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Comparison of Two Effective Advance Physiotherapy Intervention Protocol in Unilateral Knee Osteoarthritis

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ABSTRACT

Osteoarthritis (OA), one of the top five most incapacitating conditions that affects more than one third of those over 65, is a degenerative joint disease characterised by joint inflammation and a reparative bone response. OA is a complete joint disease that affects joint ligaments, cartilage, menisci, and muscles that are connected to the joints due to various pathophysiological processes. It is essential to develop a treatment plan that take into account the physiology of degenerative joint disease, but it should also take into account the demands of the various age groups and populations.

The multi structural physical, physiological and functional deficits caused by the disease call for the development of physiotherapy. The current study's goal is to assess the effectiveness of progressive resistance exercises, passive stretching exercises, soft tissue manipulation (MET), Maitland mobilisation, aerobic exercises, Tai chi, strength training, balneotherapy and aquatic therapy that are planned, therapist supervised and patient educated.

A convenience sample size of 100 was used for the initial investigation. The samples were divided into two study groups at random. BATS were the first interventional group, while PEPSMAN was the second. The interventional group's treatment plan included a physiotherapy routine that was monitored by a therapist.

The visual analogue scale, the modified WOMAC scale, the time up and go test, the functional reach test, the 40 meter fast paced walk test, the stair climbing test and the 30 second chair stand test were the outcome variables examined.

The majority of analysed end measures showed a significant improvement in the PEPSMAN interventional groups and as a result, the planned supervised physiotherapy protocol was determined to be effective in treating the many physiological deficits linked to the whole joint illness.

Anemia is a major public health problem affecting both the developed as well as the developing countries. According to World Health Organization (WHO), prevalence of anaemia among pregnant women is 56% in the developing world. India has the highest prevalence of anaemia and 20% of total maternal deaths are due to anemia. According to NFHS-5 data the prevalence of anemia in rural area of Bihar is 63.9%.

Keywords: Maitland mobilisation, Progressive resistance exercise, Passive stretching exercise, Soft tissue manipulation, Balneotherapy, Muscle Energy Technique (MET), Knee OA (osteoarthritis), PEPSMAN (Patient

Education, Progressive Resistance Exercise, Muscle Energy Technique). BATS stands for balneotherapy, Aqua exercise, Tai chi, Strength training

INTRODUCTION

The most prevalent articular illness, osteoarthritis, is projected to rank as the fourth most common cause of disability globally [1]. However, of the entire disease burden, the knee joint accounts for 83% of the disease burden in the majority of cases. Osteoarthritis of the knee joint has been shown to have considerable detrimental effects on quality of life, morbidity and mortality, as well as the economic situation of the affected population [2,3]. A global prevalence of 16% was recorded in the population aged 15 and older in 2020 and 22.9% of the population (654.1 million people) was 40 and older [4]. According to reports, 17%–61% of people in India over the age of 50 have osteoarthritis of the knee joint [5]. The two most prominent issues that lead to mobility impairments, difficulties carrying out everyday tasks, and a poor quality of life in people with osteoarthritis of the knee joint are pain and reduced function [6]. The patients also had decreased proprioception, which can affect a person's postural stability and increase their risk of falling [7-10].

Numerous researches have offered numerous techniques, but none of them take a comprehensive approach [11,12]. In one of the investigations, the population with knee osteoarthritis may have had symptom relief and an improvement in functional status with exercise therapy alone [13,14]. Exercises for strengthening and cardio fitness were advised by the National Institute for Health and Care Excellence (NICE) [15]. The Osteoarthritis Research Society International (OARSI) recommended several different types of land based structured exercise programmes, including balance, neuromuscular training, strengthening, cardio and secondly, mind-body activities [16]. Resistance workouts or aquatic aerobics were recommended by the American College of Rheumatology (ACR) [17]. For the treatment of knee joints, the Ottawa panel recommended mind-body activities, aerobic exercises and strengthening exercises with or without aerobic workouts [18-20]. The EULAR advocated intensifying exercise and activity in general.

The goal of the current study is to offer patients with knee osteoarthritis an integrated physical therapy protocol that takes a comprehensive approach to managing physical and physiological deficits related to the various structures of the affected knee joint. The method we describe in this study is not only effective at preventing osteoarthritis, but it is also affordable and widely accessible to the general public.

MATERIALS AND METHODS

Study design

The preliminary investigation, which included analysis according to protocol, included a convenience sample of 100 participants who were randomly assigned to the first interventional group (n=50) and the second interventional group (n=50) of two interventional groups. The names of all sixty participants were written on identical, well shuffled chits, which were maintained in a jar to randomly assign participants to the first and second interventional groups. A person who was not involved in the study was requested to take one chit at a time out of the jar and place it into one or two bowls that were designated as the interventional groups, respectively. The Rama university in Kanpur, India approved the study and ensured that the two study groups were homogeneous. Before participating in the study, participants' patients provided written informed consent.

Participants

Patients with knee osteoarthritis who were referred to Rama university's rehabilitation centre in Kanpur made up the patient sample pool. The 45–60 age range that was included. patients with a history of ligament and/or meniscal damage at the level of the knee joint, a recent fracture, cancer, another systemic disease, metabolic disease, infectious disease, or a history of neuromuscular disease. pregnant or nursing women, patients who had knee joint replacement surgery within the previous six months, or those who had received intra articular injections of corticosteroids at the level of the knee joint, as well as those with known cases of enclosing spondylitis, rheumatoid arthritis, osteomalacia or paget's diseases participants with a BMI of 35 or above and subjects with osteoarthritis

worse than grade 2. Patients enrolled in or about to begin any other structured lower limb strengthening programme, including those without a formal structure, were all eliminated.

Interventions

The first interventional group's participants received the BATS physiotherapy programme, which includes balanotherapy, water treatment, tai chi and strength training. The second interventional group underwent a therapist supervised PEPSMAN physiotherapy protocol that included four sessions per week for six weeks of patient education, resistance training, passive stretching exercises, soft tissue manipulation, Maitland mobilisation, aerobic exercise and neuromuscular training.

Throughout the whole study period, the patients' education sessions were held once a week, for a total of four sessions. Each educational session was organised in such a way that the subsequent session was a progression of the previous one. Each one on one session lasted for an hour and a half. The meetings were held in a quiet, pleasant setting that was well ventilated and free from outside distraction. The initial session's objectives were to inform the patient thoroughly about the sickness, comprehend his or her beliefs on the ailment and assess the patient's health. In the first session, everything was explained in detail in terms that laypeople could understand, including what knee osteoarthritis is, its causes, related articular and periarticular changes, the need for treatment, the significance of precautions, the value of physiotherapy, and the function of our protocol. The second session's objectives were to encourage the patient and address any erroneous expectations, bad experiences and misperceptions (Table 1 and Figure 1).

Table 1 The patients' education sessions

Weeks	**Pepsman group**	**Bats group**
From 1 week to 2 weeks	Patient education, progressive resistance exercises.	Patient education, strength training.
From 3 weeks to 4 weeks	Passive stretching exercises, soft tissue manipulation.	Aquatic therapy.
From 4 weeks to 5 weeks	Muscle energy technique, maitland mobilization.	Tai chi training.
From 5 weeks to 6 weeks	Aerobic exercise, neuromuscular training.	Balneotherapy.

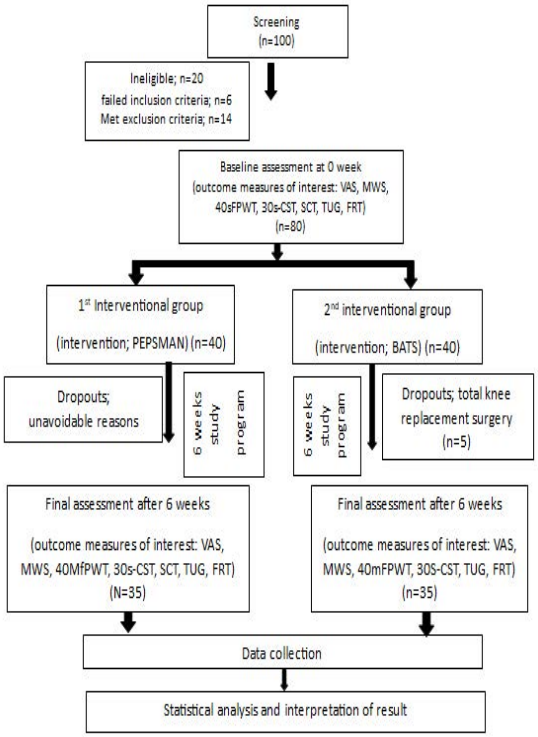

Figure 1 Protocol.

Outcomes

Pain intensity was one of the primary outcome measures evaluated. It was measured using the Visual Analogue Scale (VAS), which is a straight line that describes the limits of pain, or the two extremes of pain no pain at all and the worst suffering are represented by the two ends of the line. The patient was asked to record the perceived pain level on the scale during the pre-test and post-test evaluation in order to account for the subjective nature of the pain. The difference between the two points on the scale that were reported by a person at two distinct times represented the actual variance in pain intensity.

In order to evaluate functional mobility, quality of life, and activities of daily living, the modified Western Ontario and McMaster University (WOMAC) osteoarthritis index was used.

During the pre-test and post-test evaluation phases, the participants received the index and were asked to report it as appropriate.

To evaluate the participants' dynamic steady state balance throughout the pre-test and post-test periods, the Timed Up and Go test (TUG) was administered. To do this, it was timed how long it took the subject to stand up from a chair without armrests, walk five metres at a speed of his or her choosing and then come back and sit down on the chair.

The objective of the Functional Reach Test (FRT) was to evaluate dynamic steady state balance. The third metacarpal's initial position was marked on the participants after asking them to stand with their arms outstretched and fists made. The participants were then instructed to lean forward from the starting position without shifting their base of support until they reached the final position of maximum forward reach. For the aim of the assessment, the distance between the third metacarpal's knuckle's starting and final positions was measured.

The 40 metre Fast Paced Walk Test (40 m FPWT) was used to measure participants' ability to walk quickly over short distances, their ability to change directions while walking and their speed while walking quickly. The participants were instructed to move swiftly and safely along a ten-meter pathway. At the end of the pathway, which was marked by a cone, participants were required to turn around and head back to the starting point, which was marked by another cone. This activity was repeated until the participants had successfully covered a forty-meter walkway without running. To gauge the pace of the walk, the amount of time from start to finish was recorded.

The Stair Climb Test (SCT) evaluates a person's ability to climb or descend steps while simultaneously measuring the lower body's strength and balance. The participants were instructed to quickly and safely climb a flight of stairs with nine steps and an eight inch step height at each, then turn and descend back to the ground, during the pre-test and post-test measurement periods. Timing was taken from the starting position (both feet on the ground) to the ending position (both feet back on the ground).

The 30 second Chair Stand Test (30-s-CST) was used to evaluate the lower body's dynamic balance and strength while emphasising the subject's sit to stand action. The participants were instructed to cross their arms over their chest while sitting on a chair that was 17 inches high (seat height); with their knees bent at a 90 degree angle and their feet flat on the ground at shoulder width apart. The number of times the participants stood up and sat down during the thirty second exercise was recorded. The measurement was done both before and after the test.

Both clinically and statistically, PT has been proven to be significant. At 4 and 8 weeks, the treatment group demonstrated improvements in 6 min walk distance and WOMAC score, whereas the placebo group did not. Less discomfort, less joint stiffness, improved quality of life, and stronger hip muscles were the outcomes of these therapies. Approximately 72% and 75% of participants, *vs.* only 17% (each) of control participants, reported improvements in pain and function, respectively.

RESULTS

Out of 80 samples recruited in the preliminary study, five patients from the 2nd interventional (BATS) group dropped out for a total knee replacement procedure during the study, the 1st interventional groups experienced five dropouts due to unavoidable reasons, hence a total 35 samples in each 1st interventional group and 2nd interventional group completed the program. The characteristics of the samples are described in the exercises in 1st interventional group (PEPSMAN) physiotherapy protocol, consisting of patient education, progressive resistance exercise, passive stretching exercises and soft tissue manipulation, muscle energy technique, and maitland mobilization, aerobic exercises, and neuromuscular training. The second interventional (BATS) group are described the physiotherapy protocol balneotherapy, aquatic, Tai chi and strength training exercises.

The overall significance for the chosen factor *i.e.,* PEPSMAN and BATS, in the test of between sample effect and pairwise comparison was found to treatment. The administered interventional protocol consisting of a combination of exercise therapy and manual therapy is found significantly effective in the management of knee osteoarthritis patients, however in case of the stair climb and functional reach test,

The main data is adjusted for health, the 1st interventional group pre; and 1st interventional group post treatment. 2nd interventional pre; and 2nd interventional post treatment. The $p<0.001$ and $p<0.01$ is denoted. N=non-significant.

DISCUSSION

A preliminary study is being conducted to assess the therapeutic potential of the therapist supervised PEPSMAN physiotherapy regimen in a population of Indians with knee osteoarthritis to reduce pain and enhance static balance, dynamic balance and physical function. Functional abilities and hence, impairment. Evidence suggests that patient education is crucial in chronic illnesses like osteoarthritis, where patients first struggled to survive in a small space that discouraged them from engaging in healthy social contacts. Disturbances in mental and physical health may be influenced by disturbed social wellbeing. Recent research has backed the use of appropriate patient education to aid in better illness management. Exercise treatment is a well-researched and widely used therapeutic approach to treat knee osteoarthritis, but little research has been done to examine the therapeutic potential of manual therapy both alone and in combination with exercise therapy.

Patients with knee osteoarthritis were found to benefit significantly from an administered, designed, and therapist-supervised PEPSMAN physiotherapy protocol, which combines patient education, exercise therapy, and manual therapy. This protocol was found to have a significant therapeutic role in improving static balance, dynamic balance, pain, physical functional performance, and disability. The intervention data of the samples, which were acquired after four weeks, clearly show the outcome.

It is well known that ageing, which is a common cause of osteoarthritis, causes cell senescence, altered apoptosis, mitochondrial dysfunction, oxidative stress and homeostatic dysfunction over time. As a result, the connective tissues that make up joints become stiff, fragile and dehydrated. A delayed favourable response to the treatment in

the older age group, compared to the younger ones, may be due to the continuum of harmful alterations brought on by ageing.

An evaluation of balance is the functional reach test. Although the outcome measure of balance is frequently used in situations with lower limb deficits, the ability to maintain balance is a combined function of the lower limb and trunk stabilisers. Despite the fact that both groups experienced pain alleviation, the difference in pain between the two groups was not very noticeable. Separately, manual treatment and exercise therapy both showed promise in assisting with the disease's symptom reduction. Being a chronic ailment, knee osteoarthritis incorporates a psychological aspect of pain. The presented non-significant difference between the two groups, examined at the end of the trial, may be due to subjective belief and satisfaction.

In comparison to the BATS group, the intervention group's static and dynamic balance dramatically improved. Muscle strength, flexibility, conditioning and joint proprioception were among the parameters that were to be improved through the physiotherapeutic exercises and therapy given to the intervention group; as a result, it is possible that the improvement in these parameters led to an improvement in the samples' relative balance.

CONCLUSION

As described in the research, individuals with knee OA frequently combine a non-pharmacological exercise and therapy routine with pharmacological treatment options to achieve better results. Despite the therapeutic options available, a number of deficiencies continue to exist, making cost containment a serious concern. Approximately half of all OA patients undergoing physiotherapy are still using subpar diagnostic techniques, recommendations, and treatment modalities that lack proof of benefit (including massage, traction, and stretching).

Given that there are now no adequate and effective treatment regimens, this presents a serious healthcare challenge for persons who have OA related issues. As can be shown above with only one ailment, the future demands for healthcare vastly exceed the current ways of approach. Therefore, in order to define the diagnostic processes, assessments, treatment modalities and evaluations required for a future programme that is more cost and treatment effective, higher standards of quality research will be essential.

LIMITATIONS

In this study paced dropouts as was unable to follow up. The sample size and duration of the study is also reducing.

RECOMMENDATIONS

For Further study with a similar approach will be conducted with more advance techniques on a large sample size with increase study duration.

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