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Original research article

Efficacy of magnesium with exercises and electrotherapy vs only exercises and electrotherapy in low back pain: A comparative study

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Abstract

Introduction: Low back pain is a prevalent health issue. Pharmacotherapy, surgery, and exercise therapy are all forms of treatment. The risk factors for Low back pain include lack of exercise, smoking, changing lifestyles, and a poor quality of life Magnesium is a crucial nutrient that helps to regulate pain by controlling the NMDA receptors, which in turn relaxes the muscles.

Methodology: This study compares using transdermal magnesium oil sprays versus not using them, coupled with exercises and electrotherapy, to treat low back pain. The sample size is 30 people between the ages of 24 and 40, and the end measures include pain, Mg RBC levels, and daily living activities.

Results: Both Group A and Group B experienced a marked reduction in discomfort and difficulty performing everyday activities from Day 0 to Day 45 and Day 45 to Day 90, respectively.

Discussion and Conclusion: Both treatment regimens markedly improved patients, with Group A showing a higher improvement.

Keywords: Low Back Pain, Surgery, Transdermal Magnesium, N-methyl-D-aspartate (NMDA) receptors, Exercise

Introduction

A significant section of the population worldwide is afflicted with low back pain, which is a frequent health issue. Low back pain is any pain, stiffness, or muscular tension that is located below the costal line and above the inferior gluteal fold, whether or not it spreads into the leg. Backache risk factors are often three-dimensionally interrelated, according to studies on epidemiology, and include lifestyle and personal factors, psychosocial factors, and physical factors. Its severity might range from moderate to severe, acute to chronic. According to how long it lasts, Low back pain is broken down into three subcategories: acute (lasting less than 6 weeks), subacute (lasting between 6 weeks and 3 months), and chronic (lasting more than 3 months). Numerous things, such as strained muscles, torn ligaments, herniated discs, degenerative diseases, and anomalies in the spine, can result in back discomfort. According to epidemiological research, back discomfort is a frequent medical issue. According to the 2019 Global Burden of Disease Survey, back pain is the primary global cause of long-term disability. All ages are affected, but there has been evidence of a higher occurrence in the elderly. Low back pian is a long-term, chronic health issue that can manifest in a variety of ways. 60% of patients who experience an acute bout of Low back pain recover within three months, according to statistics. While 50–70% of persons have recurrent episodes. The Low back pain's cyclical and erratic nature is a significant contributor to the socioeconomic and societal load. Magnesium is a necessary mineral that plays a key role in many biological processes, including the control of pain. It takes part in more than 300 enzymatic processes that support the health of the immune system, the synthesis of proteins, the operation of muscles and nerves, and the creation of energy. Magnesium has additional qualities that can affect how pain is perceived and offer relief from some types of pain. By controlling the N-methyl-D-aspartate (NMDA) receptors, magnesium has a significant impact on pain management. Magnesium prevents their activation and lessens sensitivity to pain triggers. This antagonist impact serves to reduce discomfort and modify how it is perceived.

Aim of study

To compare the efficacy of magnesium with exercises and electrotherapy vs only exercises and electrotherapy in low back pain.

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Objectives of the study

The know the difference in effectiveness of magnesium with exercises and electrotherapy vs only exercises and electrotherapy in low back pain.

1. To assess, using the Visual Analogue Scale (VAS), the effects of Mg supplementation in conjunction with physical therapy and electrotherapy in participants with low back pain.
2. To assess the impact of Mg supplementation in conjunction with traditional physiotherapy management on participants with low back pain's daily activities of living (ADLs) using the Back Pain Functional Scale (BPFS).
3. To examine the impact of magnesium supplementation combined with physical activity and electrotherapy on participants with low back pain serum levels of the mineral.

Methodology

The participants with Low back pain in the current study will be divided into two groups: The experimental Group A and the control Group B. Group A will receive the transdermal application of Mg oils along with exercises & electrotherapy, whereas Group B will receive only exercises & electrotherapy. Because of this, the current investigation is a randomized controlled experiment.

Obtaining consent and ethical issues

The intended study requested ethical approval to be carried out at the Pacific College of Physical Therapy in Udaipur.

Study Population

All adults with persistent low back pain, aged 24 to 40, were included in the study.
Participants were drawn from Udaipur and its neighboring cities, hospitals, rehabilitation facilities, and neighborhoods.

Sample Size

The sample size for the study is chosen using the power analysis and the impact of the outcome measure from prior research used in this investigation.
30 patients with low back pain, residing in Udaipur.
15- Treatment with transdermal application of Magnesium along with exercises and electrotherapy.
15- Treatment with exercises and electrotherapy.

Sampling Method

For this experiment we have selected a random sampling method.

Inclusion criteria

- Male and female Patients in the age group 24- 40years.
- Patients having low back pain more than 3 weeks.
- Ability to walk independently on even and uneven surfaces without assistive devices.
- Willing participants with no serious cognitive issues and ability to comprehend commands.

Exclusion criteria

- Patients with previous history of spine surgery and any pathology of muscle, bone, ligaments
- Patients who received steroid injections within last six months & those who have recently become ill, systemic or infectious disease
- Patients with a history of a pathological conditions like malignancy, infection, rheumatoid arthritis, osteomyelitis & skin conditions.
- Patients with pacemaker.
- Pregnant women.
- Epilepsy or seizures in the past.
- Other serious illnesses or neuropsychiatric conditions, such as claustrophobia or severe depression.
- A history of drug or alcohol abuse

Procedure

Exercises: 10 repetitions of each exercise, thrice daily.

1. Cat and cow
2. Cobra stretch
3. Bridging
4. Child’s pose
5. Supine spine twist

Magnesium – 20 sprays of Dr Mg

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Tens (Transcutaneous Electrical Nerve Stimulation) for 15 minutes.
Burst TENS- Carrier frequency of 70-100Hz packaged in burst of about 7 bursts per second.

- **Pulse width:** High 100-200 micro seconds.
- **Pulse rate:** 70-100pps modulated to 1-5 bursts/sec
- **Intensity:** Strong but comfortable.

Note: Pacific Medical University, Institute's ethical approval obtained date 06/09/22, PMU/PMCH/IEC/2022/242. All participants completed information and consent form at recruitment.

Data Analysis

Nominal data from patient's demographic data i.e. age, sex, BMI, height, weight distribution were analyzed using t-test. Comparison of the pre intervention and post intervention outcome measures such as VAS, Magnesium RBC levels and Back Pain Functional Scale was done. The descriptive statistics were expressed in the median [interquartile range (IQR)].

Results

The demographic dimension (age) of the sample recruited was detailed with the median (IQR) in Table 1, while comparisons were made in Table 2 between groups. There exists no significant difference between them. Differences between the outcome scores, VAS, Serum Magnesium, and BPFS at pre-post intervention changes in 45th day and 90th day within and between the groups were tabulated in Table3 with statistical significance differences.

Table 1: Demographic dimensions of the sample recruited (n=30)

Demographic dimensions	Median (IQR)	Range
Age (Years)	31 (28.8, 33.3)	25 to 40

Note: Demographic dimensions does not follow normal distribution. Hence, expressed in median with interquartile range and range

Table 2: Demographic dimensions between Group A (n=15) and Group B (n=15)

Demographic dimensions	Group A	Group B	p-value
Age (Years)	31 (27, 36)	31 (29, 35)	0.935

Note: Demographic dimensions does not follow normal distribution. Hence, expressed in median with interquartile range.

Table 3: Patient gender distribution between Groups A and B

	Group A		Group B		Total	
Gender	Number	%	Number	%	Number	%
Male	5	33.33%	9	60.00%	14	46.67%
Female	10	66.67%	6	40.00%	16	53.33%
Total	15	100.00%	15	100.00%	30	100.00%

Table 4: Patient distribution between Groups A and B according to education

Demographic variables		A Patients(n=15)		B Patients(n=15)	
		Frequency	%	Frequency	%
Education	No Formal Education	7	46.7%	2	13.3%
	Primary Education	3	20%	2	13.3%
	Sec. & high sec. Education	0	0%	2	13.3%
	Graduation & Above	5	33.3%	9	60%

Table 5: Distribution of Patients by Occupation Between Groups A and B

Demographic variables		A Patients(n=15)		B Patients(n=15)	
		Frequency	%	Frequency	%
Occupation	Unemployed	0	0%	1	0.067%
	Employee	8	53%	6	40%
	Business	7	46.7%	8	53.3%

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

Table 6: Family Income in Rs. wise Patient Distribution Between Groups A & B

Demographic variables		A Patients(n=15)		B Patients(n=15)	
		Frequency	Percentage	Frequency	Percentage
Family Income in Rs.	Rs. 5000-1000	0	0%	1	0.06%
	Rs. 10001-15000	0	0%	2	13.3%
	Rs. 15001-20000	9	60.0%	7	46.67%
	Rs. 20001-Above	6	40%	5	60%

Table 7: Area-wise Patient Distribution in Groups A and B

Demoraphic variables		A Patients(n=15)		B Patients(n=15)	
		Frequency	Percentage	Frequency	Percentage
Area	Rural	9	60%	6	40%
	Urban	6	40%	9	60%

Table 8: Comparison of VAS score, Mg RBC and BPFS at pre-post intervention changes in 6th week and 12th week within and between the Group A & Group B (n=30)

Outcome scores	Group A (n=15)	Group B (n=15)	p-value#
VAS- Pre	7 (6, 8)	5 (5, 7)	0.002
VAS -6wk	4 (3, 5)	5 (4, 5)	0.174
VAS -12wk	1 (0, 1)	4 (3, 4)	<0.001
P-value*	<0.001	<0.001	
Mg RBC -Pre	0.8 (0.7, 1.4)	1.4 (0.9, 2.0)	0.148
Mg RBC -45th day	1.7 (1.5, 2.0)	1.5 (0.9, 2.0)	0.325
Mg RBC -90th day	2 (1.9, 2.3)	1.5 (1.0, 2.0)	0.011
P-value*	<0.001	0.249	
BPFS-Pre	26 (15, 34)	29 (26, 34)	0.325
BPFS -45th day	44 (36, 47)	37 (30, 42)	0.013
BPFS -90th day	56 (48, 58)	43 (37, 48)	<0.001
P-value*	<0.001	<0.001	

Note: Outcome scores does not follow normal distribution. Hence, expressed in median with interquartile range. * -Friedman test; # - Mann-Whitney U test

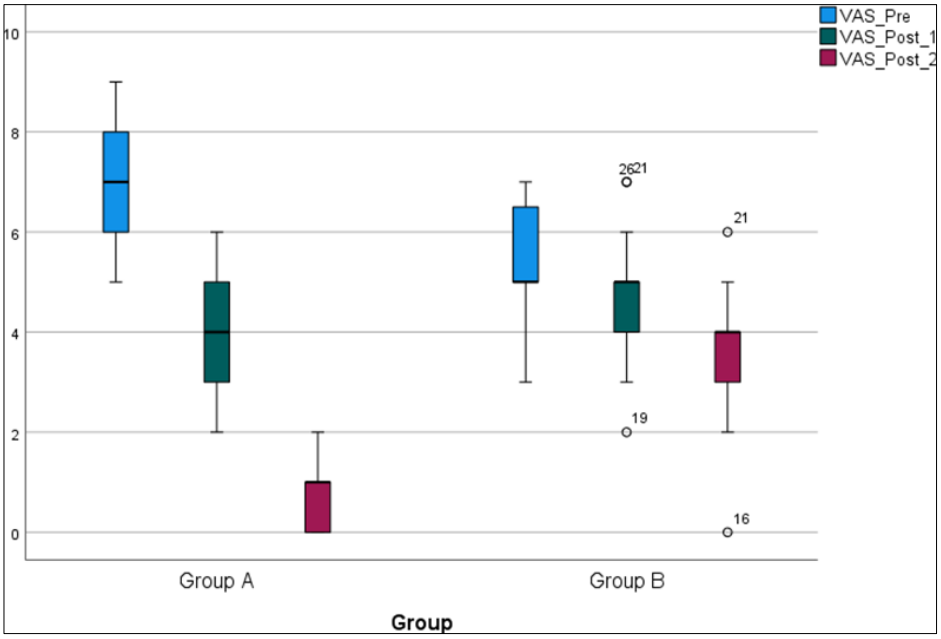

Fig 1: Pain score changes (median) between the groups

This graph up top compares the median VAS score between Group A and Group B at three distinct time periods. At day 0, post 1, and post 2, Group A's median was 7, 4, and 1, whereas Group B's was 5, 5, and 4, respectively.

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

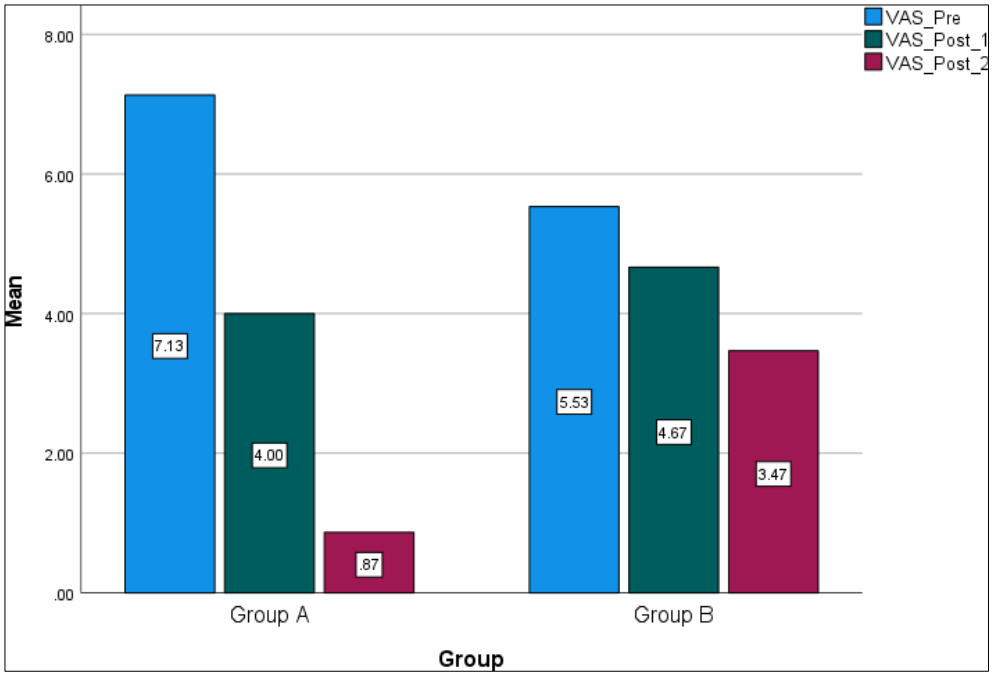

Fig 2: Pain score changes (mean) between the groups

The graph up top compares Group A and Group B's VAS scores and means at three separate time points. The mean for Group A was 7.13, 4.00, and 0.87 respectively at day 0, post 1, and post 2, while it was 5.53, 4.67, and 3.47 for Group B.

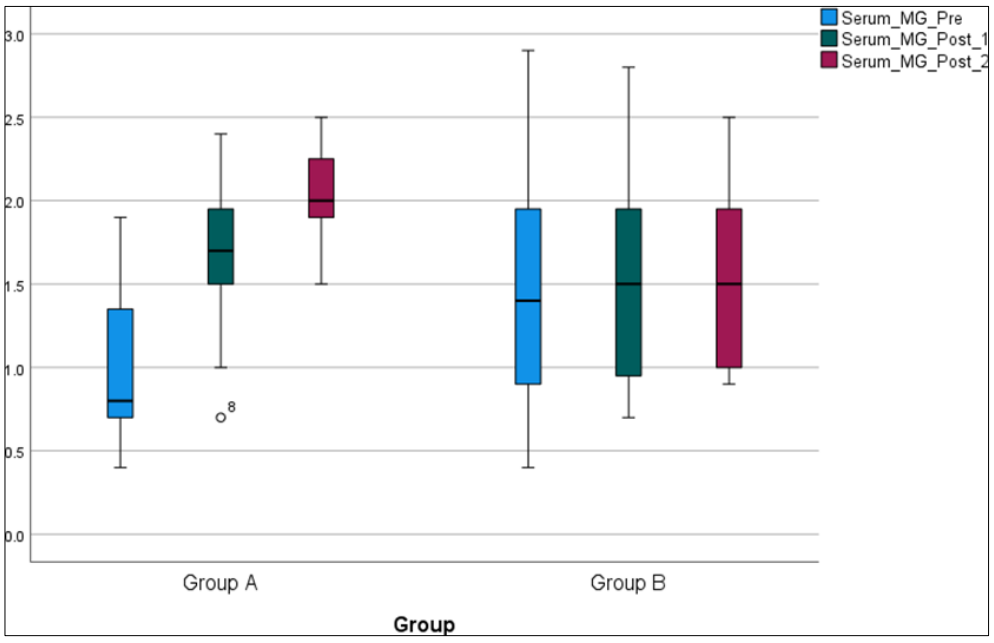

Fig 3: MgRBC changes (median) between the groups

The above graph displays the comparison of Mg RBC value and median among Group A and Group B at three different intervals. At day 0, post 1 and post 2 the median of Group A were 0.8,1.7 and 2 respectively while that of Group B were 1.4, 1.5 and 2 respectively.

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

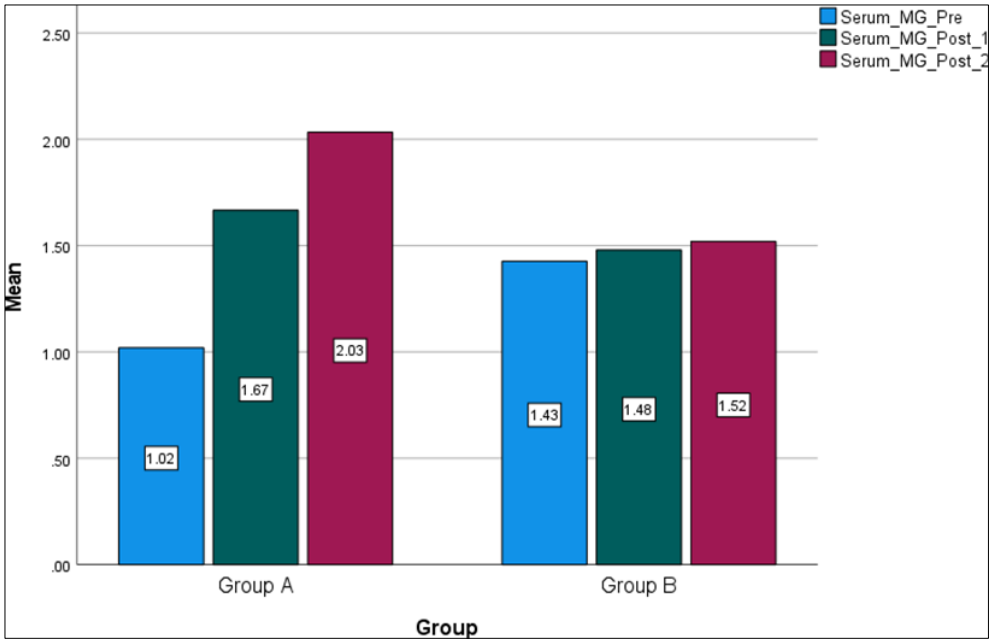

Fig 4: MgRBC changes (mean) between the groups

The graph up top compares the mean and value of the Mg RBC in Group A and Group B at three different time points. The means for Group A at day 0, post 1, and post 2 were 1.02, 1.67, and 2.03 respectively, while they were 1.43, 1.48, and 1.52 for Group B

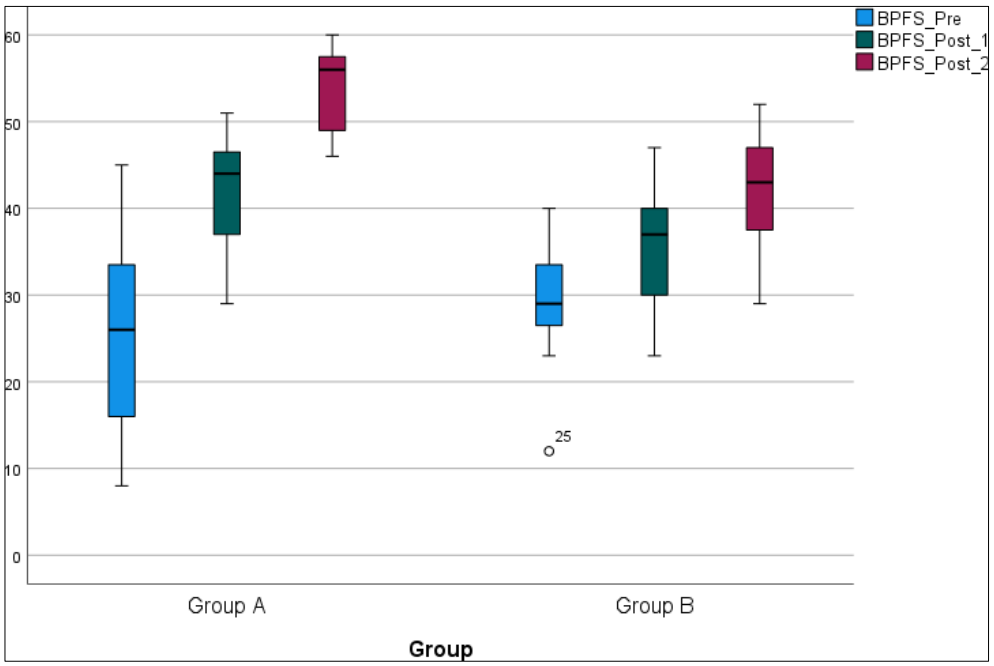

Fig 5: BPFS score changes (median) between the groups

The graph up top compares the median BPFS score between Group A and Group B at three different time points. The median values for Group A at day 0, post 1, and post 2 were 26, 44, and 56, respectively, while they were 29, 37, and 43, respectively, for Group B

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

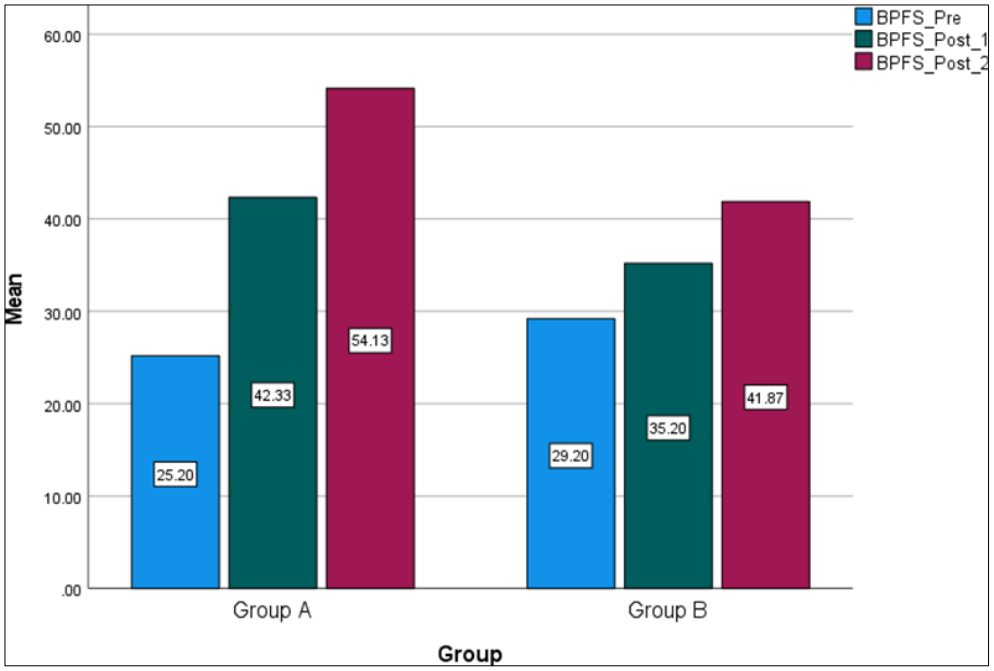

Fig 6: BPFS score changes (mean) between the groups

The graph up top compares the average BPFS score between Group A and Group B at three distinct times. At day 0, post 1, and post 2, Group A's mean values were 25.20, 42.33, and 54.13, respectively, whereas Group B's values were 29.20, 35.20, and 41.87.

Discussion and Conclusion

There are many various types of therapy, and the doctor may need to direct the patient to the most suitable rehabilitation course, making rehabilitation for low back pain a complicated topic. Symptomatic, motor control, and functional rehabilitation fall under these three broad categories. Symptomatic low back pain describes recent or recurrent episodes with recognizable symptoms. Patients with impairments who can control their mobility and minor discomfort. Studies show that using $MgSO_4$ supplements reduced pain intensity and improved lumbar spine mobility in those with resistant persistent lower back pain. Additionally, magnesium has anti-inflammatory qualities that are helpful for pain alleviation. Magnesium eases muscle discomfort by encouraging muscle relaxation, which also lessens the frequency and intensity of spasms. TENS can reduce pain temporarily, but it does not address the underlying source of the pain. According to the results of the current study, patients who had transdermal magnesium oil application had significantly different pain, back impairment, and magnesium RBC levels than those who just received exercises and electrotherapy.

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