JOURNAL OF CLINICAL AND BIOMEDICAL SCIENCES

RESEARCH ARTICLE

OPEN ACCESS

Received: 04.09.2024
Accepted: 04.11.2024
Published: 20.12.2024

Citation: Sharma M, Chauhan N, Kumari M, Verma P, Pradhan DK. Effectiveness of Manual Soft Tissue Mobilization vs Mechanical Therapy on Postpartum Knee Joint Pain and Function: A Randomized Trial. J Clin Biomed Sci 2024; 14(4): 143-147. https://doi.org/10.58739/jcbs/v14i4.128

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Funding: None

Competing Interests: None

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Published By Sri Devaraj Urs Academy of Higher Education, Kolar, Karnataka

ISSN
Print: 2231-4180
Electronic: 2319-2453

Effectiveness of Manual Soft Tissue Mobilization vs Mechanical Therapy on Postpartum Knee Joint Pain and Function: A Randomized Trial

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Abstract

Background: Postpartum knee joint pain is a prevalent issue among women, often exacerbated by physiological changes during and after pregnancy. Research indicates that knee pain affects many postpartum females, with various contributing factors. Research indicates that lower extremity pain, including knee pain, often begins during the second and third trimesters of pregnancy, suggesting biomechanical factors play a significant role. Soft tissue mobilization therapy and mechanical or electrotherapy both have proven to be beneficial in improving pain and function. **Objective:** Hence the study aimed to compare the effect of soft tissue mobilization and mechanical therapy on postpartum knee pain and function. **Materials & Methods:** The study included 60 postpartum women (30 in each group). Both the group participants received 8 weeks of treatment as per the protocol following the random allocation. **Results:** The result revealed that both the mechanical therapy and soft tissue mobilization have significantly improved knee outcomes (KOOS) following the intervention ($p < 0.05$). however, the manual therapy treatment was superior to the mechanical therapy in terms of improving pain and function. **Conclusion:** The study concludes that manual therapy treatments can be chosen over mechanical treatments to improve knee joint function among postpartum women.

Keywords: Knee Joint; Musculoskeletal; Pain; Postpartum

1 Introduction

A postpartum phase begins shortly after birth and lasts around one and a half months. Women's bodies alter dramatically during pregnancy. As a result of these changes, both joints experience tension and sagging support structures caused by the actions of the relaxing hormone. Together with the physiological

transformation, the postpartum phase is marked by emotional and psychosocial changes. As a result, a mother may have several physical difficulties that may impact her infant's health[1]. Knee pain can develop during pregnancy due to several changes that occur during the pregnancy. In pregnancy, there is an average weight gain of 0.29 kilograms per week in the lower trunk, which may be one of the most significant factors. Age increases the prevalence of knee pain, but it can occur at any age. Known risk factors for knee pain include genetic predisposition, female gender, advanced age, traumatic injury, obesity, and muscle weakness[2]. During pregnancy, knee pain, including patellofemoral disorders, is not uncommon. In motor activities, the part of the body most commonly affected by knee pain is exposed to high-shear forces[3]. Changes in posture, weight gain, and lax ligaments can cause knee pain. Four months after delivery, knee pain symptoms have improved. The Patellofemoral disease causes back pain across the patella, especially when seated for long periods[4]. Several factors contribute to this, including the increased weight of the foetus and placenta and hormonal changes that alter ligament laxity[5]. A unique sense of anticipation and transformation characterizes the postpartum period. It is typical for triathletes to undergo a range of alterations in their lifestyle, as well as physiological and physical adjustments[6]. In both genders, obesity and poor biomechanics increase the risk of knee osteoarthritis[7]. Knee pain is prevalent among pregnant and postpartum populations. Biomechanical factors are deemed to play a more significant role compared to hormonal influences. Notably, regular exercise does not significantly contribute to either protection or vulnerability to lower extremity discomfort during pregnancy[8]. Several research investigations revealed that pregnant females frequently experienced pronounced knee dysfunction linked to intensified levels of physical activity, comparatively young age, augmented body mass index[9], and a previous medical history of knee complications[10]. It may carry out to the postpartum hence our objective was to evaluate the effectiveness of Manual Therapy and Electrotherapy in treating postpartum knee joint pain in women by comparing their effects and differences. Both therapies have different mechanisms of action and there is a need to investigate the effect. The manual soft tissue release technique creates localized microtrauma, stimulating an inflammatory response that promotes healing and tissue remodelling. Additionally, it facilitates the mobilization of fascia, which can alleviate restrictions contributing to knee pain. The mechanical electrotherapy modalities help to modulate pain perception and promote healing. Electrotherapy can stimulate the release of endorphins and other neurotransmitters, which help in reducing pain perception and it can enhance cellular metabolism and regeneration, aiding in the recovery of damaged tissues as well.

The study aimed to compare the effectiveness of manual soft tissue release vs mechanical electrotherapy modalities in improving the pain and ADL outcomes among postpartum knee pain individuals.

2 Materials and Methods

2.1 Participants

Women with knee joint pain following pregnancy or postpartum were recruited from a physiotherapy facility, contacted, evaluated disease status, and informed about the objective and experimental procedures of the study. A total of sixty patients (n = 60) were recruited for the study using a convenient sampling method. Patients with cardiovascular disease, pulmonary disease, endocrinology disease, osteoporosis, and osteoarthritis were excluded from the study. Inclusion criteria included females experiencing knee joint pain after pregnancy or within 4-6 weeks of postpartum duration, aged between 22-40 years of age, free of other lower limb diseases, capable of performing physical exercise, and not currently receiving physical therapy treatments for the knee or other medications. The participants are divided into two groups, based on the block randomization method either to manual soft tissue therapy or to the mechanical therapy group.

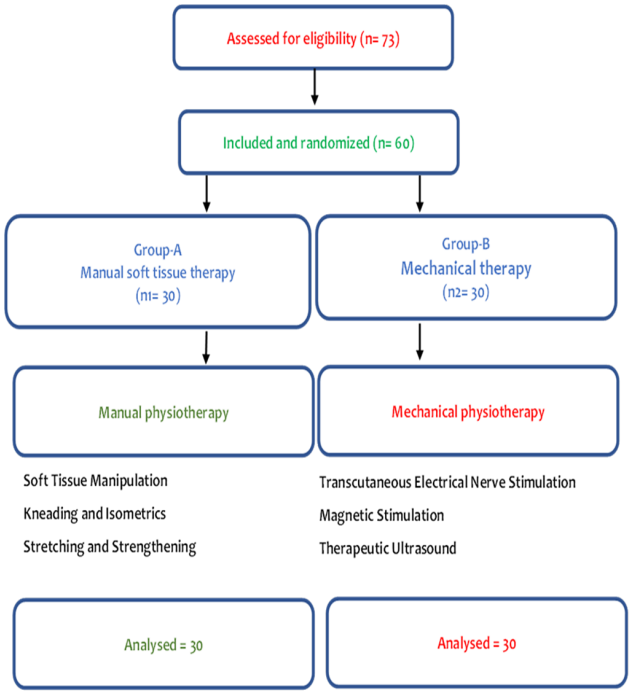

Fig 1. A flowchart illustrating the study design. The consort flow diagram

2.2 Outcome measures

2.2.1 ***Knee Injury and Osteoarthritis Outcome Score (KOOS)***

KOOS is a self-reported questionnaire consisted of 42 questions in total addressing five patient-related domains including pain (9 questions), other disease-specific symptoms (7 questions), activity of daily living (ADL) (17 questions), sport and recreation function (5 questions), and knee-related quality of life (4 questions). All items were evaluated by five-point Likert scale. Total score changes between 0 and 100. Higher scores indicate better function. It takes 5–10 min to fill in all questions.

2.2.2 ***Experimental design***

In the study's first phase, demographic details were collected, followed by a basal medical and physical examination. In the second phase, knee function was evaluated using the knee outcome survey (ADLS). The questionnaire consists of 14 items assessing symptoms and specific functional limitations. Additionally, each symptom or functional limitation is rated according to its severity. Six items were used to evaluate knee symptoms (pain, stiffness, swelling, instability, weakness, limping), and eight items were used to evaluate functional limitations (walking, stair climbing, standing, kneeling, squatting, sitting, rising from a sitting position) experienced during daily activities during the past 1-2 days. Each item has six Likert scales ranging from 0 to 5 points. Based on the KOSADLS score, a 0–100-point scale is used, with 100 representing no symptoms or functional limitations. In the third phase, Group A (n1 = 30) was subjected to manual therapy techniques such as soft tissue manipulation, kneading, isometric, stretching, and strengthening exercises. Group B (n2 = 30) was subjected to mechanical therapy, such as transcutaneous electrical nerve stimulation, magnetic stimulation, and therapeutic ultrasound, and evaluated post-intervention. Subsequent to the Declaration of Helsinki, the Ethical Committee for Human Research at Galgotias University granted approval for all investigational procedures, and all subjects furnished written assent prior to participation.

2.3 Modes of Physiotherapy Treatment

The participants in the manual soft tissue therapy had undergone Soft tissue manipulation lasts fifteen minutes, Kneading is ten minutes, isometrics are fifteen repetitions with a ten-second hold, and stretching and strengthening exercises are fifteen repetitions with a ten-second hold. Stretching and strengthening exercises help to increase the range of motion and build strength, the total duration of the treatment were 5 days a week for 8 weeks, a total of 40 sessions, and each session lasted for 15-20 minutes. In the mechanical therapy group A 15 -20 minute session of Transcutaneous Electrical Nerve Stimulation, Magnetic Stimulation, and Therapeutic Ultrasound was given in each session as in the other group.

2.4 Statistical analysis

The statistical tests witnessed in this study were performed employing SPSS version 21 for Windows software. The quantitative data were depicted in terms of mean and standard deviation (SD), whereas the qualitative data were represented through frequency and percentage (%) in a manner consistent with the conventions of academic writing. To facilitate a comparison of data derived from pre- and post- manual physiotherapy and pre- and post-mechanical physiotherapy, an analytical technique of paired-sample t-test was employed. A statistical unpaired-sample t-test was employed to discern and compare the efficacy of post-manual and mechanical physiotherapy among the patient groups. Statistical significance was determined by means of a p-value that was less than 0.05.

3 Results

Seventy-three subjects were enrolled; upon screening based on the eligibility criteria, only sixty members were included in the study. The mean age of the subjects in the study was 28.5 ± 2.1, Group - A mean 28.5 ± 2.1, and Group - B mean 27.2 ± 2.1, respectively (Table 1).

The result of the study revealed that the subscales of KOOS pain, symptoms, and ADL have significantly improved in both groups ($p < 0.05$) (Table 2). however, in between group analyses, it is found that group A had greater significant improvements ($p < 0.05$) in all three sub-scales pain (12.56), symptom (12.8) and ADL (11.6) than group B. on comparing the sub-scales the KOOS- symptom showed greater differences between the group (effect size- 0.81) relatively to KOOS-pain (effect size- 0.73), and KOOS- ADL (effect size- 0.70) (Table 3). A statistically significant difference exists in postpartum knee joint pain, symptoms, and ADL ($P < 0.05$). This means that manual physiotherapy is more efficient and effective than mechanical physiotherapy.

Table 1. Mean Age of subjects

Group	(n =60)	Mean	SD
Group -A	30	28.5	2.1
Group- B	30	27.2	2.0

Table 1 indicates the mean age of participants involved in manual physiotherapy and mechanical physiotherapy in this study.

Table 2 indicates the KOAS Score of participants involved in manual physiotherapy and mechanical physiotherapy in this study.

Table 3 indicates the KOAS Score of post-therapy in manual physiotherapy and mechanical physiotherapy groups.

Table 2. KOSS Score in pre- and post-treatment subjects

Outcomes		Group-A		Group-B	
		Mean (SD)	P-Value	Mean (SD)	P-Value
Pain	Pre	83.56 (6.15)	<0.05	83.46 (5.50)	<0.05
	Post	96.13(4.71)		93.36 (6.20)	
Symptom	Pre	81.33 (5.96)	<0.05	83.30 (6.53)	<0.05
	Post	94.13 (5.61)		93.46 (5.34)	
ADL	Pre	83.73 (6.18)	<0.05	82.26 (4.60)	<0.05
	Post	95.33 (4.09)		91.26 (5.16)	

Table 3. KOAS Score of post-therapy in manual and mechanical physiotherapy groups

	Mean Difference	Cohen's Defect Size	P-Value
Pain	2.66	0.73	0.006
Symptom	2.63	0.81	0.003
ADL	2.6	0.7	0.009

4 Discussion

In 2021, Stein BP discovered that anterior laxity increased only in the frontal plane during the second trimester and vice versa. As a result of pregnancy, the foot undergoes structural changes, including a decrease in arch height and an increase in foot length and arch drop. Structural changes can influence changes in lower limb biomechanics in the foot and knee ligaments.[11] Ericsson YB(2021) investigated the relationship between thigh muscle strength and knee pain in young women. The Spearman correlation was also used to estimate the relationship between body composition, muscle strength, knee pain, and physical activity. Weight-adjusted thigh muscular strength was lower in obese women than in normal-weight women ($p \leq 0.001$)[12]. In 2018, Zhou M conducted a cross-sectional study to investigate the impact of hormonal, reproductive, and obesity factors on the incidence of knee osteoarthritis in females of Chinese ethnicity. The research comprised a cohort of 7510 female participants with a mean age of 62.6 $\pm$ 8.6 years. The manifestation of obesity can potentially amplify the influence of reproductive and hormonal factors on Knee Osteoarthritis (KOA). Several independent risk factors have been identified for knee osteoarthritis (KOA), including but not limited to having multiple pregnancies, utilizing oral contraceptives, and engaging in hormone therapy (HT). Obesity and oral contraceptives are associated with knee discomfort[13]. As a component of the research endeavour, Jafarian conducted an assessment of the efficacy of a more extensive lumbar support intervention as a prompt rehabilitative measure aimed at alleviating posterior pelvic pain among women who have recently given birth and contrasted the results with those of a group subjected to a narrower pelvic support regimen. Based on their findings, the authors have determined that the provision of comprehensive lumbar support leads to more effective pain management, reduced disability, and an enhanced ability to engage in daily activities among expectant mothers[14]. It has been demonstrated that the central posterior-anterior (PA) mobilization significantly affects pain intensity and EMG activity of the erector spinal muscle in postnatal females suffering from mechanical low back pain and that functional capacity has also been increased[13]. [A]n increase in trunk flexion strength and a positive change in body image can be expected due to physiotherapy interventions. Despite the feasibility of conducting a clinical trial to investigate these interventions, it is recommended that further preliminary studies be conducted[14]. Modifications in mechanical loading patterns can heighten the likelihood of developing osteoarthritis. The potential influence of decreased knee moments on the mechanical stimulation of cartilage in postpartum women warrants further investigation in the context of measures of cartilage health, with the ultimate goal of establishing any potential associations with the onset of osteoarthritis[11]. Andersen presented findings on the efficacy of physical therapy interventions in addressing sacroiliac joint pain in a postpartum patient who met the diagnostic criteria for the Laslett cluster. A multimodal approach that combines pelvic floor muscle exercise and manual therapy has demonstrated a favourable effect on various outcome measures, such as pain levels, perceived disability, and perceived rating of change, in postpartum patients suffering from sacroiliac joint pain. Physical therapists can reduce pain and disability in postpartum clients with pelvic girdle pain by implementing a number of evidence-based interventions[15]. According to the study of Çapik et al., postpartum women reported a moderate level of comfort. As a precaution, midwives and nurses should determine the needs and expectations of mothers during the postpartum period as well as provide quality postpartum care[16].

5 Conclusion

The main finding of this study is that the mechanical physiotherapy results were beneficial for days, and the patient received relief. However, compared to other treatments, the results of this study provide further evidence that patients treating postpartum knee joint pain can achieve more benefits from manual therapy than mechanical physiotherapy. This study may help clinicians and physical therapists select and rehabilitate a particular population.

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