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Original Article

Orthopaedics Section

Effect of Core Muscle Stabilisation Exercises on Disability Associated with Non Specific Low Back Pain in Postmenopausal Women: A Prospective Longitudinal Study

SANTOSH KUMAR SINGH[1], JIGYASA SINGH[2], RAHUL SHANKAR[3], SNEHASHISH MUKHERJEE[4], RAKESH YADAV[5]

ABSTRACT

Introduction: Non Specific Low Back Pain (NSLBP) is a frequent problem faced by the majority of postmenopausal women at some stage of their lives, resulting in a significant level of disability.

Aim: To evaluate the effectiveness of core stabilisation exercises compared to traditional physical treatment in postmenopausal women with NSLBP.

Materials and Methods: This prospective longitudinal study was conducted at the Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India, from January to August 2022, including 50 postmenopausal women aged 45-60 years with NSLBP. They were placed into two groups. Conventional LBP physical therapy methods were administered to group 2. The identical traditional and Core muscle Stabilisation Exercises (CSE) were implemented in the group 1. The Modified Oswestry Disability Index (MODI) was used for the assessment of disability. The Mann-Whitney U test and Friedman Analysis of Variance (ANOVA) were conducted to analyse changes in disability scores across and among groups at the ends of the second, fourth and sixth weeks of treatment.

Results: Of 50 patients initially enrolled in the study, 33 patients were available for the final follow-up. Group 1 consisted of 16 patients, while group 2 had 17 patients. Significant reduction in disability was found across the two groups at the second, fourth and sixth weeks of treatment (p-value <0.05). In the sixth week of treatment, group 1 had a statistically greater decrease in ODI score (41.16±13.53) than group 2 (30.74±13.28) (p-value=0.003).

Conclusion: The CSE were found to be more effective than conventional physical therapy in reducing disability associated with NSLBP in postmenopausal women.

Keywords: Conventional physical therapy, Menopause, Modified oswestry disability index

INTRODUCTION

Modern women spend a third of their lives in menopause as their life expectancy rises [1,2]. Slower ovarian hormone production causes the transition from a premenopausal to a postmenopausal stage [3,4]. There are many signs and symptoms that occur during the postmenopausal stage. Physical symptoms may include stiffness and pain in the back and joints, hot flashes, night sweats and persistent fatigue; psychological symptoms may include irritability and anxiety, mood swings, sadness and sleep problems [5]. The reviewed research revealed a link between the postmenopausal period and depression, heat flashes, heart disease, cancer and sleep disturbances, but little focus was given to pain (in the spine and peripheral joints) [6].

Despite appearing to be a benign condition, Low Back Pain (LBP) has grown to be a significant global health issue. Many more years of impairment are now being attributed to it than to any other illness [7]. LBP, which frequently results in significant loss of working hours and disability, affects about 80% of the population at some point in their lives [8]. LBP primarily affects postmenopausal women between the ages of 45-60, and it causes distress on social and economic levels [9]. About 10% of people with LBP also have a specific form of LBP caused by a condition like lumbar spinal stenosis, spondylolisthesis, a fractured spine, an inflammatory disease, or compressed nerve roots. However, Non Specific Low Back Pain (NSLBP) accounts for 90% of LBP diagnosis, since its underlying cause cannot be determined through clinical examination [10]. On the other hand, NSLBP lacks a definitive pathology, but it has been speculated to be brought on by elements such as poor posture, reduced flexibility, a history of injury, heavy lifting, mental stress, obesity, weak deep trunk muscles, poor coordination and muscular imbalances [9-11]. Postmenopausal women with NSLBP and decreased function often feel anxious and sad, which affects their work, sexual and social lives [11,12].

The most cutting-edge conservative approach for treating LBP is still physical therapy [12]. As it promotes proximal stability and distal mobility, CSE are becoming a more significant part of the sports realm of treatments [13]. The use of Core muscle Stabilisation Exercises (CSE) is promoted as a general physical therapy approach for NSLBP. Overtime, CES have improved, focusing more and more on maintaining spinal stability. Theoretical ideas for the treatment of spinal ailments that aid in reducing pain and enhancing function in patients with LBP significantly support the use of CSE [13,14]. CSE trains muscle activity patterns without unnecessarily overloading the tissue, enhances aerobic fitness, spinal mobility, muscle strength, motor co-ordination and can help to stabilise the spine at a quite cost affordable price [14]. Different exercises, such as intense dynamic back extensor exercises, motor control exercises, yoga and aerobic workouts have all been recommended for persistent LBP but the majority of studies have shown that CSE are more efficient than general exercises [15,16]. Exercises for core stabilisation focus on the Transversus Abdominis (TrA), lumbar multifidi, as well as other paraspinal, abdominal, diaphragmatic and pelvic musculature.

Although, conventional physical therapy (application of moist heat packs, transcutaneous electrical nerve stimulation applied to the lumbar area and stretching exercises) is routinely performed in clinical settings, CSE have received limited scholarly attention so far, but it has been advocated as a form of rehabilitation, a way to improve performance, and a way to avoid injuries to the musculoskeletal system and the lumbar spine [17]. Both treatment modalities appear to be effective; nevertheless, there is still debate in both groups due to a lack of sufficient information.

The primary objective of this study was to evaluate the effectiveness of CSE compared to traditional physical treatment protocol in reducing the average disability associated with NSLBP in postmenopausal women.

MATERIALS AND METHODS

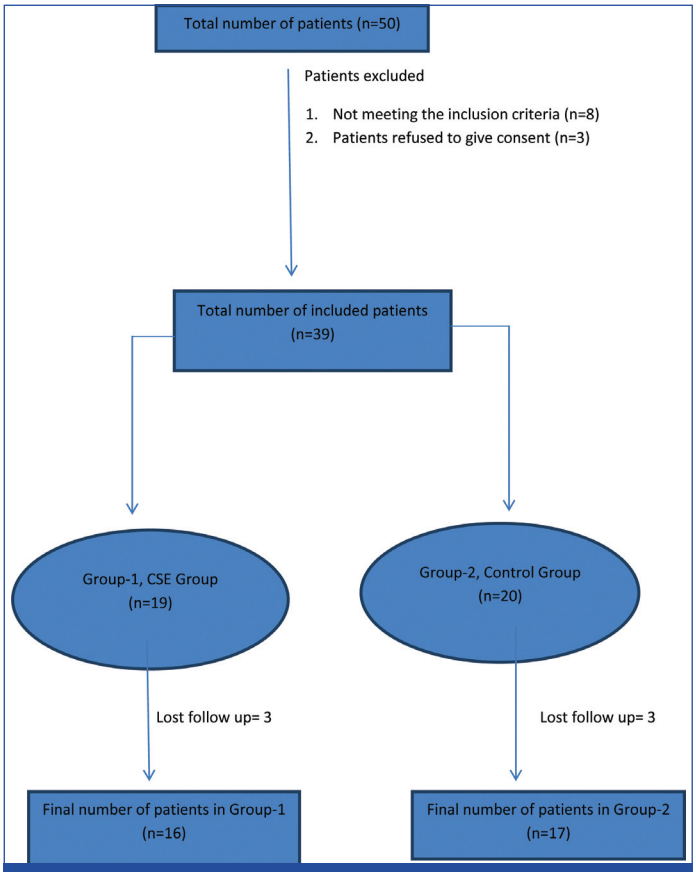
This prospective longitudinal study was conducted at the Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India, from January to August 2022, including a follow-up period of six weeks. All participants gave informed consent to participate in the study.

Based on the history and radiological imaging, the organic causes of LBP were ruled out. A non probability purposive sampling technique was used to collect the sample.

Inclusion criteria: All postmenopausal women between the ages of 45-60 years who had NSLBP for more than three months and are willing to participate in the study were included in the study.

Exclusion criteria: Women with spinal cord injuries, disc disease, lumbar canal stenosis and severe degenerative arthritis of the spine were excluded from the study.

A total of 50 patients were enrolled in this study, but 11 subjects were excluded from the study (eight patients did not fulfill the inclusion criteria and three patients refused to give consent). Six patients lost the follow-up (three in each group). In light of this, 33 individuals were assessed throughout the six week of treatment [Table/Fig-1].



[Table/Fig-1]: Flowchart of study.
CSE Group: core muscle stabilisation exercises group

With the help of the computer generated numbers, the participants were divided into two groups, experimental (group-1), and convention therapy (group-2). Conventional LBP physical therapy methods, including moist heat packs, Transcutaneous Electrical Nerve Stimulation (TENS) applied to the lumbar area, and strengthening exercises, were administered to the control (group-2). The identical traditional and CSE exercises were implemented in the experimental group (Group-1). The method adopted was described by Kisner (2012) [18], for CSE focusing on the deep group of abdominal muscles [Table/Fig-2]. For six weeks, each patient received treatment three days a week, with the physical therapy session usually lasting upto 30 minutes a day [Table/Fig-3].

S. No.	Core muscle stabilisation (CSE) exercises	Conventional strengthening exercises
1	Pressure feedback core exercise	Hip flexors stretching
2	Spinus multifidus exercise	Back extensors stretching
3	Diaphragmatic strengthening exercises	Hamstring stretching
4	Frontal and side plank exercise	Hip extensors exercises in prone
5	Pelvic floor exercises	Abdominal curl-up exercise in supine
6	Plank exercise	Calf stretching
7	Tandem standing with perturbation in form of rapid arm movements	
8	Single leg standing on foam	

[Table/Fig-2]: Different exercises in CSE and conventional-exercise therapy.

A physical therapist monitored both exercise programs. The MODI was used for the assessment of disability due to NSLBP impacting the functional activities of the patients [19]. The MODI consists of 10 patient-completed questions with six-point Likert scales as the response options. Each item consists of six statements with values ranging from 0 to 5, where a score of 0 represents the least level of disability and a statement with a score of 5 suggests the highest level of disability. A total score of 0-20% means the patient has only a mild disability; a score of 21-40% means they have a moderate disability; a score of 41-60% means they have a severe disability; a score of 61-80% means they are crippled; and a score of 81-100% means the patient is bedridden. Baseline data and data at the ends of the second, fourth and sixth weeks of treatment was collected by a research assistant from each patient.

STATISTICAL ANALYSIS

Data are presented as measures of mean and standard deviation. Data analysis was done with Statistical Package for the Social Sciences (SPSS) version 22.0. The independent t-test was used to evaluate the demographic data to see if there were any statistically significant differences between the two groups. Non parametric tests, the Mann-Whitney U test and Friedman Analysis of Variance (ANOVA) were conducted to analyse changes in disability scores across and among groups. The p-values, the significance level was set at <0.05. By calculating mean differences between the baseline and final measurements, the pre-post difference was analysed.

RESULTS

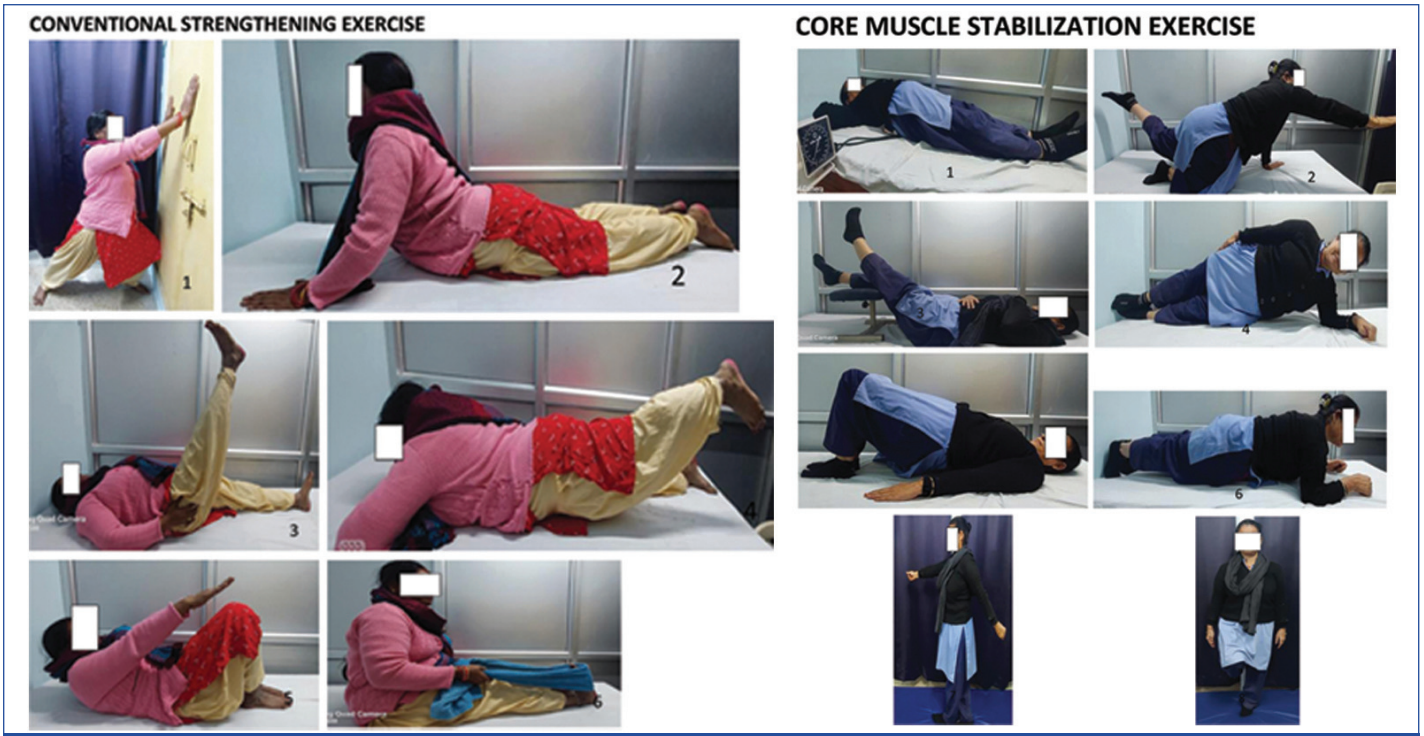
In terms of socio-demographic characteristics, the subjects in both groups were quite comparable [Table/Fig-4]. All the patients were married. Total 13 patients in group 1 and 14 patients in group 2 were housewives while three patients in both groups were doing other jobs. The mean age of group 1 patients was 53.31±7.11 years, while it was 54.40±6.31 years in group 2.

The results of the second, fourth and sixth weeks of treatment showed that the MODI scores in both groups had a statistically significant decrease [Table/Fig-5]. At the end of week six, there was a statistically significant difference between the pretreatment baseline disability score and the post-treatment disability score in both treatment groups (p<0.05).

Group 1 had a statistically greater decrease in MODI score (41.16±13.53) than did group 2 (30.74±13.28) (p<0.05). At the second, fourth and sixth weeks, respectively, the mean difference between the two groups' MODI scores was 8.69±1.37, 7.71±1.63, and 9.12±1.82, with a p-value <0.05 [Table/Fig-6].

DISCUSSION

The disability scores of both groups in the current study decreased statistically significantly from baseline to the end of the second,



[Table/Fig-3]: Clinical images demonstrating conventional and core muscle stabilisation exercise.

S. No.	Demographic variables	Group-1, core muscle stabilisation exercise group (n=16), Mean±SD	Group-2, conventional therapy control group (n=17), Mean±SD	p-value[1]
1	Age (years)	53.31±7.11	54.40±6.31	0.644
2	Height (m)	1.62±0.17	1.61±0.5	0.940
3	Weight (kg)	60.16±8.07	62.37±9.12	0.468
4	BMI (kg/m^2)	22.5±1.82	22.8±2.67	0.710
5	Menopause duration (months)	96.21±43.79	95.89±41.25	0.982
6	Low back pain duration (months)	19.72±12.56	20.10±13.18	0.997

[Table/Fig-4]: Demographic variables of participants.
[1]Independent t-test; BMI: Body mass index

Disability score	Groups	Baseline	At the end of 2nd week	At the end of 4th week	At the end of 6th week	p-value
ODI score	Group 1, Core muscle stabilisation exercise group, (n=16)	58.26±10.5	36.71±10.3	28.19±9.54	15.07±8.51	0.004
	Group 2, Conventional therapy control group, (n=17)	59.37±10.11	44.11±8.21	34.85±6.61	26.31±7.11	0.037

[Table/Fig-5]: ODI score in both groups at follow-up.
Friedman ANOVA
ODI: The modified oswestry disability index

Mean difference of MODI score in both the groups at follow-up	Baseline	At the end of 2nd week	p-value at the end of 2nd week	At the end of 4th week	p-value at the end of 4th week	At the end of 6th week	p-value at the end of 6th week[1]
	2.11±0.2	8.69±1.37	0.029	7.71±1.63	0.025	9.12±1.82	0.0003

[Table/Fig-6]: Mean difference of ODI score and p-value between both the groups at follow-ups.
[1]Mann-Whitney U test

fourth, and sixth weeks of treatment. Both treatment groups showed a statistically significant decline from the pretreatment baseline disability score and the post-treatment disability score (at the end of the sixth week). However, the extent of disability reduction was greater in group 1 (CSE) than in group 2 (conventional therapy group). CSE have a strong theoretical basis in the treatment and prevention of LBP and other musculoskeletal conditions, as evidenced by their widespread clinical application [19]. According to different studies these treatments may aid people with LBP in reducing pain and enhancing function [13,15,17]. In a systematic review, Alhakami AM et al., also demonstrated that stabilisation exercises was better than conventional exercise programs in reducing functional disability in patients with chronic NSLBP [20]. In a randomised clinical study, Abdel-Aziem AA et al., revealed significant improvements in pain intensity and functional disability scores in the women with NSLBP [21].

The results of the present study have similar outcomes compared with other studies. In a research article by Franca FR et al., a greater reduction in the MODI score was seen with the spinal stabilisation exercises in contrast to strengthening exercises in subjects with LBP [22]. Wang XQ et al., conducted a meta-analysis and found that CSE decreased pain and improved physical function significantly more than general physical exercises in patients with LBP in the short term [23]. A randomised clinical trial conducted by Inani SB and Selkar SP, also reported that, in comparison to conventional exercises, core CSE were found to be more effective at reducing pain and improving functional status in patients with NSLBP [24]. Kanwal S et al., conducted a comparative study including 24 postmenopausal women with back pain and reported that CSE had the ability to reduce pain and disability and improve strength and quality of life [25].

Hsu WH et al., conducted a prospective study of 408 postmenopausal women. They observed that with age, sit-ups,

back strength, grip strength, side steps, trunk extension and agility all deteriorated. They also reported that back strength significantly contributed to the physical component of quality of life [26]. In the present study, authors also found similar results as the disability score was significantly decreased in the CSE-group. Bhadauria EA and Gurudut P, conducted a randomised clinical trial comparing three different forms of exercise, lumbar stabilisation, dynamic strengthening and pilates, on chronic LBP in terms of pain, range of motion, core strength and function [27]. Lumbar stabilisation was found to be superior to dynamic strengthening and pilates in chronic NSLBP.

Limitation(s)

The sample size was small and the rate of dropouts was high. A bigger sample size is required in future studies for generalisation of results. Patient adherence should be maintained in future research and treatment duration should also be lengthened.

CONCLUSION(S)

Following the intervention, the disability levels in both groups significantly improved. Compared to the group that did traditional physical therapy exercises, the CSE group showed a significant reduction in the disability caused by NSLBP in postmenopausal women.

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PARTICULARS OF CONTRIBUTORS:
1. Specialist Orthopaedics, Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India.
2. Assistant Professor, Department of Obstetrics and Gynaecology, IMS BHU, Varanasi, Uttar Pradesh India.
3. Senior Physiotherapist, Department of Physiotherapy, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India.
4. Senior Resident, Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India.
5. IMO, Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Santosh Kumar Singh,
Specialist Orthopaedics, Department of Orthopaedics, ESIC Hospital, Jajmau, Kanpur-208010, Uttar Pradesh, India.
E-mail: dr.sandy03kgmc@gmail.com

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