60%). Notably, the majority — 21 participants (65.6%) — were

classified within the crippled category (61–80%). No participants were considered bed-bound (81–100%) at the start of the study.

Following the four-week intervention comprising Shortwave Diathermy combined with conventional physiotherapy, significant improvements were observed. In terms of pain severity, 25 participants (78.1%) reported mild pain, and the remaining 7 participants (21.9%) experienced moderate pain, with no individuals reporting severe pain after treatment. Functional disability outcomes also improved markedly. After intervention, 19 participants (59.4%) fell within the minimal disability range, while 13 participants (40.6%) reported moderate disability. Importantly, no participants remained within the severe, crippled, or bed-bound disability categories post- treatment. (Table 01)

The comparison of pre- and post-treatment mean scores further supported these positive outcomes. The mean VAS score reduced from 2.59 (± 0.66) before treatment to 1.21 (± 0.42) after treatment, reflecting a mean difference of 1.38 (± 0.66), which was statistically significant with a p-value of less than 0.001. Similarly, the mean ODI score decreased from 3.59 (± 0.61) pre-treatment to 1.41 (± 0.50) post-treatment, with a mean difference of 2.19 (± 0.64), also highly significant with a p- value of less than 0.001.(Table 02)(Table 03)

Tests of normality were conducted using both the Kolmogorov-Smirnov and Shapiro-Wilk tests for the variables Pre-VAS, Post-VAS, Pre-ODI, and Post-ODI scores. The results indicated that none of the variables followed a normal distribution, with significance values less than 0.05 for each, confirming non-normal data distribution. Despite this, the paired samples test revealed statistically significant improvements across both outcome measures, underscoring the clinical effectiveness of Shortwave Diathermy combined with physiotherapy for managing low back pain in this patient population. (Figure 01)

**Frequency Table OF Gender, Age, VAS and ODI Scale**

**Table 1: Showing the Frequency and Percentage of Gender, Age, Pre & Post Values of VAS and ODI Scale**

| | Variables | Total | Frequency | Percent |
|---|---|---|---|---|
| **Gender** | Male | 32 | 22 | 68.8 |
| | Female | | 10 | 31.3 |
| **Age in Years** | 25-35 Years | 32 | 2 | 6.3 |
| | 36-45 Years | | 5 | 15.6 |
| | 46 Years or Above | | 25 | 78.1 |
| **Pre-VAS** | 0-3 Mild Pain | 32 | 3 | 9.4 |
| | 4-6 Moderate Pain | | 7 | 21.9 |
| | 6-10 Sever Pain | | 22 | 68.8 |
| **Pre ODI** | 0% to 20%: minimal disability: | 32 | 0 | 0 |
| | 21%-40%: moderate disability | | 2 | 6.3 |
| | 41%-60%: severe disability | | 9 | 28.1 |
| | 61%-80%: crippled: | | 21 | 65.6 |
| | 81%-100%: bed-bound | | 0 | 0 |
| **Post-VAS** | 0-3 Mild Pain | 32 | 25 | 78.1 |
| | 4-6 Moderate Pain | | 7 | 21.9 |
| | 6-10 Sever Pain | | 0 | 0 |
| **Post ODI** | 0% to 20%: minimal disability: | 32 | 19 | 59.4 |
| | 21%-40%: moderate disability | | 13 | 40.6 |
| | 41%-60%: severe disability | | 0 | 0 |
| | 61%-80%: crippled: | | 0 | 0 |
| | 81%-100%: bed-bound | | 0 | 0 |

**Table 2: Showing the Normality Test VAS and ODI Scale**

| Tests of Normality | | | | |
|---|---|---|---|---|
| | Kolmogorov-Smirnov[a] | | Shapiro-Wilk | |
| | Statistic | Sig. | Statistic | Sig. |
| Pre-Visual Analog Scale | .417 | .000 | .638 | .000 |
| Pre ODI | .402 | .000 | .663 | .000 |
| Post Visual Analog Scale | .480 | .000 | .511 | .000 |
| Post ODI | .386 | .000 | .625 | .000 |

**Table 3: Showing the Mean and SD difference of Pre and Post Values of VAS and ODI Scale**

| Outcome Measure | Pre-Treatment Mean (± SD) | ment Mean (± SD) | Mean Difference | p-value |
|---|---|---|---|---|
| VAS | 2.59 (± 0.66) | 1.21 (± 0.42) | 1.38 (± 0.66) | < 0.001 |
| ODI | 3.59 (± 0.61) | 1.41 (± 0.50) | 2.19 (± 0.64) | < 0.001 |



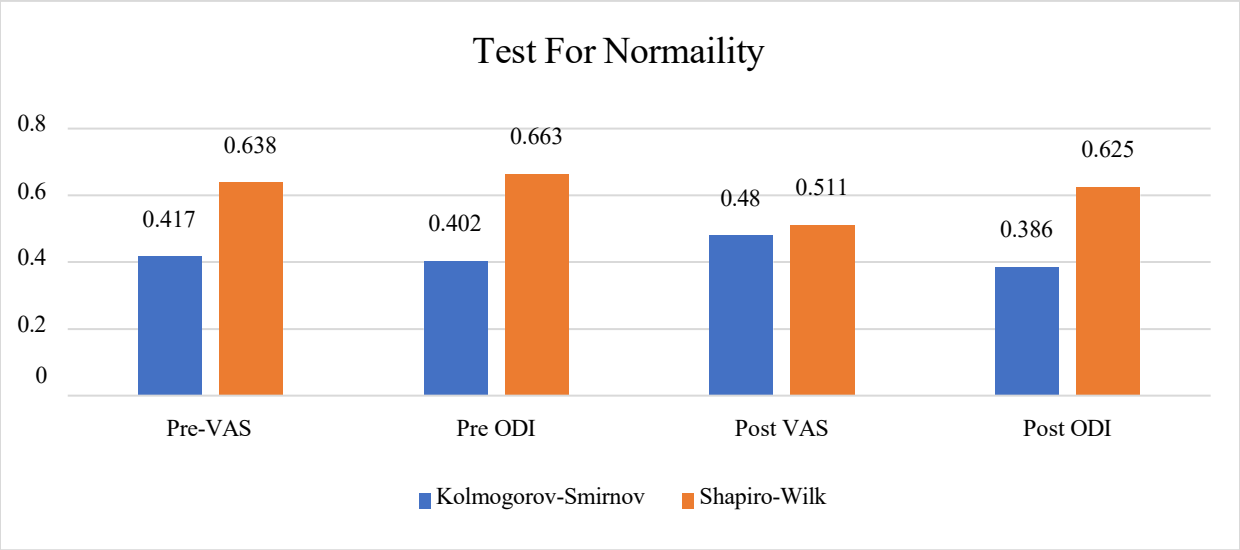


**Figure 1: Showing the Normality Test**

known epidemiology of LBP, particularly in older populations with poor health-seeking behaviors and delayed treatment access in rural and semi-urban areas like Swabi. [18, 19]

Post-treatment results showed a clear and significant shift from severe to mild pain and from high to minimal or moderate disability. Specifically, pain scores on the VAS decreased significantly, with most participants moving from severe pain to mild pain. Functional disability, as measured by the ODI, also improved substantially, with no patients remaining in the severe or crippled categories after treatment. These results align with previous findings by Ahmed et al. (2022), [20] who demonstrated that the addition of Shortwave Diathermy to conventional therapy resulted in superior clinical outcomes for chronic low back pain compared to physiotherapy alone.

The positive effects of SWD can be attributed to its thermal properties, which increase local blood flow, promote muscle relaxation, reduce joint stiffness, and enhance soft tissue extensibility. [21] Additionally, by increasing tissue temperature, SWD facilitates biochemical changes that contribute to pain relief and functional improvement. [22, 23]

Despite these encouraging outcomes, some limitations must be acknowledged. The study was conducted on a relatively small sample size (n=32), which may affect the generalizability of the findings. Furthermore, the absence of a no-treatment control group limits the ability to attribute improvements solely to the intervention, as natural recovery or placebo effects could also contribute. The non-normal distribution of outcome data also suggests the need for caution when interpreting mean values and highlights the importance of considering non-parametric tests or larger sample sizes in future research.

In conclusion, the results of this study provide valuable evidence supporting the use of Shortwave Diathermy as an effective adjunct to physiotherapy in managing low back pain in community- based rehabilitation settings. Future studies involving larger, multi-center trials with longer follow- up periods are recommended to further validate these findings and explore the long-term benefits and comparative effectiveness of different electrotherapy modalities for musculoskeletal conditions.

**Limitations:**

- Small sample size (n=32)
- Single-center study
- Short follow-up period (4 weeks)
- Absence of a no-treatment control group

**Future research** should incorporate larger, multicenter randomized controlled trials with long- term follow-up to confirm these findings and compare SWD with other electrotherapy modalities.

## Conclusion

This study concludes that Shortwave Diathermy in combination with conventional physiotherapy significantly reduces pain and functional disability in adults with low back pain. It should be considered a valuable adjunctive treatment option in musculoskeletal rehabilitation programs, particularly in community physiotherapy centers like Swabi.

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