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Effect of Combination of Isotonics Technique of Posterior Oblique Sling With Conventional Physiotherapy on Patients With Mechanical Low Back Pain

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ABSTRACT

This study was an experimental type of study. Sample size was determined by simple non probability sampling method. Sample size was taken to be 36. The persons who were diagnosed with Mechanical low back pain and persons who came under the inclusion criteria are selected for the study. A clear explanation about the study and consent form were given to the patients who are willing to participate. Assessment of the patient included NPRS score, Lumbar flexion and extension measurement. Their evaluation was taken at the start of treatment and after 4 weeks of treatment. Consent was obtained from the subject and the procedure was explained to them. All the subjects in these group were given combination of isometrics technique for posterior oblique sling.

This study examined the Numerical pain rating scores (NPRS) and Lumbar flexion measurement before and after the treatment of Mechanical low back pain with combination of isotonics technique on posterior oblique sling and conventional physiotherapy. The mean of NPRS scores pretreatment is 6.35 score out of 10 with standard deviation 1.13. Therefore, mean with standard deviation of pretreatment NPRS scores is 6.35 ± 1.13 . The post treatment Mean of NPRS scores with the standard deviation is 3.23 ± 1.03 . The mean and standard deviation of Lumbar flexion measurement Pretreatment is 3.94 ± 0.97 . The mean and standard deviation of Lumbar flexion measurement Post treatment is 6.82 ± 0.75 . Hence, there is significant improvement of lumbar flexion in the patients treated.

KEYWORDS: PNF, Low back pain, posterior oblique sling exercises.

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INTRODUCTION

Proprioceptive neuromuscular facilitation (PNF) is a concept of treatment. Its underlying philosophy is that all human beings, including those with disabilities, have untapped existing potential¹. Dr. Kabat developed the PNF method by working with patients until he arrived at combinations that made sense. He combined motions to ascertain the effectiveness of maximal resistance and stretch in facilitating the response of a weak distal muscle by irradiation from a stronger proximal muscle which was related in function. Techniques of PNF are used to place specific demands in order to secure a desired response. Facilitation, by definition, means, the promotion or hastening of any natural process; the reverse of inhibition specifically, the effect produced in nerve tissue by the passage of an impulse the resistance of the nerve is diminished so that a second application of the stimulus evokes the reaction more easily " Proprioceptive means "receiving stimulation within the tissues of the body. Neuromuscular (neuromyal) means "pertaining to the nerves and muscles." Therefore, techniques of proprioceptive neuromuscular facilitation may be defined as methods of promoting or hastening the response of the neuromuscular mechanism through stimulation of the proprioceptors.²

Form Closure and Force Closure

The pelvic girdle receives its stability from the interconnection between the symphysis pubis and the sacroiliac joints, a strong ligamentous system and the wedge shape of the sacrum, fitting vertically between the innominates. These elements build a self-locking system and contribute to the form closure of the pelvic girdle. If the sacrum were to fit perfectly between the innominates, practically no movement would be possible. Some degree of movement in the sacroiliac joints has been described and up to 1.6 mm of translation and about 4° of rotation has been measured. In order to withstand vertical loads, such as in standing positions, and to prevent shear forces, a lateral force and friction are needed to maintain stability. This occurs by the nutation movement of the sacrum in relation to the innominates and by compression generated by the myofascial structures. This is called as force closure³.

The Posterior Oblique Sling

Posterior oblique sling, containing connections between the latissimus dorsi and the contralateral gluteus maximus through the thoracodorsal fascia. The posterior oblique sling has been shown to affect the force closure at the SIJ. Gluteus maximus (GM) has the greatest capacity for force closure via the posterior layer of the Thoracolumbar fascia (TLF) and has been noted to transmit tension directly behind

the Sacroiliac joint as low as S3. van Wingerden et al. report that Gluteus maximus contraction causes an increase in stiffness at the Sacroiliac joint that noted with contraction of latissimus dorsi during gait. Rotation against resistance has been found to activate the posterior oblique sling. GM creates a muscle link between the tensor fascia Lata and the TLF. Contraction of the GM increases stiffness in both fascia that span the lumbar spine, SIJ and hips. Hungerford et al. (2003) have found that the onset of contraction of gluteus maximus is altered with SIJ dysfunction³.

Predictors Of Chronic Incapacity for Low Back Pain

Many subjects with chronic LBP have been reported to have a psychological profile that predisposes them to develop chronic pain. Additionally, people aged between 50 and 60 years are more likely to become disabled because of LBP. Further major predictors are listed here. People who have unrealistic beliefs about their pain and the nature of their disease, People whose occupation involves heavy manual work and sustained postures, People with a previous history of sickness absence, People who seek multiple investigations and treatments, People with low educational achievement or low-status occupations, People who have pending compensation issues, People with fear-avoidance beliefs, that a fear of activity may be more disabling than the original injury, People who exhibit 'illness behavior', which may include attention seeking, grimacing, catastrophizing excessive use of splints, braces, walking aids⁴.

Prevalence of Low Back Pain in India

31 studies have reported the prevalence of back pain. The prevalence of back pain has been found to range 49.1% in Indian population depending upon the population under study⁵.

RESEARCH DESIGN AND METHODOLOGY

1. Type of study- experimental study
2. Sampling method– Simple non probability sampling.
3. Study setting – Outpatient department of Nanded physiotherapy college and research center.
4. Sample size – 36

INCLUSION CRITERIA

- Ages between 20 to 50 years were selected.
- Both male and female patients were selected.
- Patients having chronic low back pain with more than 3 months of duration.
- Low back pain with non-specific nature (mechanical) i.e., without identifiable specific anatomical or neurophysiological causative factors.

EXCLUSION CRITERIA

- Patients with nerve root pain signs.
- Patients with spine pathology.
- Patients with previous spinal surgery.
- Spondylosis.
- Spondylolisthesis
- Past history of vertebral fractures
- Systemic disorders like tuberculosis of spine or rheumatoid arthritis.

MATERIALS USED

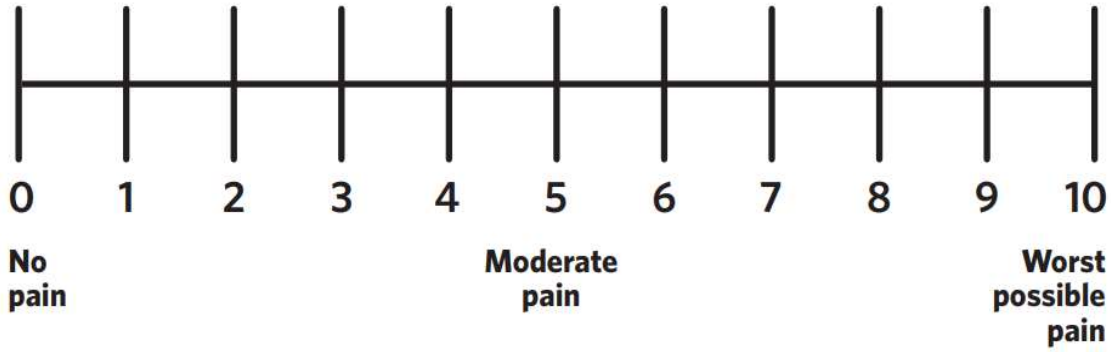
- Plinth.
- Inch tape.
- Marker.
- Paper.
- Scale.
- Patient record form.
- Numerical pain rating scale

OUTCOME MEASURES

Pain measurement – Pain was measured using Numerical pain rating scale, in which patients were asked to rate their pain on the scale according to the severity.⁶ Lumbar flexion ROM measurement – Lumbar flexion and were measured using Modified Schober test⁷.

Fig. I Lumbar flexion ROM measurement

On a scale from 0 to 10, where 0 is no pain and 10 is the worst pain you've experienced, at this moment, what number represents your overall pain level?



PROCEDURE

Calculation of Sample Size

- The formula of sample size is taken to be:

$$n = \frac{z^2 P(1-P)}{E^2}$$

- Where 'z' is confidence interval and is 95% and therefore it is taken to be 1.96⁸.
- There are 10 patients in our OPD out of 100 therefore value of 'P' is 0.1
- Value of 'E' i.e., error is 0.1.
- So, by calculation sample size is 36.
- The persons who were diagnosed with Mechanical low back pain and persons who came under the inclusion criteria are selected for the study. A clear explanation about the study and consent form were given to the patients who are willing to participate.
- Assessment of the patient included Numerical pain rating scale (NPRS) score, Lumbar flexion and extension measurement.
- Their evaluation was taken at the start of treatment and after 4 weeks of treatment. Consent was obtained from the subject and the procedure was explained to them.
- All the subjects in these group were given combination of isotonic technique on posterior oblique sling with conventional physiotherapy.

Conventional Physiotherapy

It includes hot packs, Transcutaneous electrical nerve stimulation (TENS burst mode), Mobilizations, Centralization- Peripheralization exercises (McKenzie approach), Abdominal strengthening exercises⁹.

Exercises For Activation of Posterior Oblique Sling

Quadruped hip extensions, Quadruped hip extension with shoulder extension and internal rotation, Quadruped hip extension with shoulder flexion and external rotation¹⁰.

Combination of Isotonics Technique

- Combined concentric, eccentric, and stabilizing contractions of one group of muscles (agonists) without relaxation. For treatment, start where the patient has the most strength or best coordination.
- Technique – The therapist resists the patient’s moving actively through a desired range of motion (concentric contraction).
- At the end of motion, the therapist tells the patient to stay in that position (stabilizing contraction).
- When stability is attained the therapist tells the patient to allow the part to be moved slowly back to the starting position (eccentric contraction).
- There is no relaxation between the different types of muscle activities and the therapist’s hands remain on the same surface¹¹.

DESCRIPTIVE STATISTICS –

Data analysis was done using Microsoft excel. The level of significance ‘P’ was set <0.05 for all the tests.

Table 1: Statistical analysis of NPRS score pretreatment and post treatment.

Parameter	Test	Mean	St. deviation	T stat	P value
NPRS score	PRE	6.35	1.13	16.33	<0.05
	POST	3.23	1.03		

Table 2: Statistical analysis of Lumbar flexion measurement pretreatment and post treatment.

Parameter	Test	Mean	St. deviation	T stat	P value
Lumbar flexion measurement	PRE	3.94	0.97	15.57	<0.05
	POST	6.82	0.75		

Chart 1: Total Males and Females in the study.

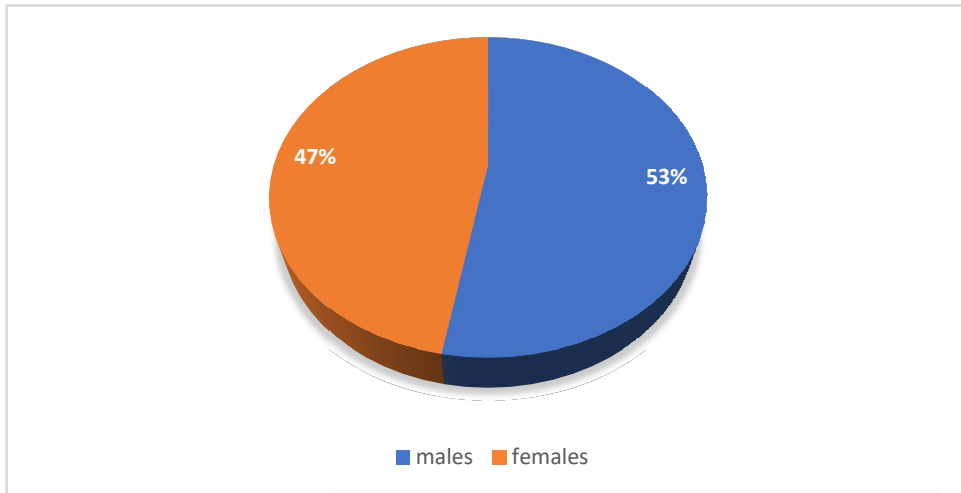


Chart 2: Comparison of pre and post treatment NPRS scores.

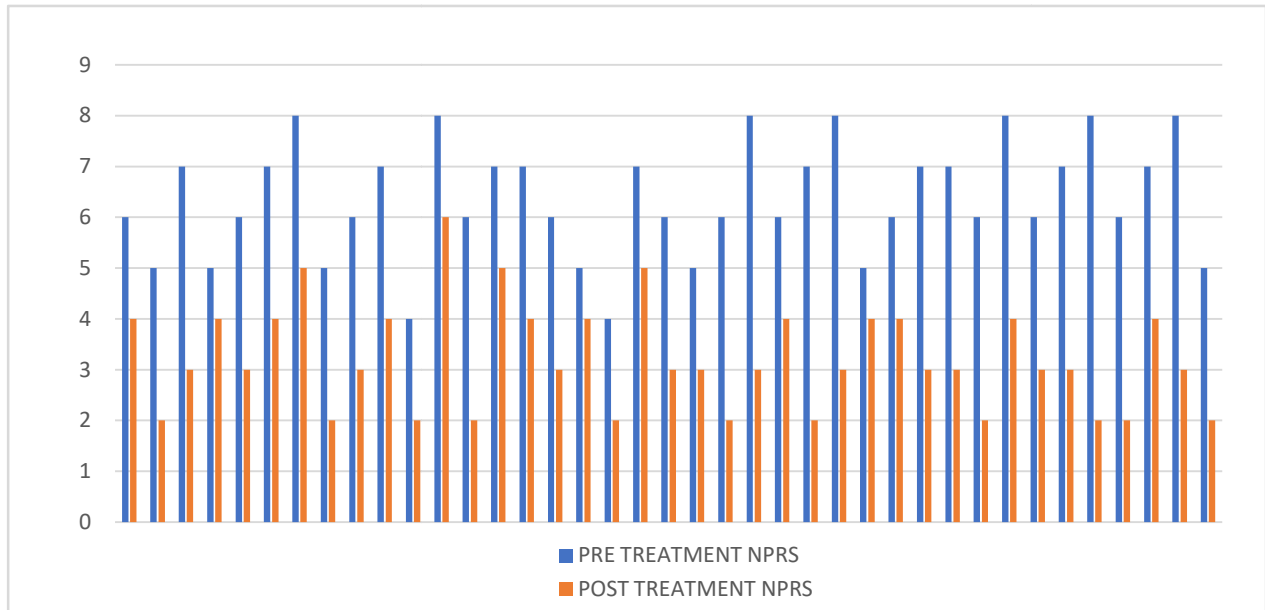


Chart 3: Comparison of mean of pre and post treatment nprs scores.

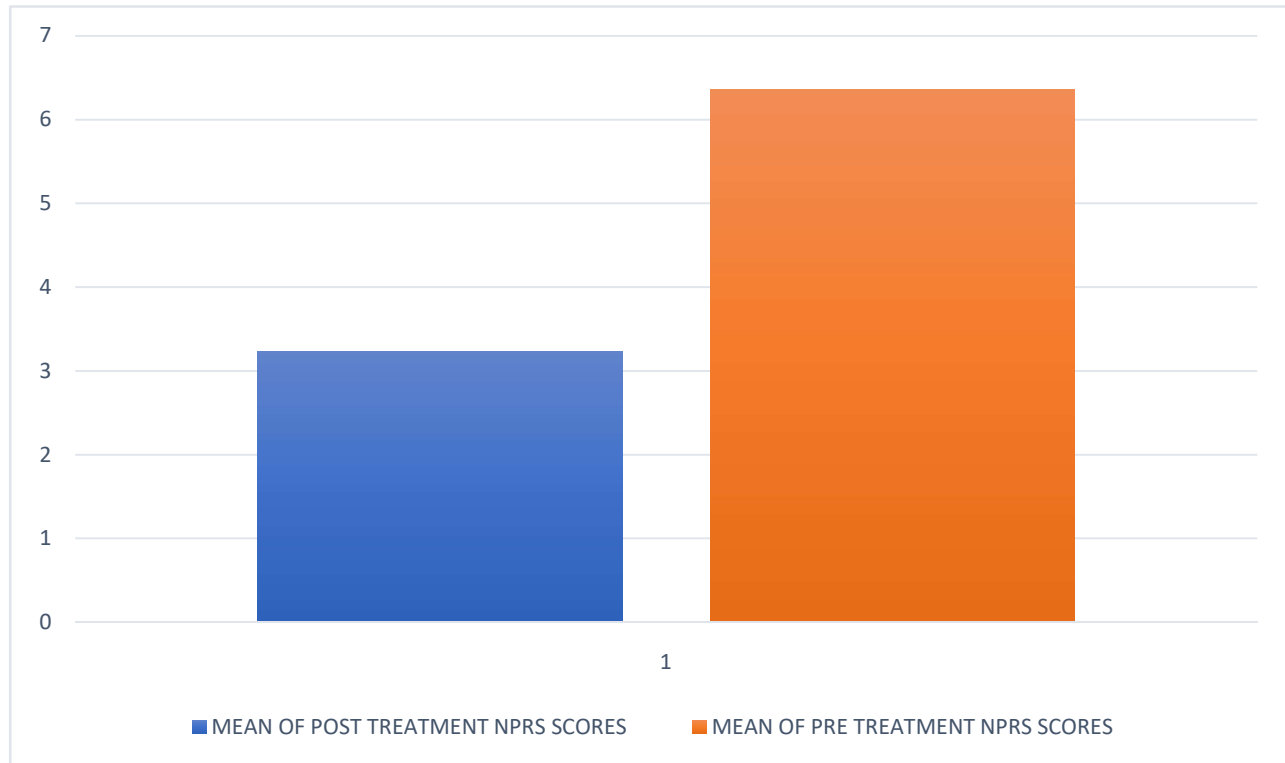


Chart 4: Comparison of pretreatment and post treatment lumbar flexion measurement.

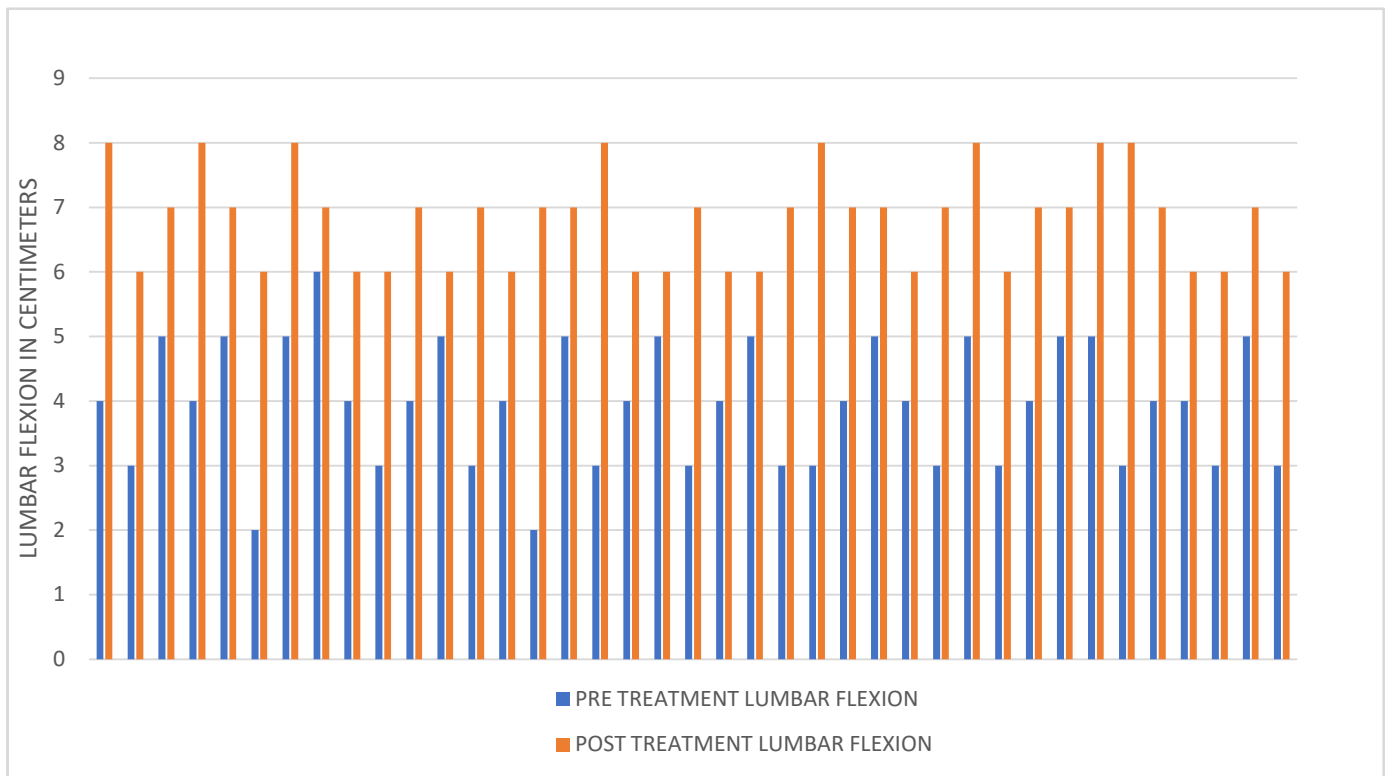
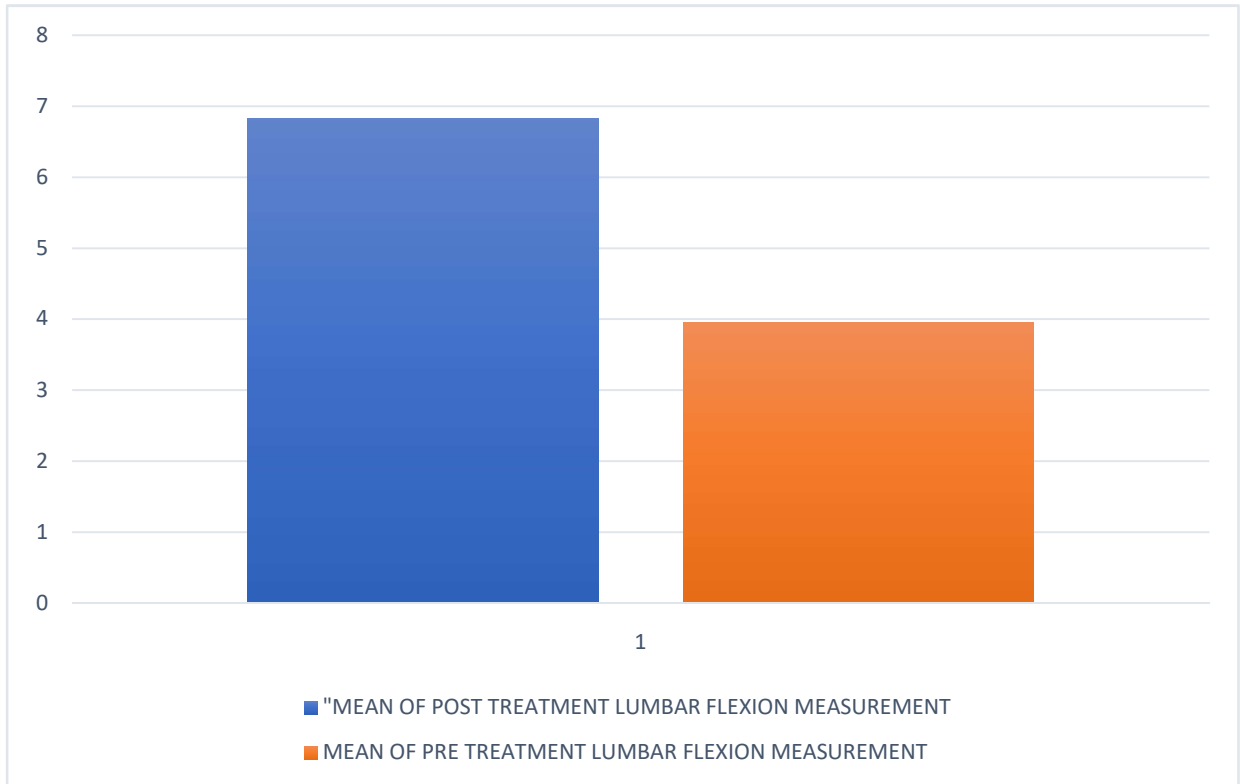


Chart 5: Comparison of mean of pre and post treatment lumbar flexion measurement



RESULTS:

This study examined the Numerical pain rating scores (NPRS) and Lumbar flexion measurement before and after the treatment of Mechanical low back pain with combination of isotonic technique on posterior oblique sling and conventional physiotherapy. The mean of NPRS scores pretreatment is 6.35 score out of 10 with standard deviation 1.13. Therefore, mean with standard deviation of pretreatment NPRS scores is 6.35 ± 1.13 . The post treatment Mean of NPRS scores with the standard deviation is 3.23 ± 1.03 . Therefore approximately 50.8% improvement in the NPRS score is seen. The mean and standard deviation of Lumbar flexion measurement Pretreatment is 3.94 ± 0.97 . The mean and standard deviation of Lumbar flexion measurement Post treatment is 6.82 ± 0.75 . Hence, there is significant improvement of lumbar flexion in the patients treated.

DISCUSSION:

The clinical course of low back pain can be described as acute, subacute, recurrent, or chronic. Given the high prevalence of recurrent and chronic low back pain and the associated costs, clinicians should place high priority on interventions that prevent recurrences and the transition to chronic low back pain¹². Sacroiliac joint dysfunction (SIJD) is estimated to be a primary pain source of low back pain in between 10 and 25% of affected patients¹³. This study is a one group case study, where one group were given conventional physiotherapy with combination of isotonic technique with posterior oblique sling exercises. The results of the study coincide with the study of Sayali R. Sawant, et al. where Subjects were randomly divided into two equal groups: PNF exercises and control. The PNF exercises group received upper and lower trunk PNF patterns, in addition to control group intervention. The control group received burst- mode TENS and Hot Pack for 4 weeks, 5 sessions per week. The conclusion of the study states that upper and lower trunk PNF exercises decrease pain and improve function and mobility of lumbar spine.

In this study, patients were given conventional physiotherapy with exercises which activate the posterior oblique sling with combination of isotonic technique. The exercises include Quadruped hip extensions (QHE), Quadruped hip extension with shoulder extension and internal rotation, Quadruped hip extension with shoulder flexion and external rotation (SFE). According to Sieun Park et.al QHE with SFE position may be clinically recommended as an effective exercise to improve EMG activity of POS muscles and increase lumbopelvic stability.

CONCLUSION:

The study aimed to show the effectiveness of conventional physiotherapy with exercises of posterior sling combined with combination of isotonic technique on patients suffering from low back pain. The study concluded that conventional physiotherapy with exercises of posterior sling combined with combination of isotonic technique is effective in relieving the pain and increasing the flexion range of motion in patients suffering from low back pain.

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