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A comparative analysis of lumbar stabilization exercises and back school program for sub-acute & chronic non-specific low back pain: an experimental study examining efficacy and outcomes

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ABSTRACT

Background: Non-specific low back pain is a burdensome condition affecting lives. Non-specific kind of pain means that the basis of the pain is not identifiable. Low back pain arrives anywhere in the region from below the 12th rib to the inferior gluteal folds.

Objective: To conduct a comparative analysis between Lumbar Stabilization Exercises (LSE) and Back School (BS) Program on subacute and chronic non-specific low back pain. Lumbar Stabilization Exercises are designed to stabilize the lumbar area and strengthen the core muscles. Back School Program is a holistic approach to reduce back pain which comprises of educational counselling, postural and ergonomic advice and exercises.

Materials and Methodology: Two groups are made, each group had 10 subjects. Group A received LSE and Group B received BS program. Both the groups also underwent conventional treatment. This design permitted us to check the specific impact of Lumbar Stabilization Exercises and the Back School Program along with the conventional treatment provided. Ten sessions of the treatment were given. Outcome measures include Numerical Pain Rating Scale (NPRS), Quebec Back Pain Disability Scale (QBPDS) and ROM was measured.

Results: Lumbar stabilization exercises demonstrated greater efficacy than the Back School Program in diminishing sub-acute and chronic nonspecific low back pain.

Conclusion: Lumbar Stabilization Exercises are comparatively more effective than the Back School Program in reducing sub-acute and chronic nonspecific low back pain.

Keywords: Core strengthening, Lumbar ROM, Non-Specific Low Back Pain, Musculoskeletal disorders, QBPDS

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INTRODUCTION

In both developed and developing nations, low back pain is the most common reason for years of disability and ranks sixth in terms of the burden of all diseases[1]. It is a common complaint that has been linked to worse quality of life (QOL) and activities of daily living (ADLs)[2]. Compared to the overall population and other ethnic populations, the Indian community has higher point, yearly, and lifetime prevalence rates of LBP, which impacts a sizable fraction of the population, particularly among women, rural residents, and elementary workers[3].

Depending on pain duration low back pain can be classified as acute (lasting less than 6 weeks), subacute(lasting between 6 and 12 weeks), or chronic (lasting beyond three months)[4]. Pain between the 12th rib andthe inferior gluteal folds, with or without leg pain, is defined as low back pain. The majority of instances are non-specific, but in 5–10% of cases, a particular cause is identified. Some degenerative problems, inflammatory illnesses, infective and neoplastic causes, metabolic bone disease, referred pain, psychogenic pain, trauma, and congenital disorders are specific causes of back pain. Back pain with no known underlying pathology is referred to as non-specific Low back pain[5].

Exercise has the most evidence of success for treating chronic low back pain, with greater advantages in terms of pain and function than any other treatment. A wide range of exercise programs have been developed; nevertheless, "lumbar stabilization exercises" have grown in popularity among clinicians who treat spine diseases[6]. In patients with non-specific low back pain, lumbar stabilization exercise is more beneficial than regular physical therapy exercises in terms of pain reduction[7]. In current practice, stabilizing exercises are used to increase the endurance, strength, and flexibility of the core muscles[8].The transverse abdominis muscle, which attaches to the vertebra via the thoracolumbar fascia, aids in spine stiffening by promoting intra-abdominal pressure[9].Exercises for lumbar stabilization are designed to enhance the neuromuscular control, strength, and endurance of the muscles that are essential for preserving the dynamic stability of the spine and trunk. The efficacy of lumbar stabilization exercises on people with low back pain, pelvic pain, and LBP with leg pain has been studied[10].

Numerous treatment options exist, including prescription drugs, physical therapy, various forms of exercise, and guidelines for back-friendly working practices[11].Back school (BS) program is an educational curriculum designed to prevent pain in the back and help people with degenerative spine conditions get better. Back school programs use theoretical and practical instruction in subjects including exercises, spine anatomy, biomechanics, best posture, and ergonomics to help patients become active participants in their recovery and in the maintenance of their quality of life[12].Although back schools have been practiced since 1969, their benefit in preventing or treating back pain has not yet been conclusively shown. A Cochrane review reasonedthat back school programs for patients with chronic LBP in a work-related setting had been relatively efficacious in comparison to other treatments or placebo or control groups which were kept on hold. More than a decade has passed since the last thorough analysis on this topic, and new studies as well as new guidance on conducting systematic reviews in the pain field have been published. More recent reviews that contain studies on back schools exist, although they are also now antiquated or are not thorough, for example, because they are geographically limited[11].

Hence, the present study was done with the objective of comparing the short-term effects of lumbar stabilization exercises and back school programs and finding a better approach in clinical practice for sub- acute and chronic nonspecific low back pain.

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Objective of the study

To compare the effect of lumbar stabilization exercises and back school program for sub-acute and chronic non-specific low back pain

Hypothesis

Null Hypothesis(H0)

There is no significant effect of Lumbar stabilization exercises on sub-acute and chronic non-specific low back pain.

There is no significant effect of Back School Program on sub-acute and chronic non-specific low back pain.

There is no significant effect of both Lumbar Stabilization Exercises and Back School Program on sub-acute and chronic non-specific low back pain.

Research Hypothesis(H1)

There is significant effect of Lumbar stabilization exercises on sub-acute and chronic non-specific low back pain.

There is significant effect of Back School Program on sub-acute and chronic non-specific low back pain.

There is significant effect of both Lumbar stabilization exercises and Back School Program on sub-acute and chronic non-specific low back pain.

REVIEW OF LITERATURE

1. **K. Kodeeswaran, S. Ashiya Anjum, et al.: -** conducted a study to compare the effects of Lumbar Stabilization Exercise (LSE) versus conservative treatment in healthcare professionals with chronic low back pain (LBP). The study utilized convenient sampling and grouped 15 subjects for LSE with IFT (Interferential Therapy) and 15 for conservative treatment with IFT. Outcome measures included NPRS (Numeric Pain Rating Scale) and Modified Oswestry Low Back Pain Disability Questionnaire. The treatment duration was 4 weeks. The study concluded that LSE with IFT was more effective than conservative management with IFT in managing LBP among healthcare professionals.

   International Journal of Current Research and Review 2022;14(8):36-39.

2. **Hye Jin Moon, MD, Kyoung Hyo Choi, MD, et al.: -** conducted a comparative study on patients with chronic non-specific low back pain. They compared lumbar stabilization exercises (LSS) with dynamic lumbar strengthening exercises. Randomization was employed, with 11 participants in the LSS group and 10 in the dynamic strengthening group. The exercises were performed for 1 hour, twice a week, over 8 weeks. Outcome measures included VAS, ODQ, and lumbar extensor strength at various angles ranging from 0° to 72°. The study concluded that LSS was more effective in strengthening lumbar extensors and improving functional outcomes in patients.

   Annals of Rehabilitation Medicine 2013;37(1): 110-117.

3. **Jaza Rizvi, Neelum Zehra et. al.: -** conducted a study at Dr. Ziauddin Hospital, to compare two different exercise approaches on non-specific low back pain (LBP) among 30 occupational therapists. The participants were divided into two groups: Group A received lumbar stabilization exercises, while Group B underwent general extension exercises. The researchers used the Numeric Pain Rating Scale (NPRS) and Oswestry Low Back Pain Disability Questionnaire as outcome measures. The results of the study showed that lumbar stabilization exercises proved to be more effective than general extension exercises in reducing low back pain among occupational therapists

   Pakistan Journal of Rehabilitation 2019;8(1): 43-48.

1. **Esha A. Bhadauria and Peeyush Gurudutt: -** conducted a study to see the efficacy of three different forms of exercises namely, LSS, Dynamic Strengthening, and Pilates in treating chronic non- specific low

back pain. The study included a total of 44 randomly assigned subjects who participated in 10 exercise sessions over a period of three weeks. IFT and HMP were used as conservative treatment for all groups. To evaluate the effectiveness of the interventions VAS, Oswestry Disability Questionnaire, Schober's test, and pressure biofeedback were used. The findings of the study indicated that the LSS group demonstrated significant improvements across all outcome measures

Journal of Exercise Rehabilitation 2017;13(4):477-485.

2. **Mehdi Pambazo, Mohammad Ali Hosseini et.al.: - conducted** a study In Iran on Effectiveness of the back school program on the low back pain and functional disability of Iranian nurse. Low back pain (LBP) as a recurrent and costly health problem and one of the leading causes of disability, is common in nurses. It can have adverse effects on the quality of life of nurses and quality of care of patients.The aim of the study was to evaluate the effectiveness of Back School program on the LBP and functional disability of Iranian nurses. A quasi-experimental methodological design was utilized for this study. Participants were nurses with back pain who participated in the Back School program workshop and completed a self-report visual analogue scales and Roland–Morris Disability questionnaire that measuring LBP and functional disability. Data were analyzed descriptively and comparisons in LBP and functional disability made between groups with t-test for pre-intervention and analysis of covariance for after intervention. Sixty-four participants (16 males, 48 females) completed this survey. The study participants' mean age was 38.9± 8.1 years in intervention group and 38.1± 8.2in control group. There were no significant differences in terms of pain (P= 0.575) and disability scores (P= 0.844) before intervention. Although, the intervention led to a decrease in the functional ability and LBP scores of the nurses (P< 0.001) in the intervention group compared with that in the control group. Overall, Back School program as an educational strategy can reduce the LBP and functional disability in nurses. This program can be suitable for preventing of pain and functional disability among nurses working in hospital settings.

Journal of exercise rehabilitation 2019 Feb; 15(1): 134–138.

3. **Patricia Thurow Bartz et. al.: -** conducted a study on Effectiveness of the back school program for the performance of activities of daily living in users of a basic health unit in Porto Alegre, Brazil. In this study, the effects of Back School on pain, functionality, and the performance of activities of daily living (ADL) in users with chronic musculoskeletal pain were evaluated. [Subjects and Methods] Forty- four users (33 females and 11 males) participated in Back School, with five two-hour theoretical and practical meetings held once a week. The assessment instruments used were as follows: (a) a circuit evaluation of posture dynamics recorded on video, (b) an observational instrument of ADL using video,
(c) anamnesis, (d) the visual analogue scale, and (e) the Oswestry Disability Index. [Results] The results showed decreased pain intensity, improved functionality, and the recovery of ADL. [Conclusion] The Back School program is an effective health education strategy for users with chronic musculoskeletal pain.

Journal of Physical Therapy Science 2016 Sep; 28(9): 2581–2586.

4. **M W Heymans, R Esmail et.al. :-**
conducted a study on Back schools for non-

specific low back pain. The objective of this systematic review was to assess the effects of back schools for patients with non-specific low back pain. Only randomized trials that reported on any type of back school for non-specific low back pain were included. Fifteen RCTs were included in systematic review. Overall, the methodological quality was low. Only 3 trials were considered high quality. It was not possible to make relevant subgroup analyses for radiation versus no radiation or to have a relevant subgroup of studies reporting on acute low back pain only. The results indicate that there is moderate evidence that back schools have better short-term effects than other treatments for chronic low back pain, and that there is moderate evidence that back schools in an occupational setting are more effective compared to 'placebo' or waiting list controls. **Spine 2005; 30(19):2153-2163.**

5. **Thayna Maria Jose, Clemente da silva et. al. : -** conducted a study to evaluate the effects of back school components in relieving pain and to improve quality of life on patients with chronic back pain
. Forty-one patients were randomized and into four groups: (I) a back school group (educational lessons and physical exercise); (ii) an educational lessons group; (iii) a physical exercise group and (iv) a waiting list control group. Patients were evaluated before and after treatment with a visual analogue scale, a short form quality-of-life questionnaire, a Roland Morris disability questionnaire and a finger- floor distance test. The back school group showed significant reduction in scores in the visual analogue scale and the Roland Morris disability questionnaire and an increase in the short-form quality of life questionnaire. The effectiveness of back
school programs in chronic back pain patients seems to be due to the physical exercise component and not on account of the educational lessons.
ConScientiae Saúde, 2014;13(4):506-515.
6. **Megan Davidson, Jennifer L Keating et. al.: -** conducted a study to examine 5 commonly used questionnaires for assessing disability in people with low back pain. The modified Oswestry Disability Questionnaire, the Quebec Back Pain Disability Scale, the Roland-Morris Disability Questionnaire, the Waddell Disability Index, and the physical health scales of the Medical Outcomes Study 36-Item Short- Form Health Survey (SF-36) were compared in patients undergoing physical therapy for low back pain. This research involved 106 individuals suffering from low back pain who completed questionnaires during their initial visit to a physical therapist and again six weeks later. The study aimed to assess the reliability and responsiveness of these questionnaires in measuring changes in patients' conditions. It was found that the measurements obtained from the modified Oswestry Disability Questionnaire, the SF-36 Physical Functioning scale, and the Quebec Back Pain Disability Scale were the most dependable and had a wide enough range to consistently detect improvements or deteriorations in most patients' conditions. On the other hand, the Waddell Disability Index had a moderate level of reliability, but it was not considered suitable for practical clinical use due to certain limitations. Meanwhile, the Roland-Morris Disability Questionnaire and the Role Limitations–Physical and Bodily Pain scales within the SF-36 were found to be lacking in terms of both reliability and the range they covered, making them less suitable for clinical applications.
Physical Therapy 2002; 82(1):8-24.
7. **7. Childs JD, Piva SR et. al.: -** conducted

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cohort study to examine the responsiveness characteristics of the numerical pain rating scale (NPRS) in patients with LBP using a variety of methods. Determination of change on the NPRS during 1 and 4 weeks was examined by calculating mean change, standardized effect size, Guyatt Responsiveness Index, area under a receiver operating characteristic curve, minimum clinically important difference, and minimum detectable change. Change in the NPRS from baseline to the 1 and 4-week follow-up was compared to the average of the patient and therapist's perceived improvement using the 15-point Global Rating of Change scale. They concluded that Clinicians can be confident that a 2-point change on the NPRS represents clinically meaningful change that exceeds the bounds of measurement error.

Spine 2005; 30(11):1331-1334.

The study was conducted at the Department of Physiotherapy, Dr. B. R. Ambedkar Medical College and Hospital in Bangalore, using a quasi-experimental design. A total of 20 participants were selected using a convenient sampling method, with strict inclusion and exclusion criteria applied. The participants were assigned to either group A (receiving lumbar stabilization treatment) or group B (receiving in back school program). Both groups received conservative treatment, including interferential therapy (IFT) and moist heat therapy, over a course of 10 sessions. This design allowed us to assess the specific impact of Lumbar Stabilization Exercises and the Back School Program in addition to the standard care provided.

Inclusion Criteria

- Both male and female aged 25-50 years
- Non-specific low back pain (>2 months)
- NPRS >= 6

Exclusion Criteria

- Spinal fractures
- Degenerative changes and tumors
- Subjects with neurological involvements
- Bone disorders
- Systemic disorders

Outcome Measures

- Numerical Pain Rating Scale
- Quebec back pain disability scale
- ROM will be measured

Experimental Procedure-

Lumbar Stabilization Exercises

- Superman Pose
- Knee to Chest
- Bridging
- Lumbar Rotation
- Pelvic Tilt
- Sit-Ups

Back School Program

- Knee Up
- Standing Quadricep Stretching
- Cat and Camel
- Abdominal Hollowing
- Bird Dog
- Lying Hamstring Stretch

The comparison was done by making a group of 10 each. Where they received LSE or BS along with conservative treatment for patients suffering from sub-acute and chronic non-specific LBP patient. We have included patients meeting the inclusion criteria and the outcome measures used is QBPDS, NPRS and lumbarROM was measured.

Statistical Analysis

The collected data were tabulated and analyzed using descriptive and interferential statistics. Paired t-test is used to analyses significance between pre and post-test values and unpaired t-test was used to analyse significance between two groups. P value <0.05 was considered as statistically significant.

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	Group – A (n=10) Mean ± SD.	Group – B (n=10)Mean ± SD.
Age (years)	40.2 ± 6.27	**40.4 ± 2.97**
Gender	**5 Males 5 Females**	**5 Males 5 Females**

Table 1. Demographic Characteristics

RESULTS

From the statistical analysis made with the quantitative data, paired t-test revealed that the mean is statistically significant between pre-test and post-test in lumbar stabilization group with $p<0.05$ and the unpaired t-test conducted between group A and B resulted that there was a significant difference between the groups with the p-value of 0.0001. Thus, lumbar stabilization exercises have a significant role in reducing low back pain.

The differences between the two groups were analyzed using post mean values of components. In general, both the groups showed significant results ($p<0.05$), however Group A (lumbar stabilization exercise) showed better reduction in pain and increased flexion/extension movements in comparison to Group B (Back school program).

	Mean	SD	T value	P value
Pretest valuesof group A	7.10	1.197	11.716	<0.0001
Post test valuesof group A	1.40	0.966		

Table 2: Pre and Post test comparison of Lumbar stabilization exercise.

Interpretation: The pre-test mean value of Numeric Pain Rating Scale (NPRS) is 7.10 (SD: 1.43) and post-testmean value is 1.40 (SD: 0.966). This interprets that functioning of low back is gradually increasing with the P value 0.0001, which is statistically significant.

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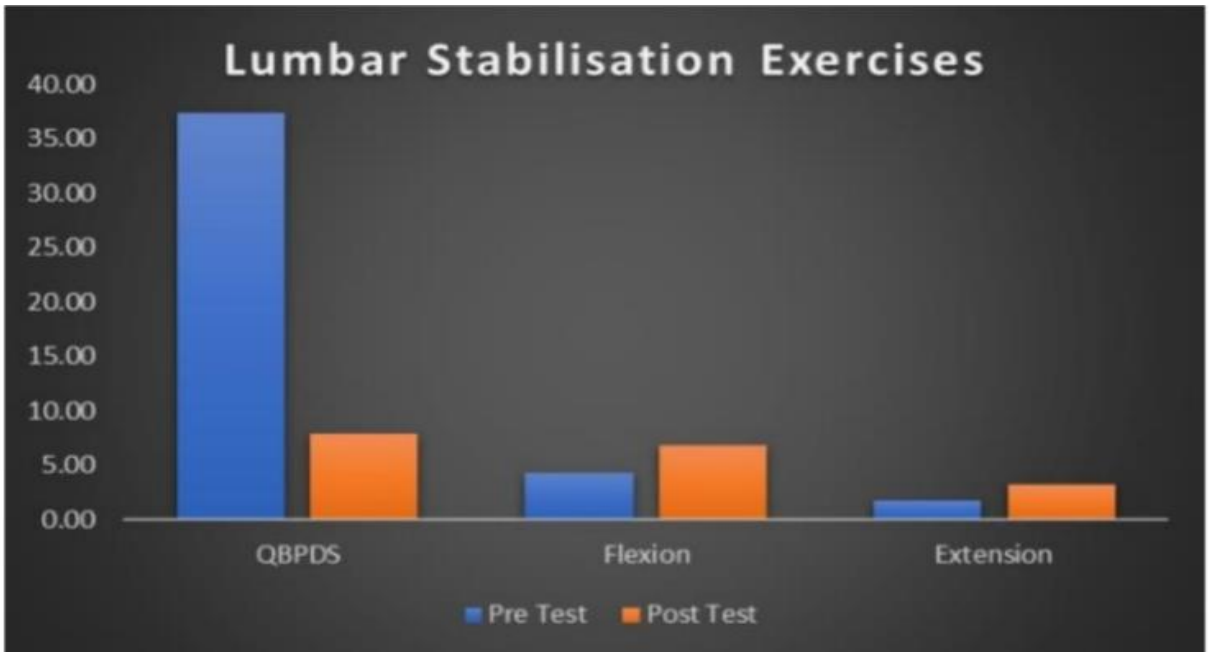

Figure 13: represents the mean comparison of Lumbar Stabilization group with the pre-test mean value of QBPDS scores, Flexion values and extension values.

Mean		SD	T value	P value
Pretest values of group B	**7.10**	**1.101**	**4.148**	**<0.0001**
Post test values of group B	**4.30**	**1.829**		

Table 3: Pre and Post test comparison of Back School Program.

Interpretation: The pre-test mean value of Numeric Pain Rating Scale (NPRS) is 7.10 (SD: 1.101) and post-test mean value is 4.30 (SD: 1.829). This interprets that functioning of low back is gradually increasing with the P value 0.0001, which is statistically significant.

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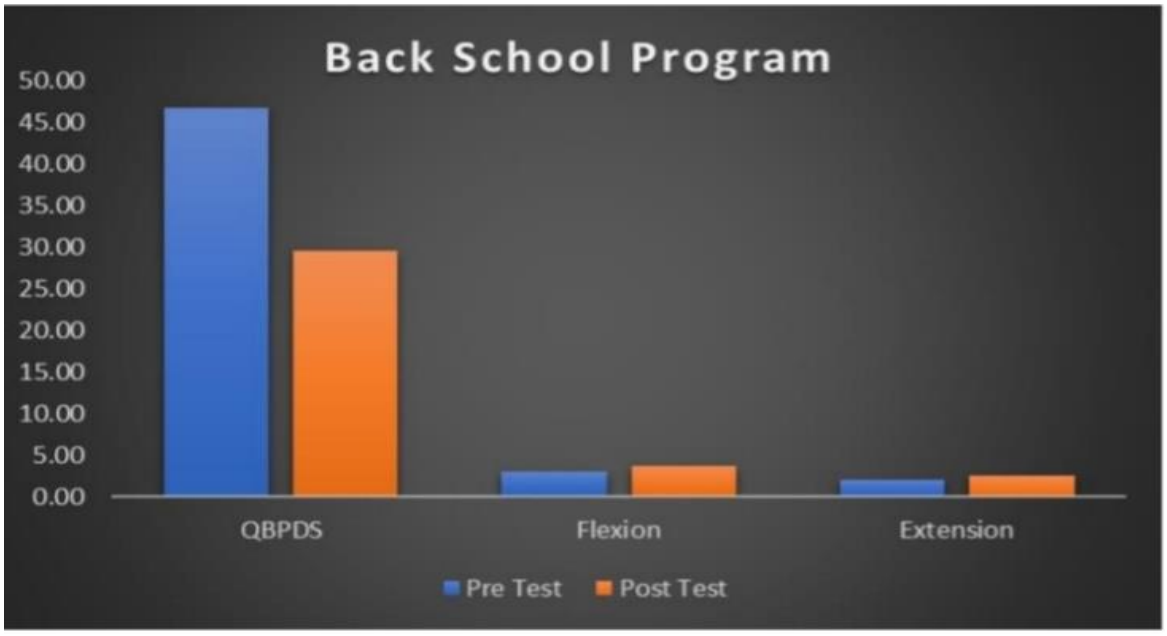

Figure 14: represents the mean comparison of Back School Program group with the pre-test mean value of QBPDS scores, Flexion values and extension values.

DISCUSSION

Low back pain (LBP) is a pervasive and debilitating condition that affects a wide range of individuals, particularly those aged between 25 to 50 years. The burden of LBP on both individuals and healthcare systems underscores the importance of effective interventions. In this study, we examined the impact of Lumbar Stabilization Exercises (LSE) and the Back School Program (BS) in the management of non-specific sub-acute and chronic low back pain.

Lower back exercises play a key role in preventing and managing back pain. The lumbar stabilization exercises program is designed to strengthen the muscles that support the torso, with a special emphasis on the abdominal muscles, which act like a corset to stabilize the lower back. These exercises are essential for maintaining a healthy spine, facilitating limb movements, and restoring balance between the abdominal and back muscles[13].

The Back School program consists of educational and training sessions delivered by therapists to patients or workers, aiming to treat or prevent lower back pain. These programs are widely utilized, especially in occupational health settings.[11]

Our study revealed that both the groups showed significant results ($p<0.05$), however LSE showed better reduction in pain and increased flexion/extension movements in comparison to BS Program. The results of our study were consistent with study of Rizvi J. et al which concluded that LSS are more effective to reduce non- specific LBP. One research has shown that core stabilization exercises not only enhance the strength of core muscles but also improve the overall function of individuals dealing with chronic non-specific lower back pain.[8]

On the contrary, a study conducted by Mehdi Pambazo showed Back School program as an educational strategy that can reduce the LBP and functional disability in nurses.[14]

The results of our study were inconsistent with the research conducted by Thayna Maria Jose et al. In their study, the back school group demonstrated a notable decrease in Visual Analogue Scale scores Roland Morris disability questionnaire scores, and an increase in the Short-Form Quality of Life Questionnaire scores.[12]

In general, both the groups showed significant results ($p<0.05$) statistically however LSE showed better reduction in pain and increased flexion/extension movements compared to BS Program.

In line with our results, a previous finding of the done by Esha A Bhadauria et al indicated that the LSE group demonstrated significant improvements across all outcome measures.[10]

The results from our study show that lumbar stabilization exercises led to a clear reduction in low back pain, as there was a noticeable difference between the initial and final values ($p<0.05$). Additionally, there was a significant difference between the effectiveness of lumbar stabilization exercises (Group A) and the Back School Program (Group B), suggesting that lumbar stabilization exercises were more successful in reducing low back pain

CONCLUSION

In conclusion, this study has demonstrated that lumbar stabilization exercises are associated with more effective pain reduction and improved mobility. Patients who engaged in LSS experienced notable reductions in discomfort and significant enhancements in their ability to move and flex their lower back. These findings underscore the effectiveness of lumbar stabilization exercises as a valuable approach to managing non-specific low back pain, highlighting their potential to deliver substantial improvements in the overall well-being.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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