"To Compare the Two Approaches of Nerve Flossing Technique On Pain, Lumbar Mobility and Straight Leg Raise in Subjects with Sciatica"

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ABSTRACT: Background: Sciatica is one of the most common painful and disabling conditions. Nerve flossing technique commonly called as neural mobilization are the forms of manual therapy that are used in an effort to reduce radiating pain and improve range of motion. A wide range of physical therapy interventions have been proposed to be effective, however the efficacy of neural mobilization technique is still undetermined in developing countries like India. **Purpose**: A study to compare the two approaches of nerve flossing technique on pain, lumbar mobility and striaght leg raise in subjects with sciatica. **Study design**: Quasi- Experimental study, comparative in nature **Methodology:** A total of 45 subjects were selected for the study as per inclusion and exclusion criteria between age group of 20-55 years. Participants were divided into 3 groups of 15 subjects each. Group A (control), Group B (Experimental-1) and Group C (experimental-2). Group A was receive Transcutaneous Electrical Nerve Stimulation (TENS), Hydro-collateral pack, Group B was receive slider mobilization (Nerve Flossing Technique) and Group C was receive single joint mobilization on knee (Nerve Flossing Technique). The baseline data was recorded on 1th day (pre- intervention) and 5th day (post-intervention) and then on 10th day (post-intervention). Total 10 sessions per subject was given over 2 weeks i.e., 5 sessions per week. The collected Data was analyzed by using ANOVA and other statistical tests as appropriate **Results:** The result showed significant improvement in slider mobilization on pain, lumbar mobility and striaght leg raise in subjects with sciatica.**Conclusion:** The present study concludes that slider mobilization is most effective nerve flossing technique in improving pain, lumbar mobility and striaght leg raise in subjects with sciatica.**Trial registration number (TRN):** Not applicable.

Keywords: Sciatica, Low back pain, Nerve Flossing Technique, Straight leg raise

1. INTRODUCTION

Sciatica is pain that radiates from the buttock along the course of the sciatic nerve. The peroneal and tibial nerves are formed by the union of the fourth and fifth lumbar nerve roots, as well as the first two sacral nerve roots, in the lumbosacral plexus[1]. Lumbar radiculopathy is defined as pain that originates in the lower back and radiates into one or both lower limbs[3].

One of the most common health-related complaints is lumbar radiculopathy caused by disc herniation. Lumbar disc herniation with radiculopathy is defined as localized displacement of disc material beyond the normal intervertebral disc space margins, resulting in low back pain, weakness, paresthesia, or numbness in a myotomal or dermatomal distribution[4]. Sciatica develops suddenly or gradually and perception can vary from aching to sharp sensation. L4-L5 and L5-S1 are the most commonly involved levels of the sciatic nerve, whereas L3-L4 is the least involved level. The most common reason for the disturbances along the

nerve course are disc rupture, osteoarthritic change, lumbar canal stenosis, spondylolisthesis, spinal tumors, piriformis syndrome, hip or lumbar cysts, vascular malformations and an intra-pelvic aneurysm[1,5] .

Sciatica is one of the most common painful and disabling conditions, affecting approximately 6% of the general population and up to 43% of a specific working population[5]. In the general population, the annual prevalence of disc-related sciatica is estimated to be 2.2 percent [6]. In approximately 90% of cases sciatica is caused by a herniated intervertebral disc resulting in nerve root compression[7].

Personal risk factors for sciatica include age, height, mental stress, cigarette smoking, and occupational factors [6]. Sciatica is more common in older population. Incidence is rare before the age of 20 and rises in the fifth decade[2]. Moreover the definitive cause are trauma, pregnancy, labour, prolonged bed rest and degenerative changes[8]. Sciatic nerve is formed by upper part of sacral plexus. It exits the pelvis below the piriformis from sciatic foramen and descends between the greater trochanter and ischial tuberosity at the back of the thigh. There it is divided into tibial and common peroneal nerves[16].

Neural tissue mobilization which is also known as nerve flossing technique which targets on breaking adhesions in the structures present along the course of the nerve, at the mechanical interface. Thereby improving the gliding of the nerve by eliminating the cause of symptom which is causing obstruction. The clinical appropriateness and effectiveness of this technique is based on the immediate reduction in pain and increase in mobility[3]. Neural mobilization techniques are types of manual therapy use to reduce radiating pain and improve range of motion[4]. It is a set of techniques aimed at restore the nervous system plasticity[10].

The goal of the mobilization is to increase the flexibility of collagen which maintains the integrity of the nerve and thus improves nerve movement[10]. In patients with lower extremity neurogenic pain, neural mobilization is directed specifically at the sciatic continuum to improve the straight-leg-raise and pain during hip flexion[11]. In lumbosacral radiculopathy, the neural mobilization method is a successful intervention for reducing pain, functional impairment and improving the physiological function of the nerve root[7]. It can be delivered in a variety of ways, including slider, tensioner and single joint mobilization procedures. Sliding procedures comprise a series of motions that result in extension of the nerve bed at one joint while shortening the nerve bed at another. It include elongating the space between either ends of the nerve bed. These strategies have been shown to have various biomechanical impacts on the nervous system[12].

PURPOSE

Numerous studies and researches have been found on the effectiveness of on slider mobilization and single joint mobilization (knee) on pain, lumbar mobility and SLR in subjects with sciatica but there are limited studies which have compared the effects of slider mobilization and single joint mobilization (knee) on sciatica.

The present study aims to compare the two approaches of nerve flossing technique on pain, lumbar mobility and straight leg raise in subjects with sciatica.

MATERIALS AND METHODS

Participants

45 subjects with age group 20-55 years were recruited for the study. Inclusion criteria were (i) Subjects who gave written informed consent, (ii) Subjects with age group between 20-55 years, (iii) Gender- both male and female were enrolled, (iv) Subjects diagnosed with sciatica and (v) Subject with positive straight

leg raise were included. Exclusion criteria were (i) Subjects with recent surgery of spine and lower limb, (ii) Subjects with history of Malignancy,(iii) Subjects with spine and lower limb metal implant,(iv) Pregnancy, (v) Subjects with vascular disorders and diabetic neuropathy,(vi) Subjects with spine and lower limb fracture and (vii) Subjects with defective skin condition like psoriasis and eczema.

Study design

A study Quasi- Experimental in nature with comparative design was carried out for one and half year. The sample was conveniently divided into 3 groups: Group "A" was given TENS and hydro collator. Group "B" was given slider Mobilization in addition to TENS and hydro collator pack and Group "C" was given Single Joint Mobilization (Knee) in addition to TENS and hydro collator pack. The baseline data was recorded on 1st day pre-intervention, 5th and 10th day post- intervention. Total 10 sessions per subjects was given for consecutive 2 weeks i.e., 5 sessions per week.

INTERVENTIONS

Ethical approval was obtained from DAV Institutional Ethical committee (no. MPT-2021-2023)

Total 50 subjects were approached during the study. Only 45 subjects between the age group of 20- 55 years, who satisfied inclusion and exclusion criteria were recruited for the study. After explaining need and procedure of study, written informed consent was obtained from subjects.

Hydro collator pack: Hydro collator pack was applied over low back region for 10 minutes in prone lying position[3].

TENS: The Frequency of 100Hz, 4-channel Transcutaneous Electrical Nerve Stimulation (TENS) was applied at the well-tolerated intensities on painful region for 15 min, the electrodes were positioned at the level of para spinal i.e., L4-L5 and L5–S1[9].

Slider mobilization: The subject was in high sitting, therapist passively extended subjects knee from 80° of flexion to 20° of flexion, while the subject simultaneously performed active cervical spine extension from full comfortable cervical flexion to full comfortable cervical extension[13].

Single joint mobilization: The subject was in high sitting position, therapist passively extended subjects knee from 80° of flexion to 20° of flexion, while the subject looked straight to maintain the cervical spine in a neutral position[13].

Main outcome measures

Visual analogue scale (vas): A 10 cm straight line was drawn on a paper marked with number 0 to 10. Where 0 represents no pain and 10 represents the worst tolerable pain. The subjects were asked to encircle a point on the line as per the severity of his/her pain. This point indicated present pain severity[9].

Modified Schober test: For Lumber flexion the first mark was at the lumbosacral junction, the second mark was 10 cm above the first mark. The third mark was 5 cm below the first mark. The measuring tape was aligned between both superior and inferior mark. Subject were asked to bend forward by keeping knee straight as far as possible. The range of motion was the difference between 15 cm and length was measured at the end range of motion[14] .

For Lumber extension subject were asked to bend backward as far as possible and put his/her hand on the buttocks. The distance was noted between superior and inferior mark at the end range of motion. The range of motion was the difference between 15 cm and the length was measured at the end range of motion[14].

Straight leg raise: The subject were in supine position. The therapist passively flex and adduct the hip, extend the knee and dorsiflex the ankle. Hip flexion continued until the patient complaints of pain, discomfort or tightness at the low back or back of the leg. Straight leg raise was assessed by universal goniometer[15].

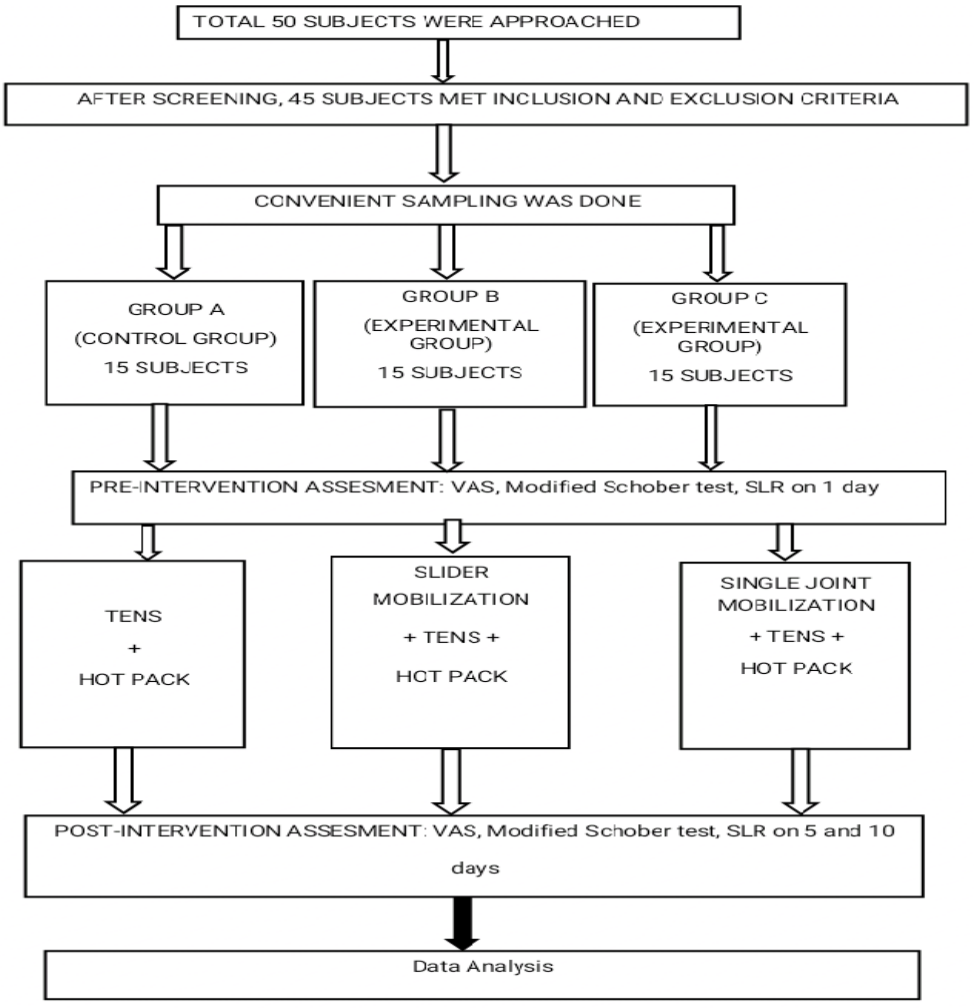

Figure 1: Flow chart depicting interventions given in each group and data collection on 1st, 5th and 10th day

DATA ANALYSIS

Data analysis was carried out after collecting the data of three outcome measures of the A, B and C group. Reading of the data were taken for pain, lumbar mobility and straight leg raise on day 1st, 5th and10th day. Data analysis was done by SPSS software version 18. Repeated measure ANOVA was done for intra group analysis. For inter group analyses was done by one way ANOVA and Post Hoc analysis by Tukey's.

Inter group analysis for pain, lumbar mobility and straight leg raise on the 1st, 5th and 10th was done using Post Hoc analysis by Tukey's. Level of significance selected for study was $p<0.05$.

RESULTS

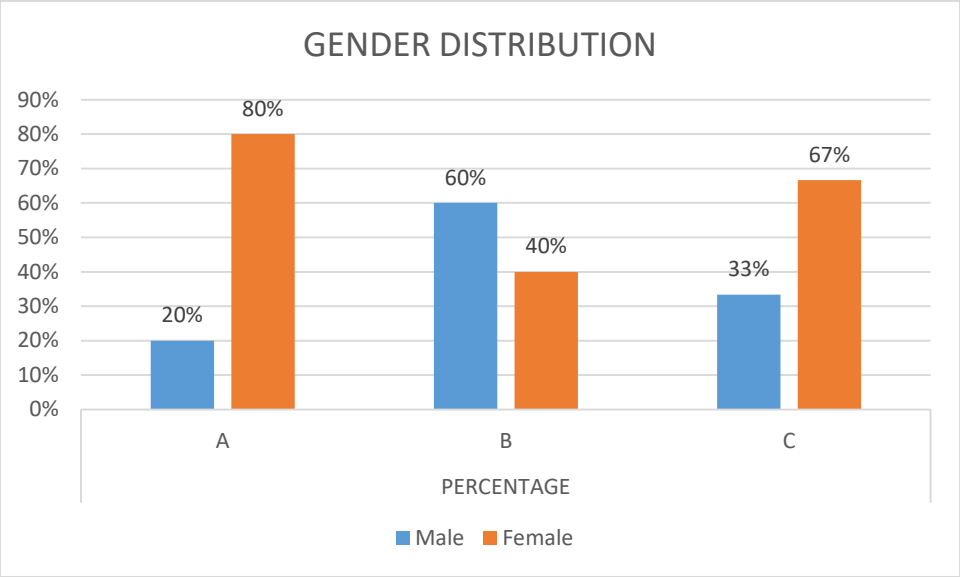

Figure 2: Analysis for gender variability

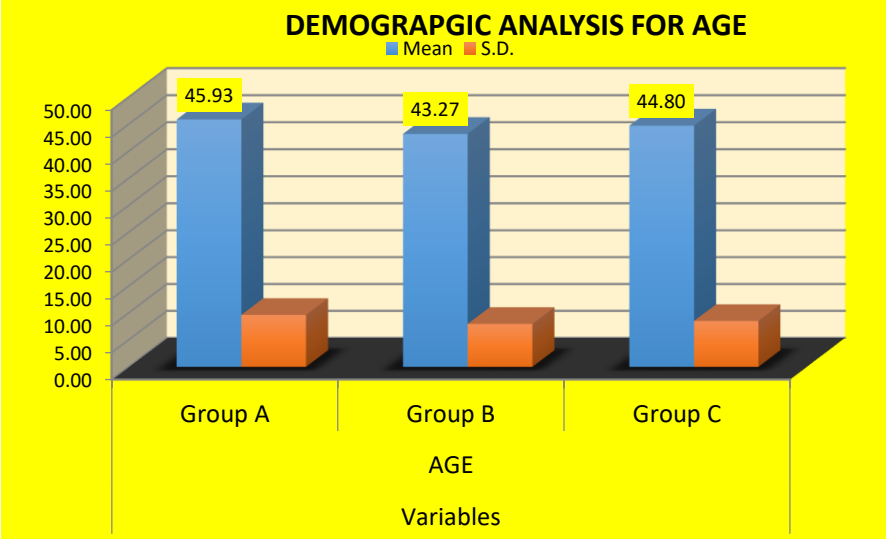

Figure 3: Analysis for age distribution

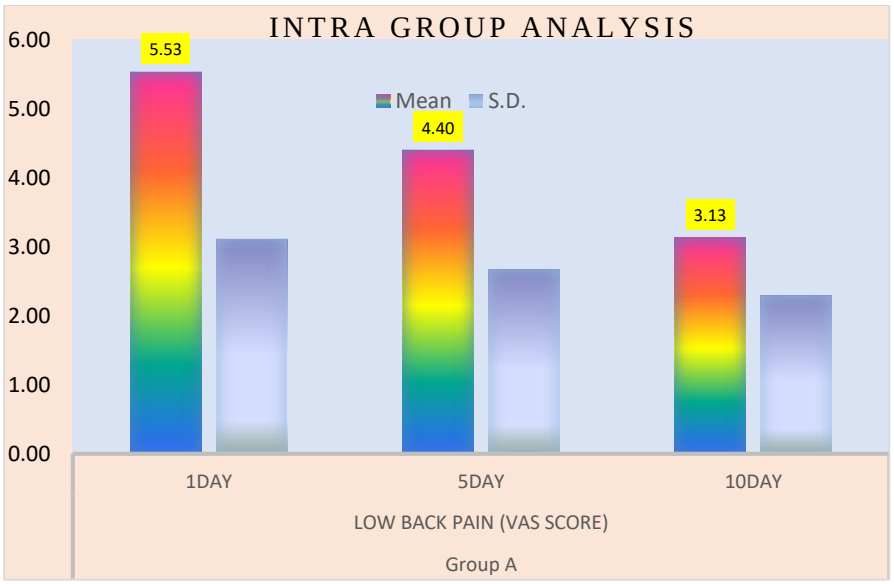

Figure 4: Analysis for change in VAS Score for group A

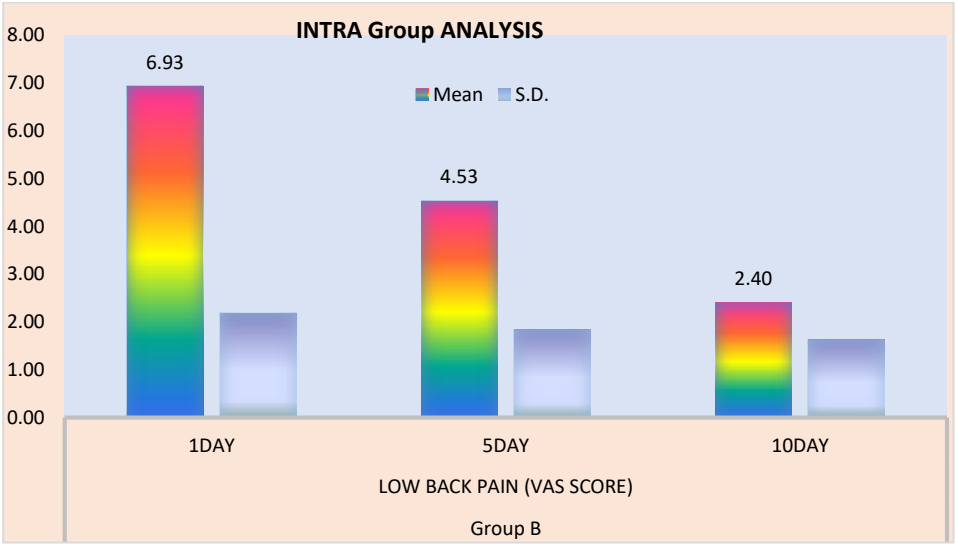

Figure 5: Analysis for change in VAS Score for group B

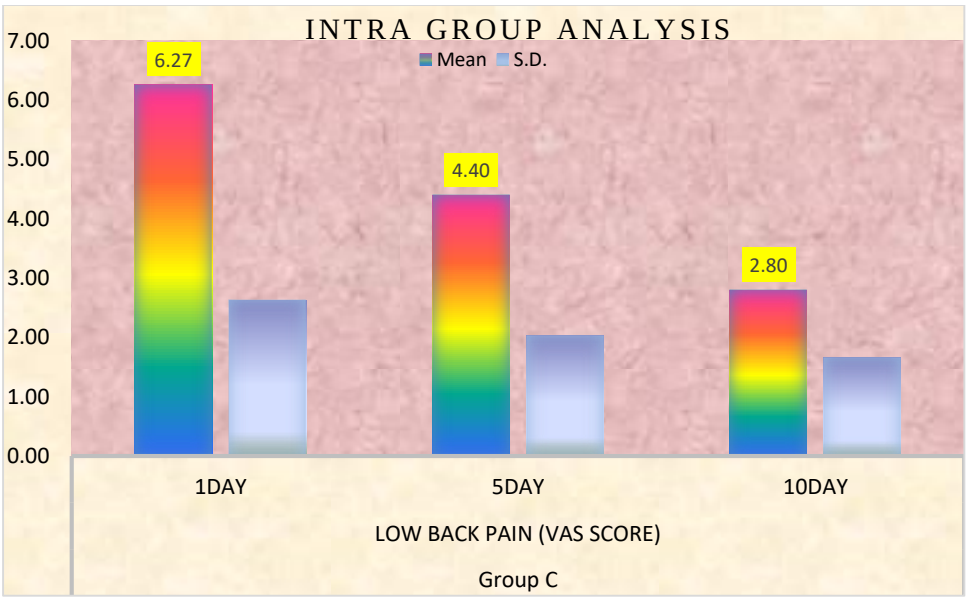

Figure 6: Analysis for change in VAS score of Group C

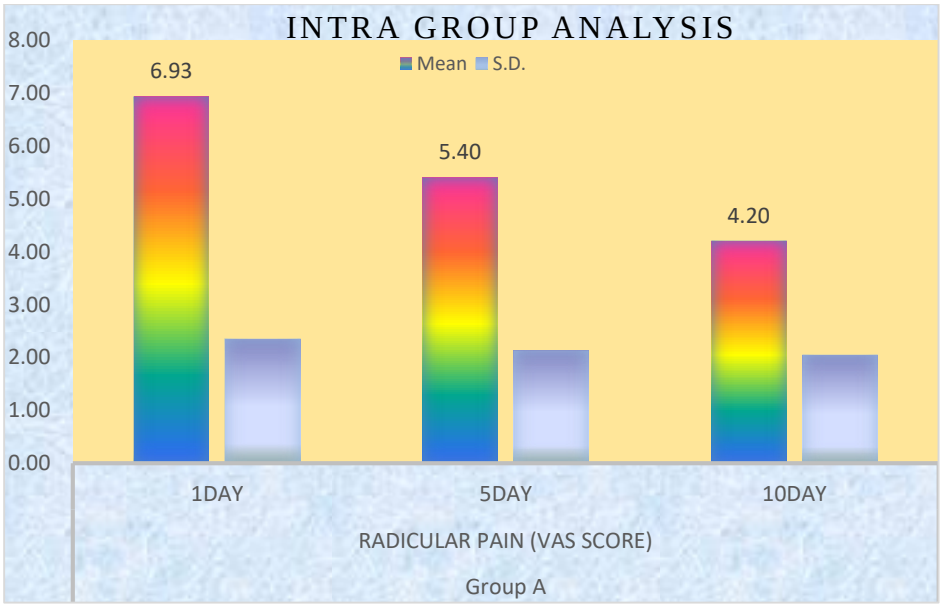

Figure 7: Analysis for change in VAS score of Group A

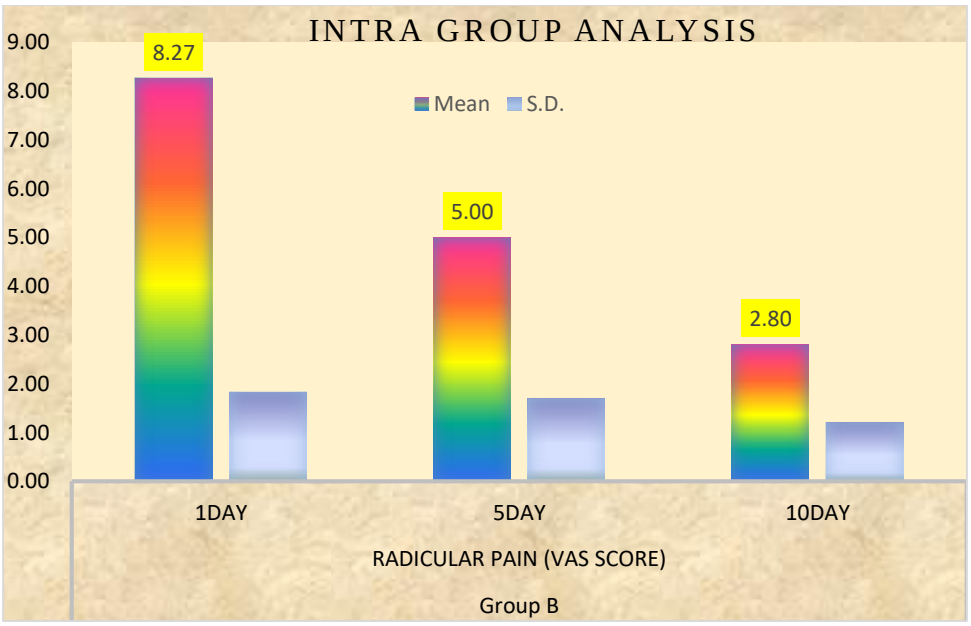

Figure 8: Analysis for change in VAS score of Group B

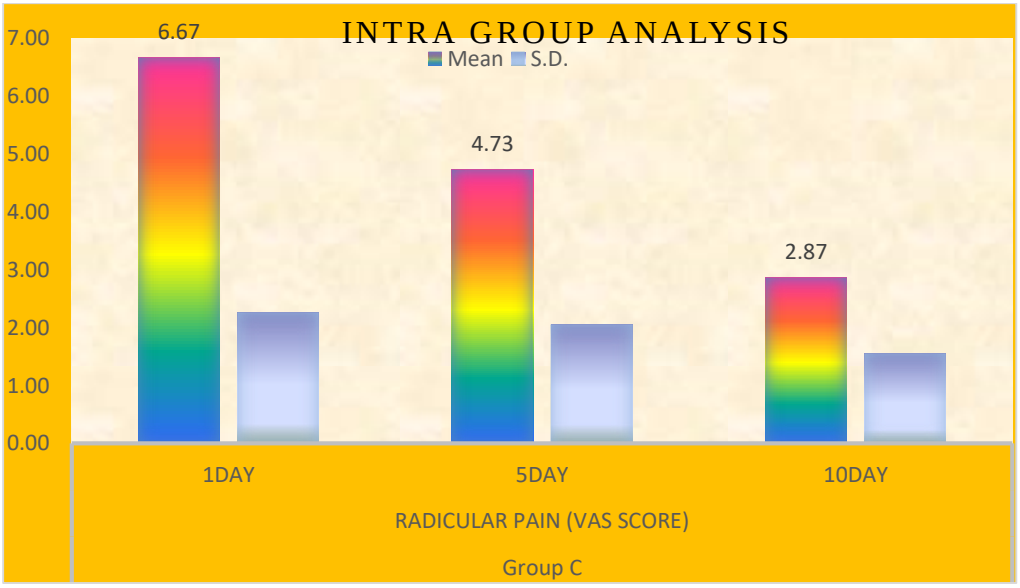

Figure 9: Analysis for change in VAS score of Group C

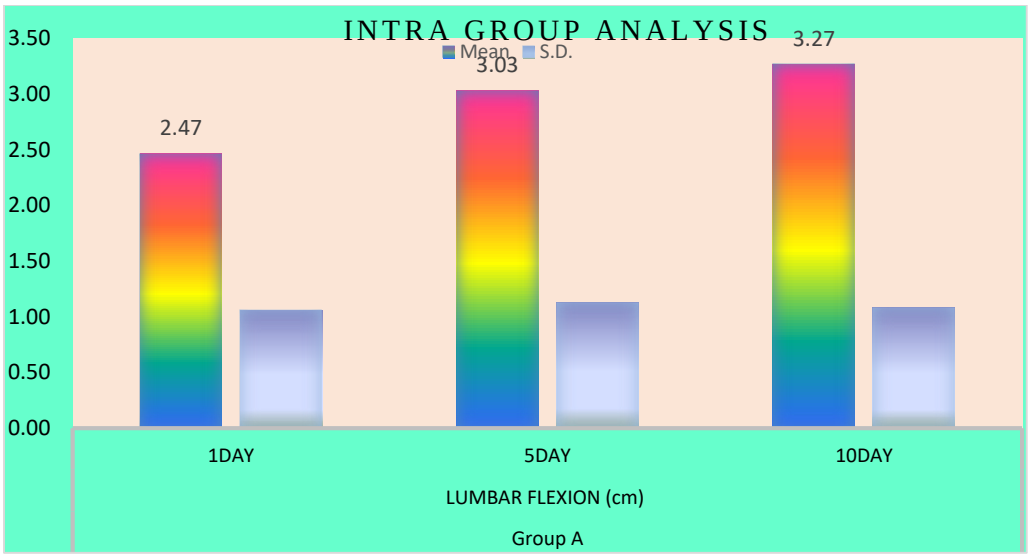

Figure 10: Analysis for change in Modified Schober Test readings of Group A

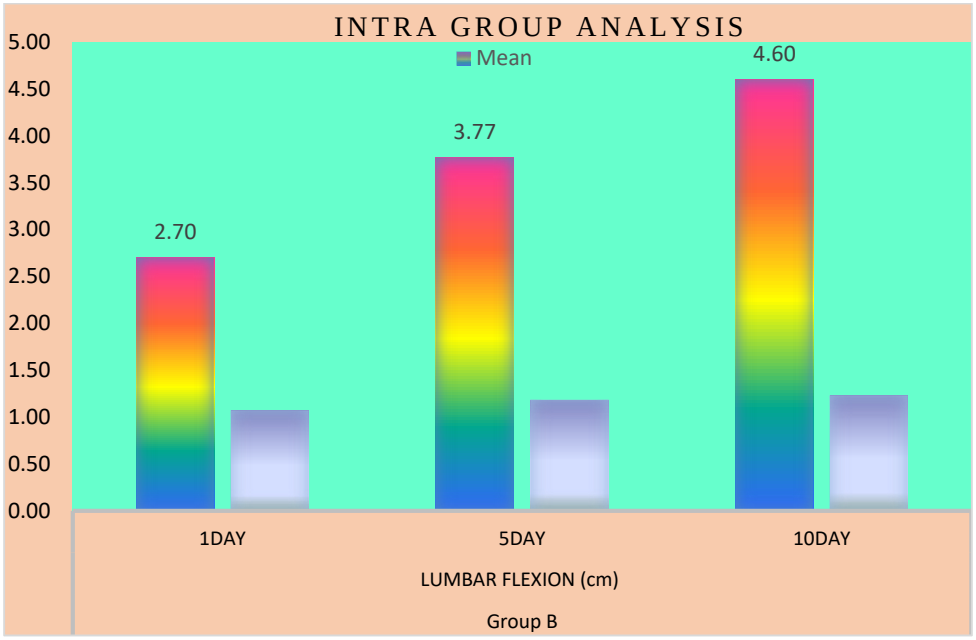

Figure 11: Analysis for change in Modified Schober Test readings of Group B

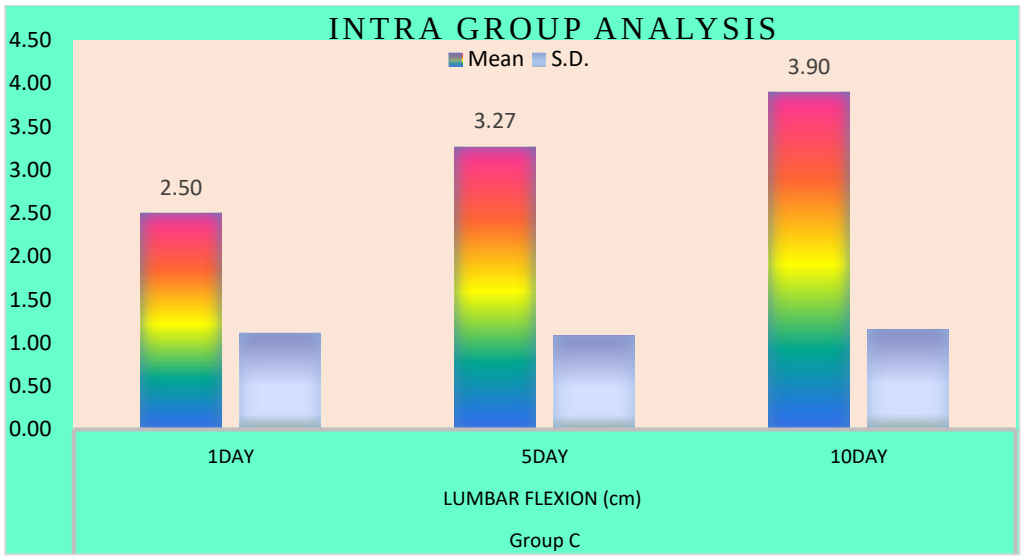

Figure 12: Analysis for change in Modified Schober Test readings of Group C

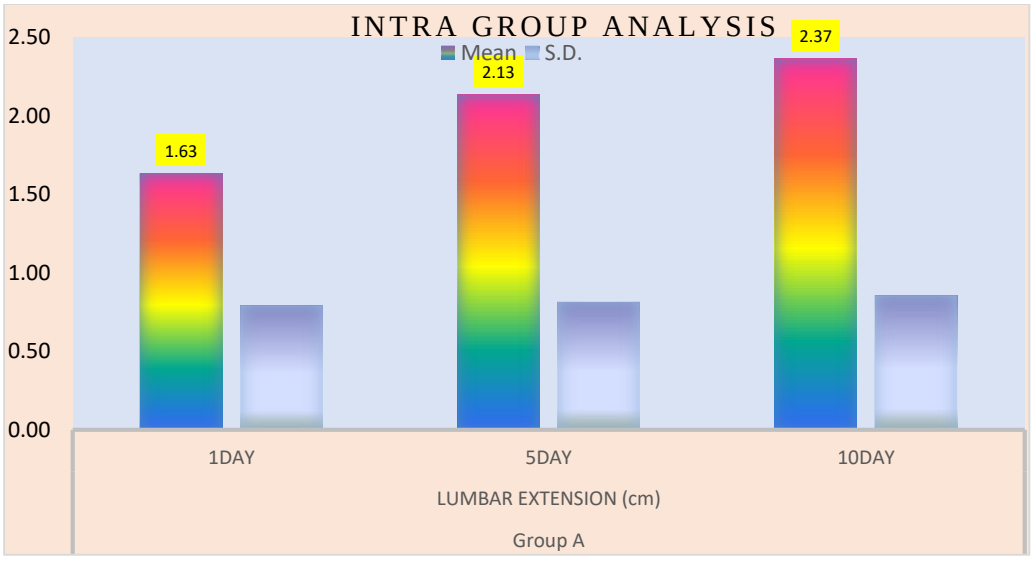

Figure 13: Analysis for change in Modified Schober Test readings of Group A

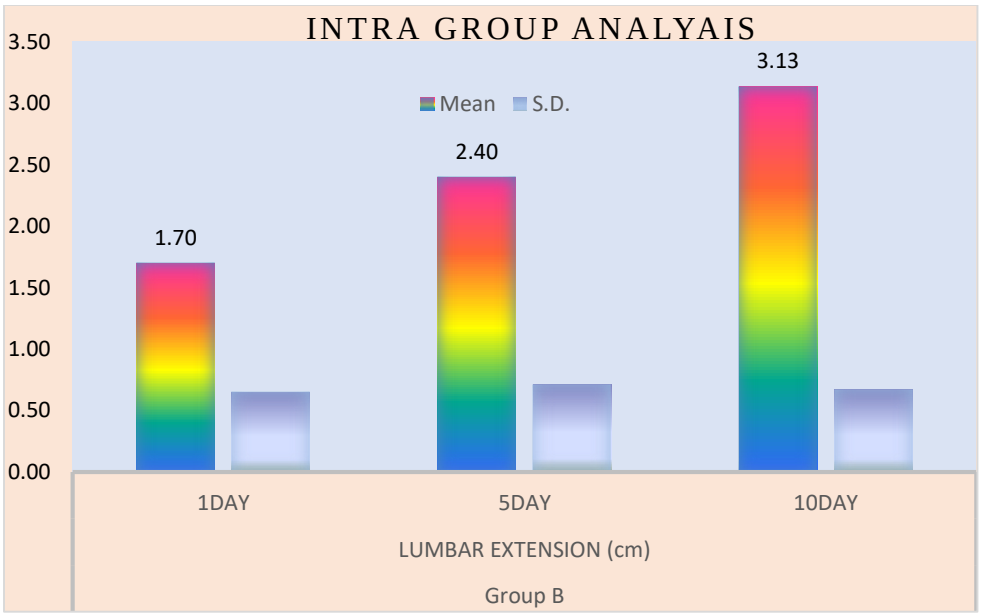

Figure 14: Analysis for change in Modified Schober Test readings of Group B

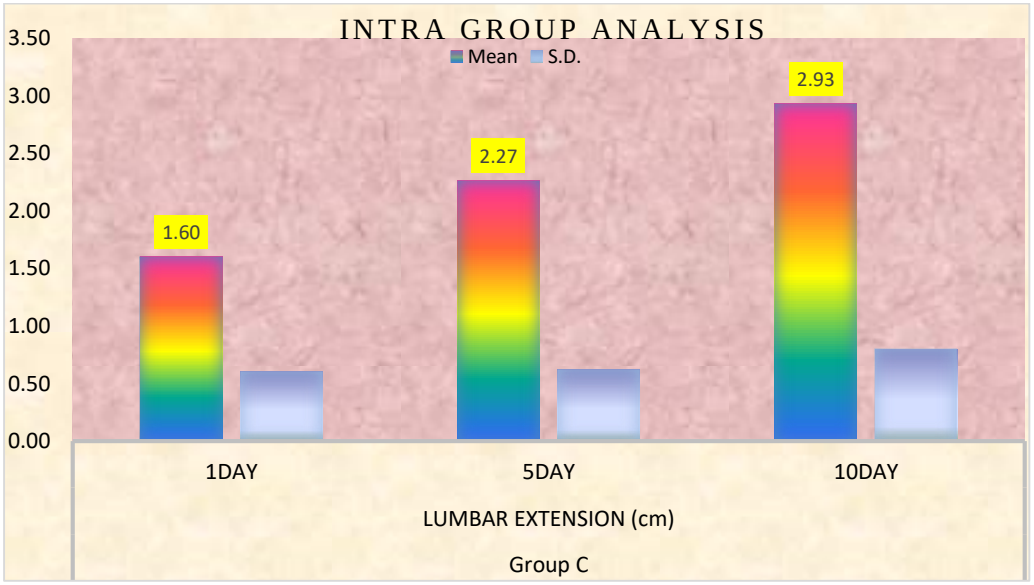

Figure 15: Analysis for change in Modified Schober Test readings of Group C

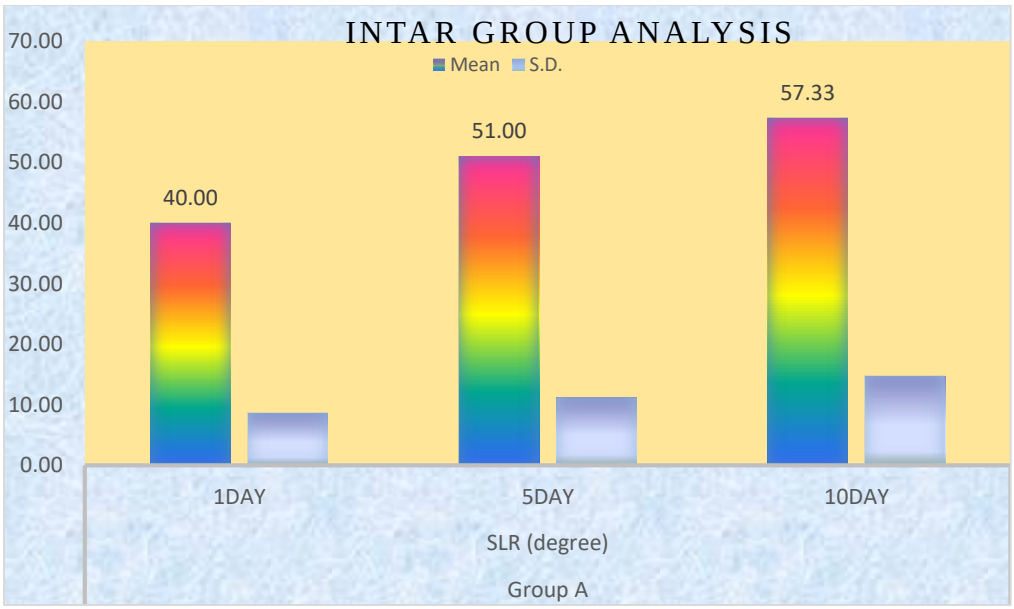

Figure 16: Analysis for change in SLR readings of Group A

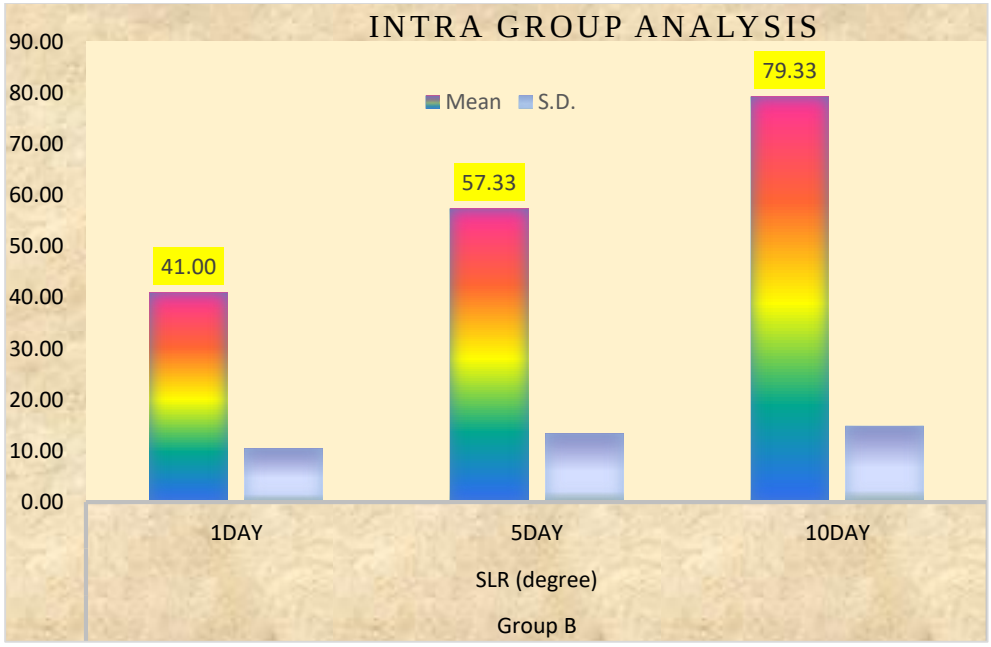

Figure 17: Analysis for change in SLR readings of Group B

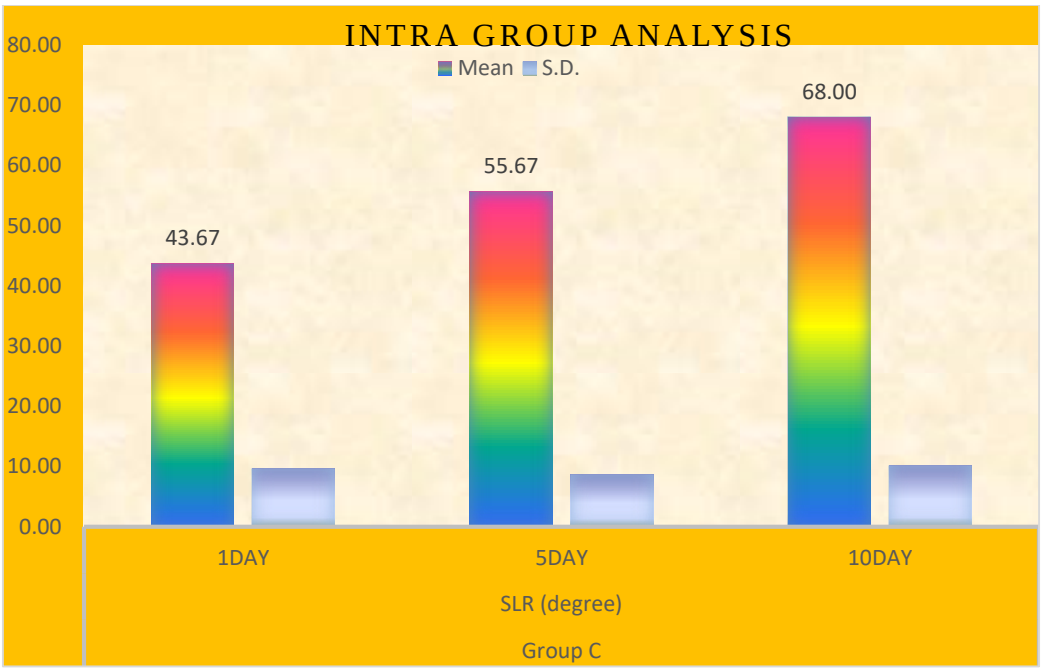

Figure 18: Analysis for change in SLR readings of Group C

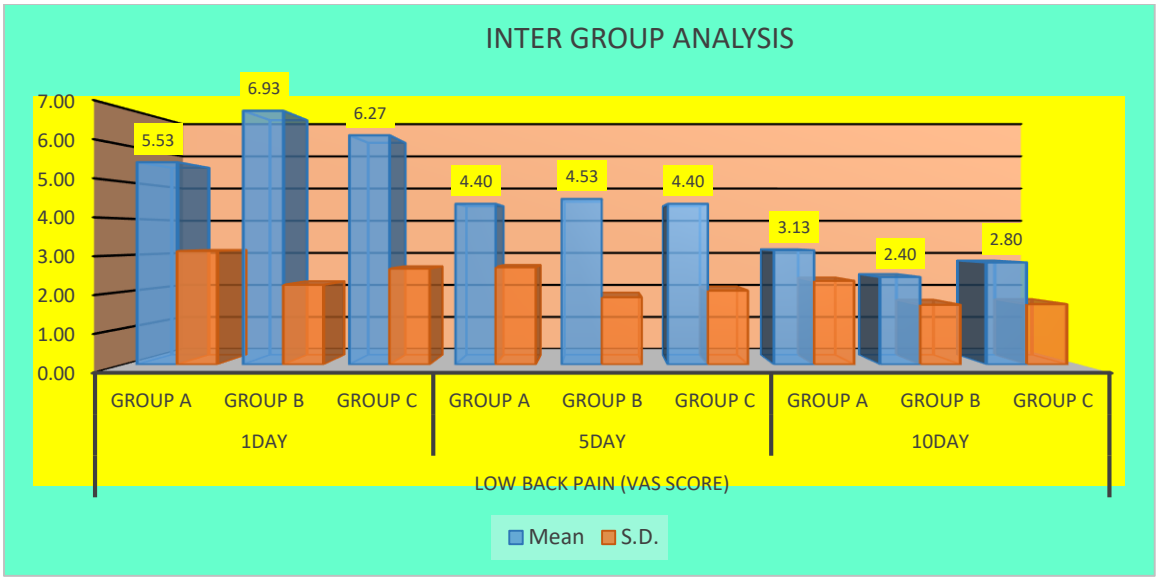

Figure 19: Analysis for change in VAS readings of Group A, B and C on 1st, 5th and 10th day

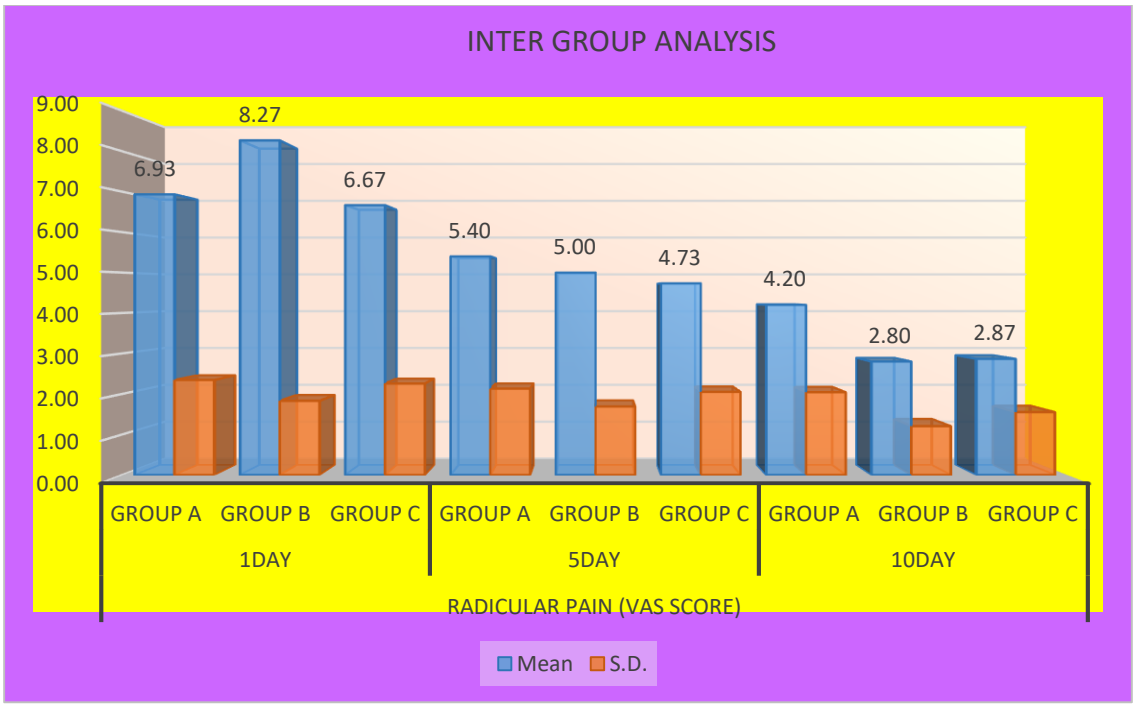

Figure 20: Analysis for change in VAS score of Group A, B and C on 1st, 5th and 10th day

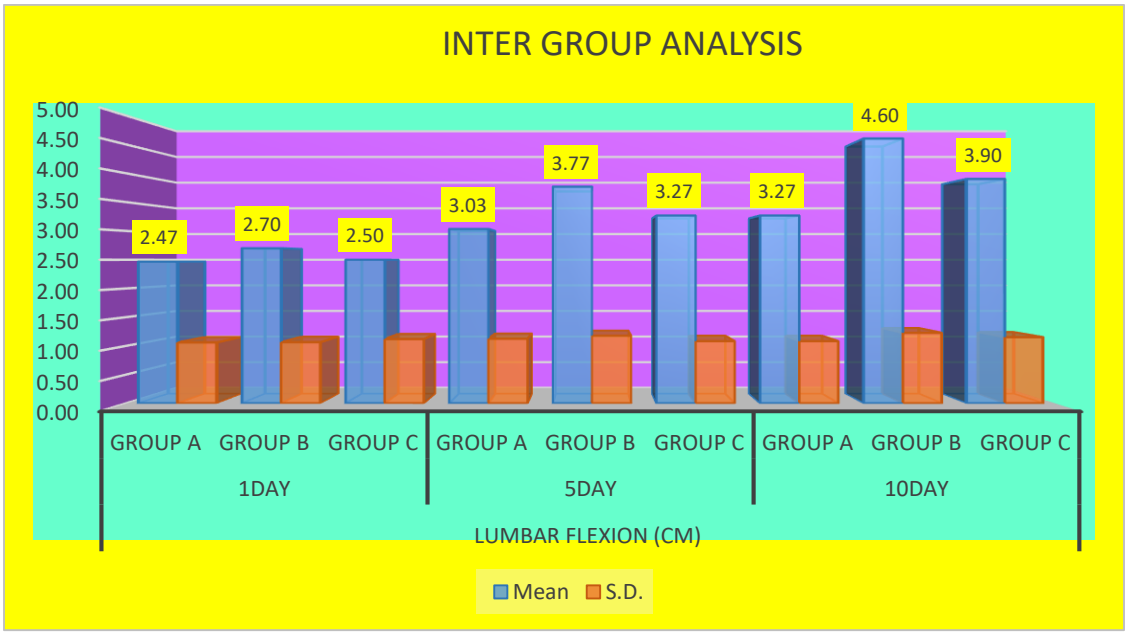

Figure 21: Analysis for change in Modified Schober Test readings of Group A, B and C on 1st, 5th and 10th day

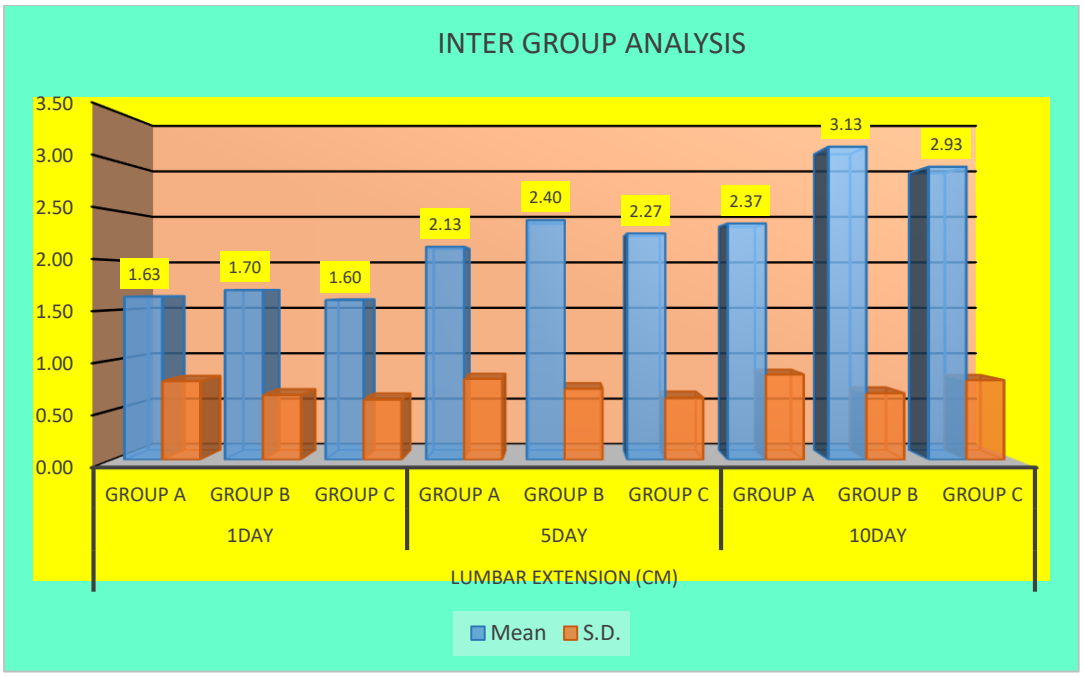

Figure 22: Analysis for change in Modified Schober Test readings of Group A, B and C on 1st, 5th and 10th day

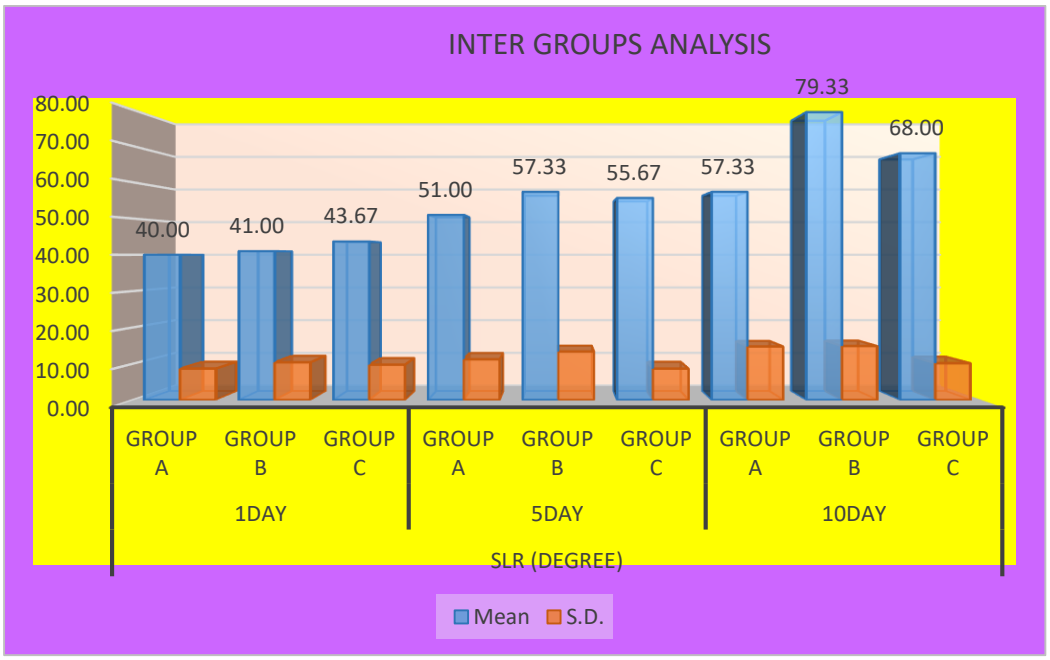

Figure 23: Analysis for change in SLR readings of Group A, B and C on 1st, 5th and 10th day

DISCUSSION

The findings of the current study revealed that slider mobilization nerve flossing technique in group C was found to be more effective than single joint mobilization nerve flossing technique on pain, lumbar mobility and SLR in subjects with sciatica because the amount of nerve excursion caused by slider mobilization is more than single joint mobilization.

A present study on Influence of Nerve Flossing Technique on acute sciatica and hip range of motion in 2015 by Anikwe EE, Tella BA, Aiyegbusi AI and Chukwu SC, concluded that TENS showed decrease in pain intensity in the joint capsule due to stimulation of mechanoreceptors by the pain modulation[5]. Another study conducted by Vijayaraj V in 2018 on A comparative study between McKenzie technique and neural mobilization in chronic low back pain patients with radiculopathy concluded that TENS showed significant results in decreasing pain, improved functional ability and increased lumbar mobility in chronic low back pain with rediculopathy[4].

Our findings find support in the study of Thakur A, Mahapatra RK and Mahapatra R in 2015 on Effect of Mulligan spinal mobilization with leg movement and Shacklock neural tissue mobilization in lumbar radiculopathy, they concluded that hot pack in combination to spinal mobilization with leg movement technique showed significant improvement of pain intensity, lumbar ROM and SLR in LBP with lumbar radiculopathy[3].

The literature available shows that the application of hot pack cause vasodilatation resulting in increased blood circulation and improves metabolism. Moreover increase in the metabolism results in the removal of metabolic waste and increase in oxygen demand. This mechanism was stated by Van't Hoff's law. Thus, this law explains the physiological effects of heat over pain reduction[17].

A study in 2018 demonstrated the Effect of neurodynamic mobilization on pain and function in subjects with lumbo-sacral radiculopathy by Sharma SS and Sheth MS and came to the conclusion that neuro-dynamic mobilization showed significant in reducing low back pain as well as SLR in subjects with lumbo-sacral radiculopathy[10]. Another study that supports the result of our study by Tejashree D, Ajit DS and Gandhi K in 2014 identified Effect of neural mobilization on agility in asymptomatic subjects using sliders technique, concluded that sliders mobilization in combination with conservative treatment showed significant results in ROM, strength and agility[12].

Our findings bear resemblance to the observation of Anikwe EE, Tella BA, Aiyegbusi AI and Chukwu SC on Influence of Nerve Flossing Technique on acute sciatica and hip range of motion in 2015 and came to the conclusion that nerve flossing technique therapy showed significant improvement in radicular pain and hip ROM[5].

A present study in 2016 identified by LDesoky MT and Abutaleb on Efficacy of neural mobilization on low back pain with S1 radiculopathy and concluded that neural mobilization showed significant improvement in pain, functional disability and enhancing physical function of the nerve in LBP with lumbosacral rediculopathy[7].

The mechanism behind improvement in pain and range of motion by nerve flossing technique is due to the increased in blood circulation, axon transportation and reduced pressure which is caused by intra neural and extra neural fibrosis. Thus, tissue mobility is restored by increase in vascular and exoplasmic flow. Moreover, the reduction in nerve compression, friction and tension results in decreased machanosensitivity. All these physiological effects of the technique helps in improving ROM of hip and spine. Therefore, results in improvement of lumbar mobility along with improvement in SLR[10].

Hence, the result of the present study revealed that there is statistically significant difference between slider mobilization and single-joint mobilization (knee) on pain, lumbar mobility and striaght leg raise in subjects with sciatica.

CONCLUSION

Therefore, the result of the study concludes that the experimental group B (slider mobilization) showed better results than group C (single joint mobilization) on improving the pain, lumbar mobility and straight leg raise in subjects with sciatica. Hence, this study support alternate hypothesis H_1

LIMITATIONS

The sample size for the study was small. Long term follow-ups of the subject have not been done. The study was defined to limited population. External factors affecting the progress cannot be controlled.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY STATEMENT

Data has been collected from the OPD (outpatient department) of D.A.V. Institute of Physiotherapy and Rehabilitation, Jalandhar and its affiliated hospitals.

CONSENT TO PUBLISH

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest to report

ETHICS APPROVAL STATEMENT

Authors reporting experiments on humans and the use of human tissue samples confirms that all experiments were performed in accordance with relevant guidelines and regulations. All methods were carried out in accordance with relevant guidelines and regulations. All experimental protocols were approved by DAV Institutional Ethical Committee (no. MPT-2021-2023). Informed consent was obtained from all subjects and/or their legal guardian(s).

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Both authors Dr. Carolina Walia (C.W.) and Dr. Vijayshree Singh (V.S), participated in framing of this review study. C.W. and V.S. participated in methodology and analysis. C.W and V.S contributed to conceptualization and writing. C.W and V.S took main contribution in manuscript writing. Both authors C.W. and V.S took main contribution in manuscript writing. Both authors C.W. and V.S. took part in manuscript revision and approval final version of the manuscript.

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