



A STUDY TO COMPARE EFFECTIVENESS OF ELECTROTHERAPY AND EXERCISE THERAPY VERSUS THE EFFECTIVENESS OF ELECTROTHERAPY AND EXERCISE THERAPY ALONG WITH TRANSDERMAL MAGNESIUM SUPPLEMENTATION IN OA KNEE

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Abstract

Osteoarthritis (OA) is a widespread condition, especially among older individuals, often leading to disability. Knee osteoarthritis is increasingly common as people age. Risk factors include age, weight, and repetitive joint strain. Pathogenesis involves cytokines, leptin, and mechanical stress. Diagnosis can be difficult due to asymptomatic cases and limited sensitivity in X-ray exams. OA significantly affects quality of life, impacting physical and mental health, with increased mortality risk, especially from heart-related issues. Magnesium plays a vital role in numerous physiological functions, including pain modulation. Its unique properties can influence pain perception and alleviate various types of discomfort. This study compare effectiveness of electrotherapy and exercise therapy versus the effectiveness of electrotherapy and exercise therapy along with transdermal magnesium supplementation in OA knee.

Method

In this randomized controlled trial, 30 participants with knee osteoarthritis (OA) pain will be divided into two groups: experimental (n=15) and control (n=15). The experimental group will undergo transdermal magnesium oil spray application alongside standard physiotherapy, while the control group will receive standard physiotherapy alone. Outcome measures including pain intensity, functional impairment, and magnesium levels will be assessed pre- and post-intervention using statistical analysis. This study aims to evaluate the efficacy of combining

transdermal magnesium supplementation with conventional physiotherapy for managing knee OA pain.

Result

The results of the study showed significant differences between the two groups. Participants who received transdermal magnesium oil application in addition to conventional therapy experienced noteworthy reductions in knee pain levels, as indicated by lower Numeric Pain Rating Scale (NPRS) scores compared to those who underwent only exercises and electrotherapy. Moreover, these participants demonstrated increased levels of magnesium in red blood cells (RBC), suggesting enhanced absorption of magnesium through transdermal application. This dual benefit suggests that combining transdermal magnesium supplementation with conventional therapy may offer a more effective approach for managing knee pain and improving magnesium levels

Introduction

Osteoarthritis (OA) represents a failure of the diarthrodial, synovial-lined joint. In the elderly, osteoarthritis of the knee is the main cause of chronic disability. Due to increased life expectancy and obesity, the prevalence of osteoarthritis in the Indian population is on the rise. Osteoarthritis is age-related and affects more than 80% of people over the age of 55. OA in load-bearing joints is strongly associated with body mass index. As life expectancy increases and obesity rates reach epidemic proportions, OA is becoming more common. Pathogenesis involves an imbalance between normal cartilage derivative and repair mechanisms, resulting in net cartilage loss, bone hypertrophy, and bony growths called osteophytes. OA has a preference for the joints of the fingers, knees, hips, shoulders and spine. Occurrence in an atypical joint such as the elbow can usually be traced to previous trauma, congenital joint abnormality, underlying systemic disease, or chronic crystalline arthropathy. The heterogeneity of OA results from many factors that may contribute to cartilage damage.

Symptomatic knee OA, which is described as pain most days of the month along with radiological signs of arthritis, has a prevalence of 22 to 39% in India.

Osteoarthritis is a chronic disease of the synovial joints, where there is a gradual softening and breakdown of the articular cartilage, accompanied by new growth of cartilage and bone at the edges of the joints, cyst formation and sclerosis in the subchondral areas of the bone, mild synovitis and capsular fibrosis.

Osteoarthritis differs from simple wear and tear in that it is asymmetrically distributed, often associated with abnormal loading rather than frictional wear. It is not an inflammatory disorder, although there are occasional local signs of inflammation. In its most common form, osteoarthritis is not accompanied by any systemic disease.

When treating knee osteoarthritis (OA), a multidisciplinary approach is often necessary for both opinion and treatment. Physiotherapy plays a key role in pain surgery, exercise modalities such as electrotherapy and muscle strengthening exercises specifically acclimated to knee OA. Pharmaceutical surgery may involve targeting NMDA receptors, which play a role in pain signal transmission. Acting as an NMDA receptor antagonist, magnesium represents a unique medium analogous to ketamine and dextromethorphan. Exercise is an integral part of treating knee OA by improving alignment, reducing undue stress on the joint, and increasing blood circulation to speed healing. Exercise also promotes the release of endorphins, the body's natural anodynes, aiding in pain surgery and recovery. Similarly, anti-inflammatory magnesium packs may be beneficial for knee OA, as inflammation is a common factor in painful conditions. Magnesium helps to inhibit the product of pro-inflammatory motes while promoting the effort of anti-inflammatory substances, which contributes to the relief of knee osteoarthritis pain.

Need for Study

Knee osteoarthritis (OA) is a debilitating condition that affects a significant proportion of the elderly population. Current treatment options usually include electrotherapy and exercise therapy to manage pain and improve joint function. However, recent studies have suggested that supplementing this treatment with transdermal magnesium may provide additional benefits in terms of pain reduction and functional improvement. This proposed study aimed to compare the efficacy of electrotherapy alone and exercise therapy combined with transdermal magnesium supplementation in patients with knee OA. The need for this research arises from the interest in alternative and complementary approaches to the management of knee OA, as well as the potential of transdermal magnesium to improve treatment outcomes. By conducting a comparative analysis, we hope to provide valuable insight into optimal management strategies for knee OA and contribute to evidence-based practice in the field. Ultimately, the results of this study can have important implications for improving the quality of life and functional outcomes for people living with knee OA.

Population and sample

The data for this study will be sourced from patients experiencing OA knee pain and visited Sriganaganagar College Of physiotherapy for treatment and from nearby clinics. All adults with Knee OA , aged 30 to 60, were included in the study. Participants were drawn from Sriganaganagar city hospitals, rehabilitation facilities.

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 OA knee pain.

15- Treatment with transdermal application of Magnesium along with exercises and electrotherapy.

15-Treatment with exercises and electrotherapy.

Inclusion Criteria

- Individuals aged between 30 and 50 years.
- Both male and female patients.
- Patients experiencing osteoarthritis (OA) knee pain for more than 6 months.
- Capability to walk on both even and uneven surfaces.
- Patients with independent locomotion (without the use of assistive devices).
- Absence of serious cognitive deficits.
- Ability to comprehend commands.
- Willingness to actively participate in the study.

Exclusion Criteria

- Patients with a history of previous spine surgery.
- Individuals who have received steroid injections within the last six months.
- Patients with a history of pathological conditions such as malignancy, infection, rheumatoid arthritis, or osteomyelitis affecting the musculoskeletal system.
- Presence of pathologies related to muscles, bones, ligaments, etc.
- Patients with a pacemaker.

- Individuals with any skin conditions that may interfere with the study.
- Individuals with a history of epilepsy or seizures.
- Other serious illnesses or neuropsychiatric conditions, including claustrophobia or severe depression.
- Those who have recently experienced systemic or infectious diseases or other health problems.
- A history of drug or alcohol abuse.

Research methodology

Research methodology serves as a comprehensive guide for conducting research, outlining goals, performance, progress tracking, and success criteria. The choice of methodology has a significant impact on the reliability and validity of the study. Provide the overall organizational structure for empirical research, guiding the process of collecting accurate and reliable data. In this study, the participants will be divided into two groups: experimental group A and control group B, both of whom are experiencing knee OA pain. Group A will undergo transdermal application of Mg oil to the affected area and standard physiotherapy, while group B will receive standard physiotherapy only. This randomized controlled trial includes various elements such as study design, study content, sample size, sampling methodology, development of data collection instruments, data collection process, and data analysis strategy. A quantitative research approach was deemed suitable, emphasizing the use of numerical data and statistical analysis to gain insights. This choice aligns with the need for precision and objectivity in examining the phenomenon under study.

Common Treatment Given For Group A and B:

Each patient was given treatment plan that includes four sessions per week for three months, with each session lasting 45 minutes.

Electrotherapy-TENS aims to alleviate discomfort by modulating pain signals and promoting the release of endorphins, the body's natural pain relievers. The electrical stimulation is thought to interrupt pain transmission and provide a degree of analgesia.

High intensity Burst Mode tens was used

Exercise therapy- The exercises targeting the specific needs of osteoarthritis (OA) knee patients, addressing muscles strengthening and pain reduction .

The goal is to strengthen 1) Quadriceps 2) Adductor 3) Hamstrings 4) Gluteus group of muscles

Common exercise Given

- 1) Static Quadriceps strengthening
- 2) Hamstrings strengthening
- 3) Static Adductors Strengthening with Gluteal bridging

Additional support Given to Group A-

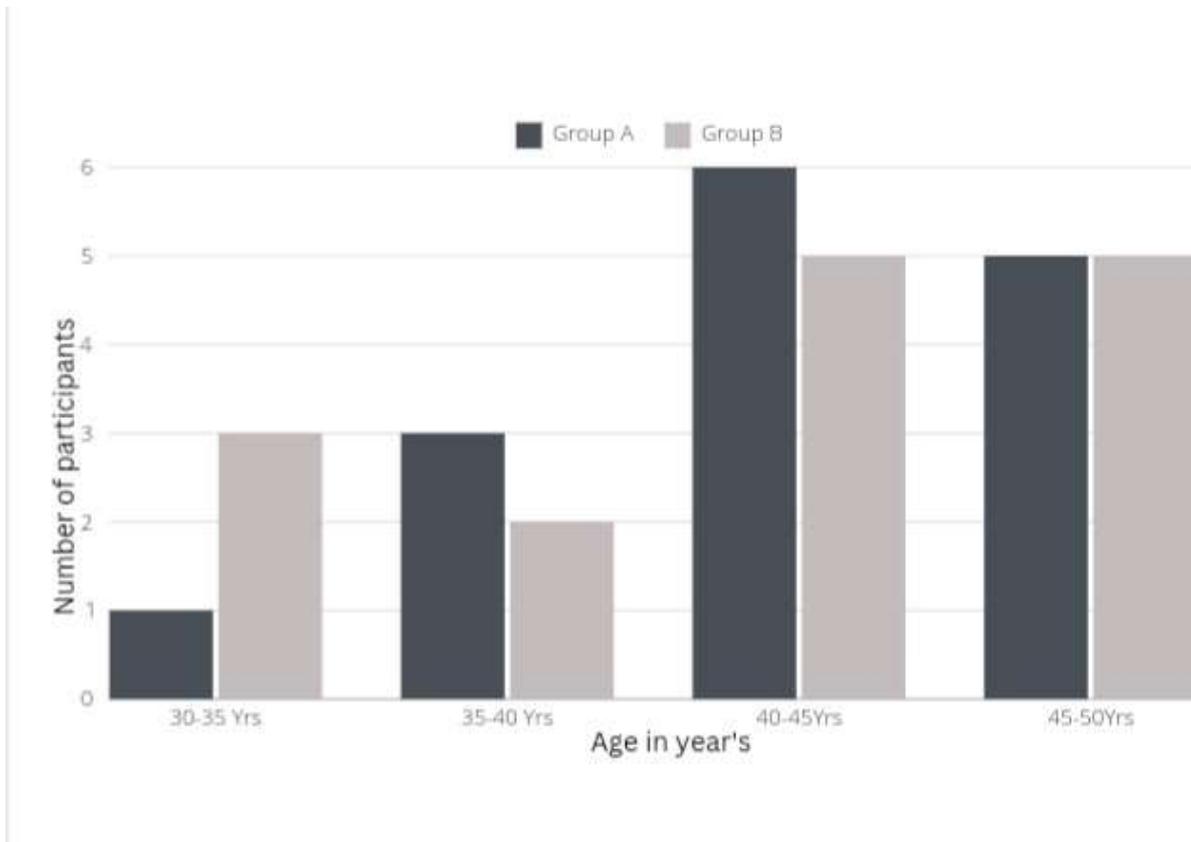
Magnesium: Many people use magnesium supplements for health or to improve their diet. Treatment of magnesium deficiency with oral magnesium supplements has been shown to be beneficial. In addition, a recent meta-analysis found a dose-dependent response of magnesium supplementation to blood pressure, with a daily intake of 370 mg of magnesium showing greater benefit than lower doses. A growing body of research has been published in the medical and popular media and on the Internet promoting transdermal magnesium as an effective and preferable alternative to oral magnesium. All cells in the body are bathed in magnesium, so transdermal magnesium administration seems to be the best way to restore depleted magnesium stores. It enters the tissues through the skin and is quickly distributed to all cells of the body.

Transdermal absorption of magnesium is superior to oral administration due to complete absorption and reduced side effects due to gastrointestinal transit.

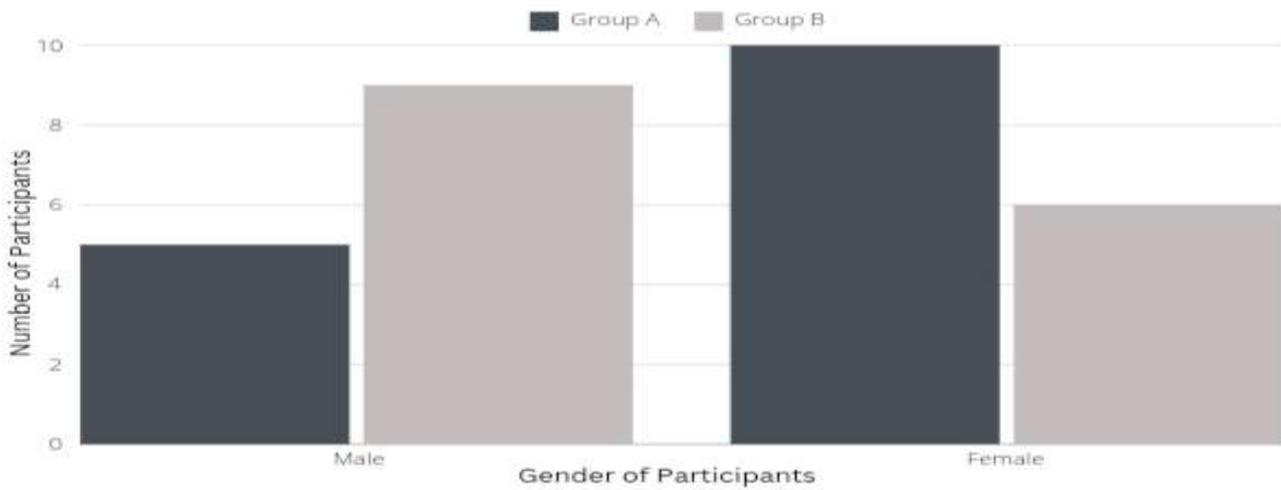
Dosage: 15-20 sprays of DR MG + magnesium oil / day to the affected area (transdermal) for 6 months.

Results –

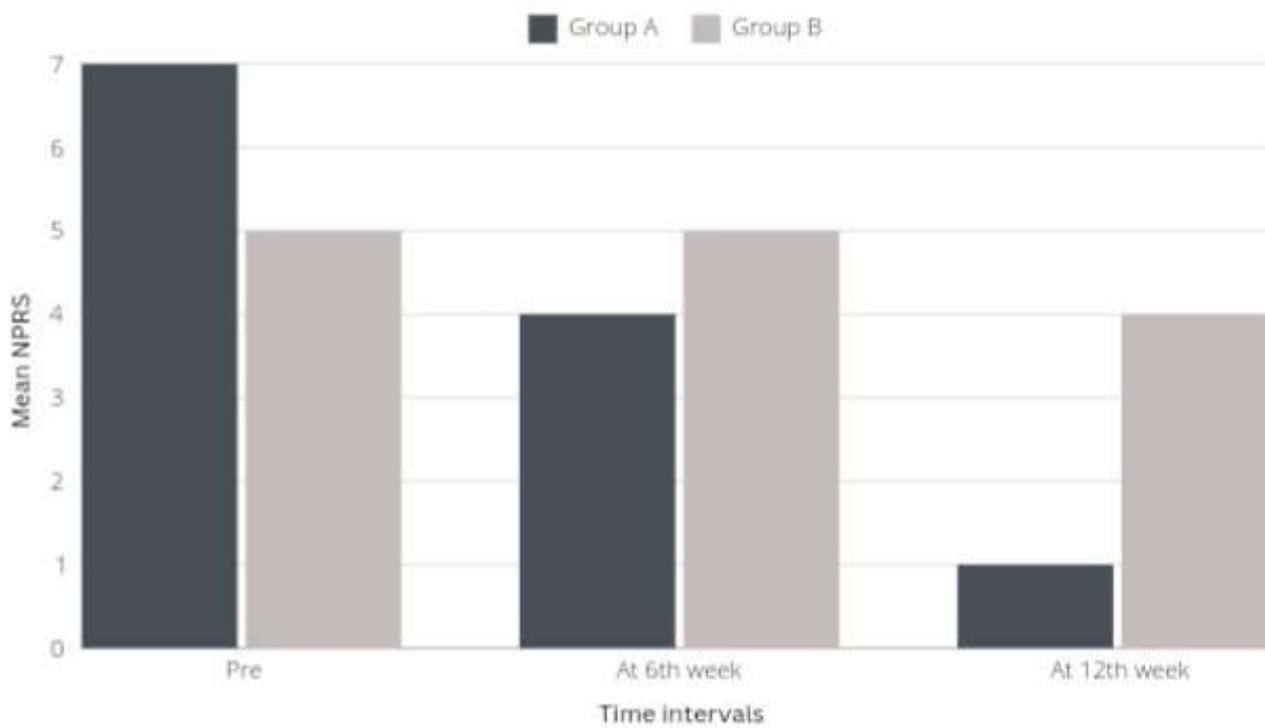
Demographic characteristics of study population



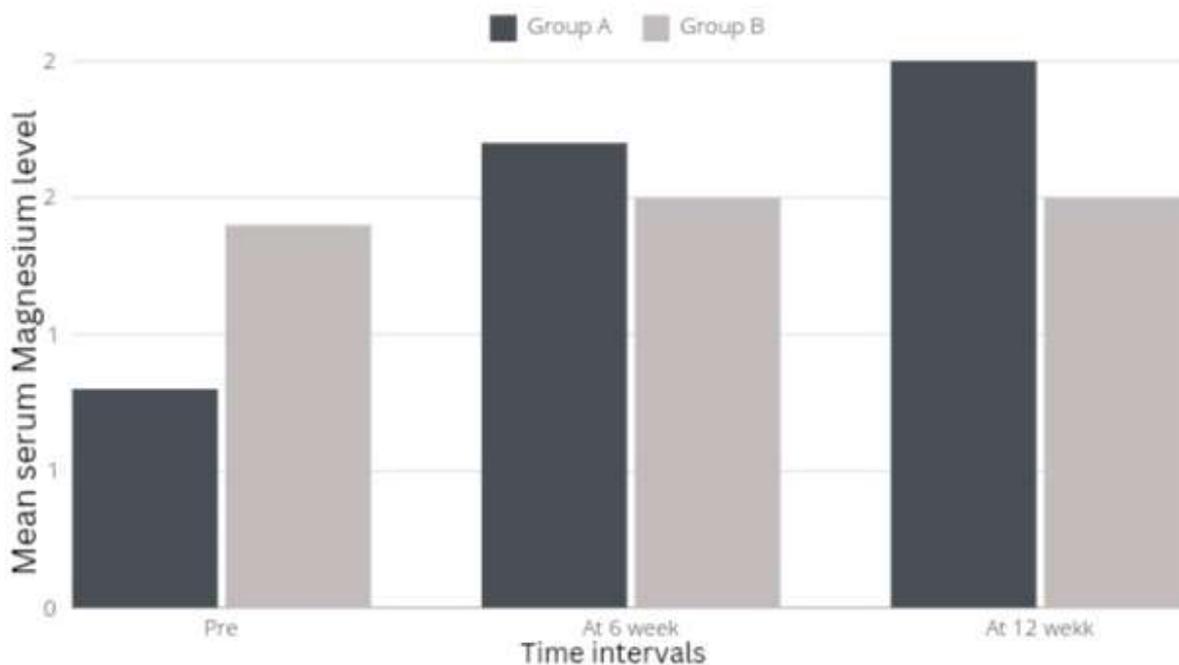
Graph 1 – Comparison of group A and B by age



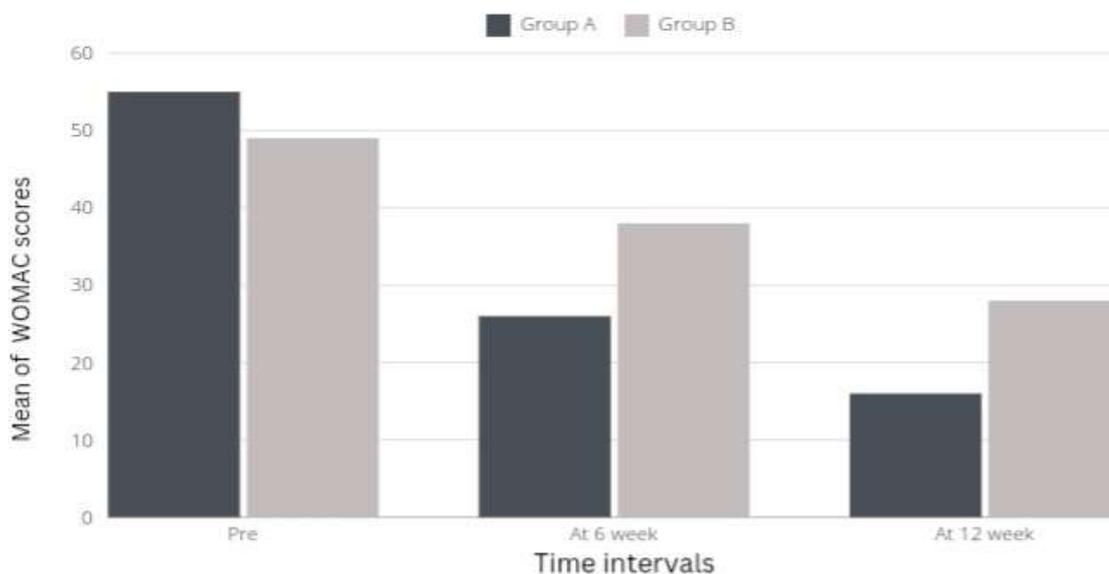
Graph 2 – Comparison of Group A and B by Gender



Graph 3- Comparison of Group A and B By NPRS at Pre , 6 week and 12th week



Graph 4 – Comparison of Group A and Group B By mean serum magnesium level at Pre ,6th week and 12th week



Graph 5 – Comparison of Group A and Group B by mean WOMAC score at Pre, 6th week and 12th week

Discussion

Treating OA knee pain is complicated by the many different rehabilitation approaches available and requires a physician’s guidance to determine the most appropriate program. The three main categories of treatment are symptomatic, motor control, and functional. Symptomatic OA knee pain involves resolution of specific symptoms in new or recurring episodes.

For patients who experience moderate discomfort and disability with controlled movement, a functional approach is used to reduce functional deficits. Given the various classification systems for OA knee pain, each with advantages and limitations, choosing the most effective treatment program can be complicated.

Tertiary prevention in the treatment of knee OA pain aims to reduce the adverse effects of pain, disability, and loss of work. The main goal is to treat pain, restore function, prevent future disorders, support work and productivity, and prevent sequelae in acute cases. The diverse population of OA knee pain complicates the development of a universal rehabilitation paradigm applicable to all or most of the population.

Magnesium sulfate (MgSO₄) and magnesium citrate (C₆H₆MgO₇) are commonly used to manage osteoarthritis (OA) knee pain due to their analgesic and muscle relaxant effects. This effect is due to its ability to inhibit the release of presynaptic acetylcholine in sympathetic and neurovascular synapses. In addition, MgSO₄ solution can be a minimally invasive pain reliever, showing antinociceptive effects in central and visceral pain tests. Historically, MgSO₄ was given orally or intravenously for pain relief, especially in people experiencing myogenic pain associated with OA knee problems.

A total of 30 subjects-15 in each group-participated in the current study, divided into two groups. The experimental group (group A) received standard physiotherapy management, which is exercise and electrotherapy and transdermal application of magnesium oil, while the control group (group B) received standard physiotherapy management, which is only exercise and electrotherapy.

A total of 19 men and 11 women were included in this study, divided into 30-35, 35-40, 40-45, 45-50 age groups, 4, 5, 11 and 10 patients respectively.

In group A, there were 1,3,6,5 patients in four age categories (30-35, 35-40,40-45 and 45-50), 10 men and 5 women in group A. Conversely, group B had 9 men and 6 women with 9, 2, 5 and 5 patients in each age group (30-35, 35-40, 40-45 and 45-50), respectively. The effect of therapy program on NPRS pain, Western Ontario and McMaster University osteoarthritis index (WOMAC) and serum magnesium level (day 0), post-intervention-1 and intervention-2 in two groups.

NPRS pain intensity (day 0), post-intervention-1 and post-intervention-2 and pain scores at different intervals of group A were 7, 4 and 1, respectively.

The NPRS was used to assess pain severity at three separate time points: baseline (day 0), post-intervention, and post-intervention-2. The mean pain scores for group B were 5, 5, and 4, respectively.

Blood samples were recorded at baseline (day 0) and after intervention -1 and at different intervals for groups A and B after the intervention, 0.8, 1.7, 2 and 1.4 for group A, 1 and 5 and 1.5 for group B.

The value of RBC Mg in three different ranges in group A. On Day 0, Post 1, and Post 2, the average score of group A was 0.8, 1.7, and 2, respectively. Group B had three different intervals. The average score of Group B in the articles 0, 1, and 2 was 1.4, 1.5, and 1.5, respectively. WOMAC scores were divided into three different ranges in group A. On Day 0, Post 1, and Post 2, Group A scored 55, 26, and 16, respectively, while Group B had three different WOMAC scores. The average scores of Group B in Papers 0, 1, and 2 were 49, 38, and 28 respectively.

Conclusion

In conclusion, the findings of this study suggest that incorporating transdermal magnesium supplementation alongside conventional therapy provides significant benefits for individuals with OA knee pain. The observed reductions in knee pain

levels, as indicated by lower NPRS scores, and the increased levels of magnesium in red blood cells (RBC) emphasize the effectiveness of transdermal magnesium supplementation in enhancing pain management and magnesium absorption. These results highlight the potential of combining transdermal magnesium supplementation with conventional therapy as a comprehensive approach for improving outcomes in individuals with OA knee pain. Further research is needed to validate these findings and elucidate the mechanisms underlying the observed effects.

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