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Effects Of Pulsed Low-Frequency Magnetic Field Therapy On Pain Intensity In Patients With Musculoskeletal Chronic Low Back Pain In Riyadh City -Saudi Arabia-2023

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Abstract

Objectives: To investigate the efficacy of pulsed electromagnetic field (PEMF) therapy combined with therapeutic exercises in the treatment of chronic low back pain (CLBP).

Research Methodology: Forty-two patients (22 males, 20 females), were randomized into either the treatment group (PEMF and therapeutic exercises) or placebo group (sham PEMF and exercises). Primary outcome measures were pain intensity on the 10-point Numeric Pain- Rating Scale and disability measured by the Roland-Morris Disability Questionnaire. The patients were assessed at baseline, during the treatment period (weeks 3, 6, and 9), and after treatment (week 13).

Results: The treatment group experienced a more rapid improvement in both pain and disability compared with the placebo group. The analysis showed a significant improvement in the pain intensity and disability scores in the treatment group at week 3 ($p < 0.05$), whereas an improvement in the placebo group was detected at week 6. The significant improvement in both groups was sustained for weeks 6, 9, and 13. There was no difference between the groups in scores of pain intensity and disability at weeks 6 and 13.

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Conclusions: PEMF therapy improved pain and disability in patients with CLBP. However, it does not seem to be superior to other treatment options.

Keywords: Lower back pain; Magnetic field therapy

Background

Low back ache (LBP) is the most commonplace musculoskeletal ache sickness that reasons primary care visits in Saudi Arabia [1]. LBP is a notably everyday circumstance and influences extra than eighty% of the populace at some point in their lifetime [1]. Chronic low again pain (CLBP), defined as any pain or discomfort between the 12th rib and gluteal crest persisting for greater than 12 weeks [2], is one of the leading reasons of incapacity globally [3]. Emerging evidence indicates that approximately 33% of acute LBP patients fail to recover and expand CLBP [4]. There is proof that CLBP is regularly associated with a sizable economic burden, because of confined bodily potential, profession burden, activity quandary, paintings absenteeism, and price of medical care [4].

There are diverse tips for the control of CLBP, inclusive of exercising, acupuncture, massage remedy, yoga, cognitive behavioral therapy, modern rest, spinal manipulation, and interdisciplinary rehabilitation [5]. However, studies shows that those interventions only have modestly useful consequences [6]. Pulsed electromagnetic field (PEMF) remedy has been used to control various pain situations; it aims to persuade behavioral in addition to physiological parameters with the intention to alleviate ache. However, its efficacy in treating CLBP has now not been nicely installed. Moreover, only a few studies had been carried out on PEMF and CLBP, and the findings of those studies are inconsistent. Finegold and Flamm [7] observed that

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PEMF therapy had little impact at the pain depth amongst patients with CLBP. In assessment, Loo [8] in 2009 and Arneja et al. [9] in 2016 suggested that the usage of PEMF undoubtedly contributed to patient recuperation. The conflicting findings appear to be attributed to study differences in sample length, studies parameters, and treatment duration.

This take a look at in general investigated the efficacy of PEMF remedy at the discount of pain depth and functional incapacity amongst patients with CLBP. Secondary results of hobby have been its impact on mental consequences (melancholy, tension, and pressure), sleep styles, and patient perceived results. We hypothesized that PEMF reduces the depth of ache associated with CLBP and improves functional capability, psychological aspects, and sleep styles.

Study Design

The take a look at changed into designed as a randomized double-blind placebo-controlled trial. The study members have been patients with CLBP referred to the physical therapy branch at the Harimila General Hospital, Saudi Arabia . We calculated that the full patient sample length required become 40 with the intention to have a 90% danger of detecting variations that had been significant at the five% alpha stage [10]. The pattern length was increased by using five% to compensate for patient dropout from the examine. The overall pattern size become fifty two patients, while the range of preliminary individuals in line with institution became 26 patients; 10 sufferers did not whole the treatment classes, and 42 have been included inside the very last evaluation (20 inside the remedy organization, 22 inside the control institution). The study inclusion standards were males or women aged 18–60 years providing with a primary criticism of returned ache rated ≥five on the 10-point Numeric Pain-Rating Scale (NPRS) in the location

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among the twelfth rib and the iliac crease for extra than 12 weeks, with or without leg pain; other inclusion standards included the capacity to examine, recognize, and follow the have a look at commands. Patients with CLBP were excluded if they had regarded or suspected severe spinal pathology (e.G., metastatic, inflammatory, or infectious diseases of the spine; cauda equina syndrome; or spinal fracture), took blood-thinning or clotting inhibitor remedy, or had spinal surgical treatment within the previous 6 months. Additionally, patients with an present or planned pregnancy throughout the observe duration, a history of epilepsy or psychosis, immunosuppression (number one immunodeficiency, circumstance requiring immunosuppressive medicinal drug, inherited sickness affecting the immune gadget, and neutropenia), and implanted metal gadgets (pacemaker, defibrillator, neurostimulator, spinal wire stimulator, bone stimulator, cochlear implant, and others) were additionally excluded. The sample changed into divided into agencies (remedy organization and manipulate organization) thru stratified random sampling using pc-generated block randomization.

The treatment group received PEMF remedy through a Bio-Electro-Magnetic-Energy-Regulation (BEMER) device, whereas the control organization acquired sham PEMF therapy (the BEMER device turned into not active throughout the remedy session). Both corporations obtained workout therapy. Patients underwent PEMF or sham PEMF remedy for three months (thirteen weeks) for a complete of 39 periods (three–five instances per week) administered for 20 minutes according to session. The final results measures were assessed at the first consultation, at weeks 3, 6, and 8 at some stage in remedy, and then at week thirteen, post treatment. The participants, researchers, and assessors had been blinded to the usage of PEMF.

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Outcome measures

Pain intensity:

Pain intensity was measured using the 10-point NPRS

with 0 representing “no pain” and 10 representing “worst imaginable” pain. This scale has been validated for use in the measurement of pain intensity among patients with obvious pain [11]; the Arabic version of the NPRS has been previously validated and shown to be reliable and comparable with the English version [12].

Physical disability

The Roland-Morris Disability Questionnaire (RMDQ- 24) was used to evaluate self-rated physical disability due to LBP. It evaluates a patient’s daily living aspects, such as sleeping, walking, lifting, resting, housework, appetite, dressing, and self-care, and has been shown to be a suit- able measure for patients suffering from mild to moderate disability arising from acute, subacute, or chronic LBP

[13]; the Arabic version of the RMDQ-24 has been re- ported to be valid and reliable [14].

Sleep disturbance

Item 6 of the Pittsburgh Sleep Quality Index (PSQI) was used to measure patients’ quality and patterns of sleep over a 1-month period via a self-reported questionnaire and is presented in Table 1. The tool accurately detects sleep disturbance in patients with LBP [15], and the valid- ity and reliability have been previously ascertained [16]; the Arabic version of the PSQI is also valid and reliable [17].

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Global perceived effect of change

The global perceived effect (GPE) scale is widely used among patients with musculoskeletal disorders. It com- bines patient-perceived outcomes, such as mental health, physical role, social and physical functioning, health tran- sition, emotional function, and general health, allowing the patient to integrate all factors to give an overall evalu- ation [18]. The scale consists of integers from −5 through 5, with 0 representing “unchanged,” 5 representing “com- pletely recovered,” and −5 representing “vastly worse.”

Statistical analysis

Descriptive statistics were used to describe demographic data and group characteristics. A paired t-test was used to compare the differences before and after the interventions for both the treatment and control groups. An indepen- dent t-test was used to compare the two groups before the intervention, during the intervention (weeks 3, 6, and 9), and after the completion of the treatment (week 13). Sta- tistical analysis was performed using IBM SPSS software for Windows ver. 20.0 (IBM Corp., Armonk, NY, USA). Statistical significance was defined as $p<0.05$.

Results

A total of 80 patients with CLBP were screened for eli- gibility, of which 28 did not meet the study criteria and were thus excluded. Ten of the remaining 52 eligible pa- tients did not complete the treatment sessions. Finally, 42 patients were included for the analysis, of which 20 were allocated in the treatment group and 22 in the control group (Fig. 2). The baseline analysis of pain intensity and self-rated physical disability scores showed no statistical difference between the treatment and control groups ($p=0.87$ and 0.51, respectively). In

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addition, the demo- graphic characteristics also revealed no statistically significant difference between the groups in age, body mass index, marital status, gender, and duration of LBP. Importantly, there was no difference between the groups in pain medication usage (p=0.69). However, there was a statistically significant difference between the groups (p=0.02) in reference to stress level. Table 1 illustrates the subjects' baseline characteristics.

Table 1. The description of the sample characteristics

Characteristic	Treatment group (n=20)	Control group (n=22)	*p*-value
Age (yr)	41.45±9.45	42.61±9.69	0.76
Body mass index (kg/m2)	30.66±4.59	31.13±7.57	0.76
Gender			0.77
Male	10	12	
Female	10	10	
Marital status			0.93
Single	2	3	
Married	18	18	
Divorced	0	1	
Employment			0.36
Working	15	18	
Not working	5	4	
Pain intensity (0–10 NRS)	5.70±1.97	5.59±2.32	0.87
Disability (RMDQ-24)	8.95±3.64	9.89±5.20	0.51
Depression	2.95±3.05	5.41±5.97	0.10
Anxiety	2.95±3.36	4.36±3.94	0.06
Stress	5.35±3.82	9.09±5.97	0.02
Pain medication use			0.69
Yes	7	9	
No	13	13	
Duration of the low back pain (mo)			0.50
3–6	3	3	
6–12	0	4	
>12	17	15	

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1. The effect of pulsed electromagnetic field on pain intensity and self-rated physical disability of low back pain

The analysis showed a statistically significant improvement in pain intensity for the treatment group at weeks 3, 6, 9, and 13 ($p<0.05$) (Table 2, Fig. 2). Pain intensity did not significantly improve at week 3, but there was a significant improvement at weeks 6, 9, and 13 ($p<0.05$) in the control group. The analysis of the self-rated physi- cal disability scores for the treatment group revealed a statistically significant improvement in physical disability at weeks 3, 6, 9, and 13 ($p<0.05$) (Table 2, Fig. 3). For the control group, there was no statistically significant differ- ence in the self-rated physical disability at weeks 3 and 6, but there was a significant improvement in weeks 9 and 13 ($p<0.05$) (Table 2, Fig. 2).

The comparison between groups in pain intensity showed no statistically significant difference at all time- point assessments (Table 2). However, the comparison between groups with respect to physical disability showed a significant improvement in the treatment group only at week 3 ($p<0.05$) (Table 2).

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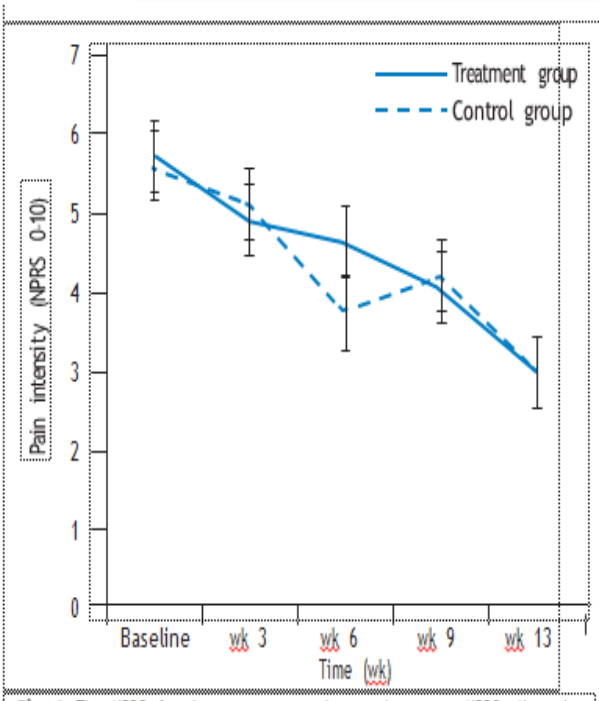

Fig. 1. The NPRS for the treatment and control groups. NPRS, Numeric Pain Rating Scale.

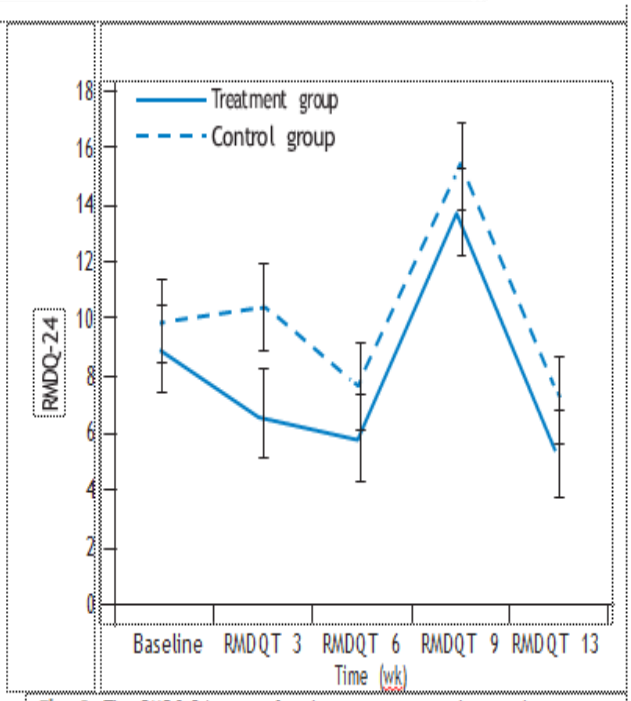

Fig. 2. The RMDQ-24 score for the treatment and control groups. RMDQ-24, Roland-Morris Disability Questionnaire.

Table 2. The comparison of pain rating score and selfrated physical disability score between and within groups at different time-point assessments

Period	Treatment group (n=20)		Control group (n=22)		Between groups p -value
	Mean±SD	p -value	Mean±SD	p -value	
Pain intensity (0–10 NRS)					
Baseline	5.70±1.97		5.59±2.32		0.87
wk 3	4.90±2.15	0.04	5.09±2.40	0.23	0.78
wk 6	4.60±2.18	0.004	3.72±2.58	<0.001	0.24
wk 9	4.05±2.39	0.002	4.18±3.01	0.019	0.87
wk 13	2.95±2.16	<0.001	2.95±2.59	<0.001	0.99
Disability (RMDQ-24)					
Baseline	8.95±3.64		9.89±5.20		0.51
wk 3	6.65±4.13	0.004	10.45±6.13	0.56	0.02
wk 6	5.80±3.95	0.002	7.72±6.58	0.111	0.26
wk 9	13.75±2.84	<0.001	15.45±4.51	<0.001	0.10
wk 13	5.30±3.82	<0.001	7.18±6.93	0.03	0.28

Discussion

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Although PEMF resulted in a significant reduction in pain intensity and self-rated physical disability in patients with CLBP in the current study, it was not superior to therapeutic exercises given to the control group at the same period, which is similar to previously reported find- ings. Oke and Umebese [4] in 2013 reported a significant improvement in pain intensity and functional activity in the PEMF group but not in the standard medication group. A study by Gyulai et al. [21] in 2015 found that BEMER therapy reduced fatigue and pain intensity in the short term for CLBP patients. Moreover, Park et al. [5] in 2014 reported a significant decrease in pain intensity (p<0.05) and functional disability (p<0.01) in the PEMF group compared with the control group, but no signifi- cant difference in depression (p=0.850) [6], similar to the present study. Omar et al. [10] in 2012 reported a significant difference between the PEMF treatment group and placebo group before and after application of PEMF in pain intensity, functional disability, and sleep qual- ity (p=0.024, p<0.001, and p<0.001, respectively) [10]. However, the present study revealed these differences were not significant. Elshiwi et al. [6] in 2018 reported a significant difference between the treatment group (PEMF therapy effects with 50 Hz frequency and low intensity of 20 Gauss) and the control group (conventional noninva- sive treatment modalities) in the context of pain intensity (mean difference [MD], 1.52; 95% confidence interval [CI], 0.34–3.35) and functional disability (MD, 8.14; 95% CI, 6.5–9.96). Finally, Abdelhalim and Samhan [7] in 2018 reported a significant pain intensity reduction in the PEMF group (p<0.05) compared with the control group after 3 months of treatment (p>0.05).

On the contrary, other studies did not support our find- ings. For example, Harden et al. [8] in

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2007 reported no significant difference in pain intensity throughout the treatment period ($p>0.05$) between the treatment (15 millitesla PEMF group) and control groups. Similarly, Krammer et al. [10] in 2015 found that the PEMF group failed to demonstrate any significant improvement in pain intensity and functional disability ($p>0.05$) over a 4-week assessment period. Arneja et al. [9] in 2016 reported no significant improvement in the mental health total score of both the PEMF group and the control group ($p=0.753$ and $p=0.447$, respectively). The literature suggests several factors might contribute to this discrepancy, for example, duration of treatment, parameters of the machine (fre- quency, pulse rate and width, magnetic flux density), and frequency of intervention, in addition to different follow- up periods.

Conclusions

There is no significant difference between the treatment and control groups was reported with respect to pain intensity, physical disability, sleep quality, and GPE, although there were significant improvements in the treatment group. This study has therefore concluded that PEMF therapy improves the outcome of CLBP patients. However, it is not superior to other treatment options. On the other hand, these findings make it obvious that CLBP is a com- plex condition, making it difficult to identify an effective treatment. Therefore, each patient needs to be assessed individually in order to tailor a suitable treatment plan.

Recommendations

Given these findings and considering the complexity and variety of patients with LBP, specific attention must be aimed at subgroups of patients with CLBP. CLBP patients should be screened for prognostic indicators by identifying modifiable risk factors (biomedical,

psychological, and social) before initial decision-making. The current study findings support the notion that patients should be categorized into low, medium, and high-risk categories, and then treatment options should be customized .

References

1. Roberti, Roberta, et al. High-intensity, low-frequency pulsed electromagnetic field as an odd treatment in a patient with mixed foot ulcer: A case report. Reports, 2022, 5.1: 3.

2. Abdulla, Fuad A., Et Al. Effects Of Pulsed Low-Frequency Magnetic Field Therapy On Pain Intensity In Patients With Musculoskeletal Chronic Low Back Pain: Study Protocol For A Randomised Double-Blind Placebo-Controlled Trial. BMJ Open, 2019, 9.6: E024650.

3. Freburger JK, Holmes GM, Agans RP, et al. The ris- ing prevalence of chronic low back pain. Arch Intern Med 2009;169:251-8.
4. Vrbanic TS. Low back pain: from definition to diag- nosis. Reumatizam 2011;58:105-7.
5. Stewart Williams J, Ng N, Peltzer K, et al. Risk factors and disability associated with low back pain in older adults in low- and middle-income countries: results from the WHO Study on Global AGEing and Adult Health (SAGE). PLoS One 2015;10:e0127880.
6. Maher C, Underwood M, Buchbinder R. Non-specif- ic low back pain. Lancet 2017;389:736-47.
7. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians
8. Schneider, C.; Stratman, S.; Kirsner, R.S. Lower Extremity Ulcers. Med Clin. N. Am. 2021, 105, 663–679.
9. Harries, R.L.; Bosanquet, D.C.; Harding, K.G. Wound bed preparation: TIME for an update. Int. Wound J. 2016, 13 (Suppl. 3), 8–14.

10. Gallelli, G.; Cione, E.; Serra, R.; Leo, A.; Citraro, R.; Matricardi, P.; Di Meo, C.; Bisceglia, F.; Caroleo, M.C.; Basile, S.; et al. Nano-hydrogel embedded with quercetin and oleic acid as a new formulation in the treatment of diabetic foot ulcer: A pilot study. Int. Wound J. 2019, 17, 485–490.

11. Romano, F.; Paolino, F.M.; Rizzo, B.A.; Russo, A.; Southworth, S.; Serra, R.; Gallelli, L. The use of growth factors, CD34+cells and fibrin for the management of chronic venous ulcers. Int. Wound J. 2015, 13, 1011–1013.

12. Serra, R.; Gallelli, L.; Conti, A.; De Caridi, G.; Mafalda, M.M.; Spinelli, F.; Buffone, G.; Amato, B.; Ceglia, S.; Spaziano, G.; et al. The effects of sulodexide on both clinical and molecular parameters in patients with mixed arterial and venous ulcers of lower limbs. Drug Des. Dev. Ther. 2014, 8, 519–527.