

ORIGINAL RESEARCH

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EFFECT OF HIP MOBILIZATION WITH EXERCISES FOR SUBJECTS WITH CHRONIC NON SPECIFIC LOW BACK PAIN ASSOCIATED WITH HIP IMPAIRMENT

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ABSTRACT

Background: There is a basic assumption from the studies on hip-LBP relationship that suboptimal function of the hip might result in an alteration of the mechanics of the lumbopelvic region. Evidence is mounting to support the possibility that low back pain may be result of hip rotation deficits. The excessive or limited hip rotation range of motion could be a predisposing factor for low back dysfunction. Exercises and hip joint mobilization, individually found to be effective in chronic nonspecific low back pain with hip impairment. Hence, the purpose is to find the effect of hip joint mobilization with stretching exercises on intensity of pain and functional disability for subjects with chronic nonspecific low back pain associated with hip impairment.

Method: An experimental study design selected 30 subjects with chronic low back pain associated with Hip impairment randomized 15 subjects each into Study and Control group. Control group received stretching exercises while Study group received hip joint mobilization with stretching exercises thrice a week for 3 weeks. Pain intensity was measured using Visual Analogue Scale and Functional disability was measured by Modified Oswestry Disability Index for LBP before and after 2 weeks of treatment.

Results: There is statistically significant difference in improvement in means of VAS and Modified ODI when analyzed within the group. When the post-intervention means were compared between Study and Control group there is a statistically significant difference in means after 2 weeks of treatment.

Conclusion: The present study concluded that the two weeks duration of combined hip joint mobilization with stretching exercises significantly effective on improving pain and functional disability than only stretching exercise regimen for chronic non-specific low back pain associated with Hip impairment.

Key words: Chronic low back pain, hip joint mobilization, stretching exercises, pain, hip impairment, functional disability.

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INTRODUCTION

Chronic nonspecific low back pain is defined as low back pain present for more than three months not attributable to a recognizable specific pathology and no precise structure has been identified causing the pain which may include lumbago, myofascial syndrome, muscle spasm, mechanical low back pain, and back sprain.¹ Nonspecific Low Back Pain has become a major worldwide public health problem with 11–12% of the population being disabled by low back pain². It is estimated that the prevalence of chronic low back pain (CLBP) is 23%.²

There is a basic assumption from studies on hip-LBP relationship that suboptimal function of hip might result in an alteration of the mechanics of the lumbopelvic region. Such alterations are proposed to contribute to low-magnitude loading of the lumbopelvic region and accumulation of tissue stress that, over time, contributes to tissue injury.^{3,4} The relationship between hip and lumbar spine pain has been labeled by some as the hip-spine syndrome.⁵ Spinal and hip movements are closely coordinated in many functional and daily activities, but only a few studies have investigated this relationship under anatomical, monoplane conditions.⁶⁻⁸

Recent studies have demonstrated an association between LBP and impairments in neuromuscular control between the hip and lumbopelvic region. Patients with LBP demonstrated less active hip motion and early compensatory lumbopelvic motion, suggesting altered lumbopelvic control and coordination.⁹⁻¹¹ It was estimated that the hips may be contributing pain generator in approximately 12.5% of patients with LBP.¹² Several studies have reported an association between LBP and hip rotation deficits impairments¹¹ including limitations in hip internal rotation, hip external rotation, total hip rotation, mobility using the flexion-abduction-external rotation (FABER) test, and hip flexion. The excessive or limited hip rotation range of motion could be a predisposing factor for low back dysfunction.⁸

Muscular imbalances contribute to habitual overuse in isolated joints and faulty movement patterns, creating repetitive micro trauma, dysfunction and chronic injury. Abnormal habitual posture causes tightness in Lumbo-Pelvic-Hip complex musculature causing abnormal stresses that increase shear or compressive forces on the joints that lead to excessive stress on the articular surfaces¹⁴ that develops into mechanical low back pain¹⁵. Studies have found that passive and active

stretching of muscles improves flexibility and increase range of motion in low back pain.¹⁶

Clinical decision making can be challenging when patients present with CLBP with concomitant hip impairments.¹⁷ It is found from a case study that impairment-based manual therapy and exercise for the hips in patients with CLBP can result in noticeable improvements in pain and disability.¹⁷ There are several studies linking LBP with impairments in hip ROM and neuromuscular control; however, there is little clinical evidence investigating the influence or treatment of these impairments. Therefore, the present study is with research question 'Whether the hip mobilization with stretching exercises dose have an effect on improving pain and functional disability in subjects with chronic non-specific mechanical low back pain associated with hip impairment? Therefore, the purpose of this study is to find the effect of hip joint mobilization with stretching exercises on intensity of pain and functional disability for subjects with chronic nonspecific low back pain associated with hip impairment. It was hypothesized that there will be a significant difference in effect of hip mobilization with stretching exercises on improving pain and functional disability in subject with chronic non-specific mechanical low back pain associated with hip impairment.

MATERIALS AND METHODS

Pre to post test experimental study design with two group- Study and Control group. As this study involved human subjects the Ethical Clearance was obtained from the Ethical Committee of KTG College of Physiotherapy and K.T.G. Hospital, Bangalore as per the ethical guidelines for Biomedical research on human subjects. The study was registered for subject for dissertation with University (RGUHS) No. : 09_T031_39082. The study was conducted at K.T.G. Hospital, Bangalore. Subjects included were with chronic non-specific low back pain associated with hip impairment, age group between 18 to 45 years,² both male and female subjects, non-Specific LBP (pain between T12 and the gluteal fold), >6 months in duration without radiating pain below the knee,¹⁸ subjects with hip impairment confirmed with at least two of the following range of motion (ROM) impairments in one or both hips:¹⁸ prone internal rotation < 30°; prone external rotation < 30°; supine flexion < 110°; prone extension < 10°. Subjects excluded were with red flags for manual therapy to the hips (i.e. tumor, fracture, metabolic disease, rheumatoid arthritis, osteoporosis, and prolonged history of steroid use)¹⁷ previous surgical or non-surgical management within the last 6 months,

signs of nerve root compression (i.e. muscle weakness, hyporeflexia, and decreased sensation), fear-avoidance beliefs questionnaire (FABQ) – work subscale score ≥ 34 , who undergone spinal surgery. All the subjects fulfilling the inclusion criteria were informed about the study and a written informed consent was taken. Total 30 Subject (n=30) were recruited by Simple random sampling method using group marked 30 paper slips in closed envelopes randomly allocated 15 subjects into study group and 15 into control group. No subjects were missed any treatment sessions and dropped from the study. The study was carried with duration of two weeks intervention.

Procedure of Intervention for Study group: Subjects in this group was treated with hip joint mobilization and supervised stretching exercises thrice a week for two weeks. All patients were instructed to perform stretching exercises twice daily as a home exercise program.

Procedure of five techniques of Hip Joint mobilization: Each glide was given for 10-15 repetitions for 5-6 times in a session. The grade of mobilization was begin with Grade-2 and progressed to Grade-4 depending on subject condition. Total duration of mobilization was lasted for 20 minutes.^{19, 20}

1. Long-axis distraction manipulation: is a high-velocity, end-range, longitudinal traction force to the lower extremity on the acetabulum in supine with the hip in slight flexion, abduction, and varying degrees of internal and external rotation of the lower limb.¹⁸ Subject was positioned supine with hip in 30° flexion, 30° abduction and external rotation. Subject's pelvis was fixed with belt and ask the subject to hold on to the edge of the table. Therapist standing at patient's feet wrap mobilization belt around the ankle in a figure of 8 pattern and connect behind therapist's waist. Slide hands inside the belt so grasp is strengthened by the belt. Therapist leans back and provides a static force in a longitudinal direction;
2. Caudal non-thrust manipulation: is a low-velocity, mid-end-range, superior-to-inferior oscillatory force to the femur in a supine position, with hip flexed to 90–100°.¹⁸ subject was in supine and grasp table. Therapist standing on side to be mobilized. Wrap mobilization belt around hip crease, cross in front of therapist and wrap behind waist. Stabilize knee and if necessary ankle. Passively bring subject limb in to flexion adduction/abduction, internal/external rotation prior to symptom provocation. Lean back to take up slack of soft tissue. An oscillatory or static force was applied in caudal direction to the proximal femur. Adjustment was made for hip flexion, rotation and adduction as needed;
3. Anterior-

posterior hip mobilization progression: is a low-velocity, mid-end-range.¹⁸ subject in supine with hip flexed, adducted and rotated so that foot is along the lateral aspect of the opposite knee. Therapist standing on opposite side with hands over the knee. An oscillatory or static force along the long axis of the femur in a posterior direction was applied. Adjustment was made for flexion, adduction and internal rotation. Subject should feel the stretch “in their back pocket;”

4. Posterior-to-anterior non-thrust manipulation in neutral:¹⁸ is a low-velocity, mid-end-range, posterior-to-anterior oscillatory force to the femur in prone position. Subject in prone with the knee flexed to 90–100°. Therapist standing on the side to be mobilized. The leg was supported above the knee with one hand. With mobilizing hand, hypothenar eminence is in gluteal fold over proximal femur. An oscillatory or static force was applied in an anterior/lateral direction;
5. Posterior-anterior mobilization in flexion, abduction, external rotation:¹⁸ is a low-velocity, end-range, posterior-to-anterior oscillatory force to the proximal femur in a prone position, with hip flexion, abduction, and external rotation. subject is in lying with hip flexion, abduction external rotation. Therapist standing on the side to be mobilized supports the leg above the knee with one hand. With mobilizing hand, hypothenar eminence is in gluteal fold over proximal femur applies an oscillatory or static force in an anterior/lateral direction in varying degree of extension abduction and rotation.

Procedure of Stretching Exercises: Each stretching position was holded for thirty seconds, two sets of ten repetitions on right and left side. Thirty second rests was taken every five minutes during the stretching session.¹⁵

1. Kneeling iliopsoas stretch: On a mat, set one knee down and the other leg up so patient is in kneeling on one knee. In this position subject lean forward with hips always keeping upper body upright and without forward bending the trunk. Instructed to activate and hold the abdominals and glutei muscles on the side of stretching so that subjects's lower back is not over arching. The stretch force was applied until he/she feel a stretch feeling in the upper thigh/hip area.²¹
2. Kneeling hip internal rotation stretch: It was performed by kneeling on the floor keeping both the knees together slightly apart. A bolster/ pile of blankets or a large pillow placed between the heels and subjects sits on it. Subject was asked to stay in this position until feels sufficient stretch that enough for he/she. If needed a deeper stretch, subjects was asked to recline back onto the bolster or pillow. The position was hold for five to 10 deep breaths. With each exhale try to relax the hips and

low back.²¹ 3. Supine piriformis stretch: Subject supine lying on the floor, put one foot up against a wall to provide additional support during the stretch. If not using a wall support, slowly move stretch limb towards chest to apply gentle pressure towards inside of other knee. Stretch force was applied until subject feels a deep stretch in buttock and hip.²¹ 4. Lower Back Stretching: Stretching for Erector spinae muscle and quadratus lumborum that lie within the layers of the thoracolumbar fascia. This stretching was performed subject in supine position; holding right knee with both hands and pulling it into the chest then again pull the left knee to chest while breathing deeply and holding the position for thirty seconds.¹⁵ 5. Hamstring Stretching: The subject was asked to bend their one hip joint at 90° from a supine position and slowly extending the knee joint while supporting the popliteal region with both hands and holding for approximately ten seconds at maximal extension. The position was held for thirty seconds.¹⁵ 6. Tensor Fasciae Latae Stretching: Passive stretching of Tensor Fasciae Latae was performed with the assistance of a person, extending and internally rotating the hip joint on the stretched side from a lateral recumbent position and holding for approximately thirty seconds.¹⁵



Fig 1. Kneeling iliopsoas stretch



Fig 2. Hip Distraction

Procedure of Intervention control group:

Each patient was treated with supervised stretching exercise described in study group three times in a week and instructed to do the stretching exercises twice a day at home for two week.

Outcome measurement

The outcome measurements such as Low back pain was measured using Visual Analog Scale and Functional Disability was measured using

Oswestry Disability Index before and after two weeks of intervention.

Visual Analog Scale: VAS is presented as 10 cm line. Patient is asked to mark a 10cm line to indicate pain intensity where the end points are the extremes of no pain and pain as bad as it could be, or worst pain. Visual Analog scale (VAS) has high reliability and concurrent validity to measure intensity of pain.^{22,23}

Oswestry Disability Index:^{24,25} The ODI is a self-administered questionnaire that requires 5 minutes to complete and 1 minute to score. Scores are associated with degree of disability ranging from minimal to bedbound. ODI is a valid, reliable, and responsive condition-specific assessment tool that is suited for use in clinical practice. It is easy to administer and score, objectifies client's complaints, and monitors effects of therapy.^{24,25}

STATISTICAL METHODS

Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean \pm SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Paired 't' test as a parametric and Wilcoxon signed rank test as a non-parametric test have been used to analysis the variables pre-intervention to post-intervention with calculation of percentage of change. Independent't' test as a parametric and Mann Whitney U test as a non-parametric test have been used to compare the means of variables between two groups with calculation of percentage of difference between the means. Statistical software: The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

In study Group there were 15 subjects with mean age 33.13 years and there were 7 males 8 females were included in the study. In control group there were 15 subjects with mean age 30.07 years and were 6 males 9 females were included in the study. There is no significant difference in mean ages between the groups. In both the groups there were 8 right sided and 7 left sided subjects with no significant difference between the side distributions between the groups.

When means were analyzed from pre intervention to post intervention within the groups (table-2) it was found that there is a statistically significant change in means of Visual analog score and ODI score in percentage($p < 0.000$) with negative

percentage of change showing that there is decrease in the post means. There is clinical significant improvement with large effect size in both the groups. When pre intervention means were compared between study and control groups it was found that there is no statistically significant

difference in means of VAS and ODI. When post intervention (table-3) means were compared there is a statistically significant difference in means of VAS and ODI between the groups. There is a clinical significant difference in post means with large effect size.

Table 1: Basic Characteristics of the subjects studied

| Basic Characteristics of the subjects studied | | Study Group | Control Group | Significance ^a |
|---|---------|-------------------------|-------------------------|---------------------------|
| Number of subjects studied (n) | | 15 | 15 | -- |
| Age in years (Mean ± SD) | | 33.13 ± 7.50 (19-45) | 30.07 ± 4.99 (21-39) | p = 0.861 (NS) |
| Gender | Males | 7 | 6 | P = 0.000** |
| | Females | 8 | 9 | |
| Side | Right | 8 | | --- |
| | Left | 7 | | |

a - Pearson Chi-Square

Table 2: Analysis of pain and functional disability within study and control Groups (Pre to post test analysis)

| | Pre intervention (Mean ± SD) min-max | Post intervention (Mean ± SD) min-max | Percentage change | Z value ^b (Non parametric significance) | t value ^a (Parametric) Significance P value | 95% Confidence interval of the difference | | Effect Size (r) |
|------------------------------------|--|--|----------------------|---|---|---|-------|-------------------|
| | | | | | | Lower | Upper | |
| Study Group | | | | | | | | |
| Visual analog scale score in cm | 8.40 ± 0.90 (6.3- 10.0) | 1.87 ± 1.11 (0.0-4.6) | -77.73% | -3.413 p=0.001** | 30.932 P <0.000** | 6.07 | 6.97 | + 0.95 (Large) |
| ODI score in percentage | 72.06 ± 8.44 (60.0- 90.0) | 17.10 ± 5.76 (8.0-30.0) | -76.26% | -3.411** p=0.001** | 23.871 P <0.000** | 50.02 | 59.89 | + 0.96 (Large) |
| Control Group | | | | | | | | |
| Visual analog scale score in cm | 8.80 ± 0.90 (7.1- 10.0) | 5.38 ± 1.63 (1.4-7.3) | -50.28% | -3.410 p<0.001** | 8.842 P <0.000** | 2.58 | 4.24 | + 0.79 (Large) |
| ODI score in percentage | 77.48 ± 11.07 (58.0- 96.0) | 41.48 ± 10.15 (22.2-58.0) | -55.56% | -3.409 p<0.001** | 11.857 P <0.000** | 29.48 | 42.51 | + 0.86 (Large) |

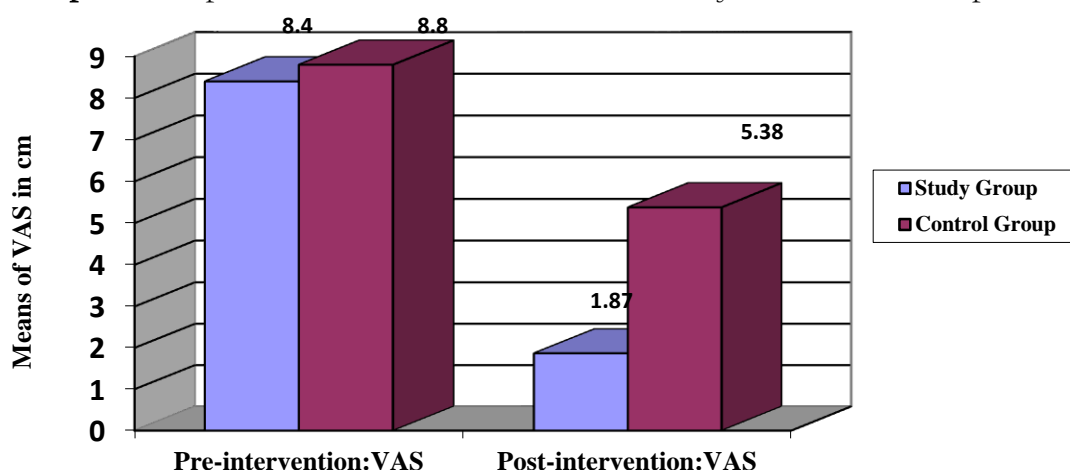
** Statistically Significant difference p<0.05; NS- Not significant; a. Pared t test. b. Wilcoxon Signed Ranks Test

Table 3: Comparison of means of pain and functional disability between study and control Groups

| | Study Group (Mean ± SD) min-max | Control Group (Mean ± SD) min-max | Percentage of difference | Z value ^b (Non parametric) | t value ^a (Parametric) Significance P value | 95% Confidence interval of the difference | | Effect Size r |
|------------------------------------|---------------------------------------|---|--------------------------------|---|--|--|--------|-------------------|
| | | | | | | Lower | Upper | |
| PREINTERVENTION | | | | | | | | |
| Visual analog scale score in cm | 8.40 ± 0.90 (6.3- 10.0) | 8.80 ± 0.90 (7.1- 10.0) | 4.65% | Z= -1.330 P=0.184 | -1.206 P =0.238 (NS) | -1.07 | 0 .27 | + 0.21 (Small) |
| ODI score in percentage | 72.06 ± 8.44 (60.0- 90.0) | 77.48 ± 11.07 (58.0- 96.0) | 7.24% | Z=-1.539 P=0.124 | -1.505 P =0.143 (NS) | -12.77 | 1.95 | + 0.26 (Small) |
| POST INTERVENTION | | | | | | | | |
| Visual analog scale score in cm | 1.87 ± 1.11 (0.0-4.6) | 5.38 ± 1.63 (1.4-7.3) | 96.82% | Z=-4.130 P=0.000** | -6.876 P =0.000** | -4.56 | -2.46 | + 0.78 (Large) |
| ODI score in percentage | 17.10 ± 5.76 (8.0-30.0) | 41.48 ± 10.15 (22.2-58.0) | 83.23% | Z=-4.510 P=0.000** | -8.082 P =0.000** | -30.55 | -18.19 | + 0.82 (Large) |

** Statistically Significant difference p<0.05; NS- Not significant a. Independent t test b. Mann-Whitney Test

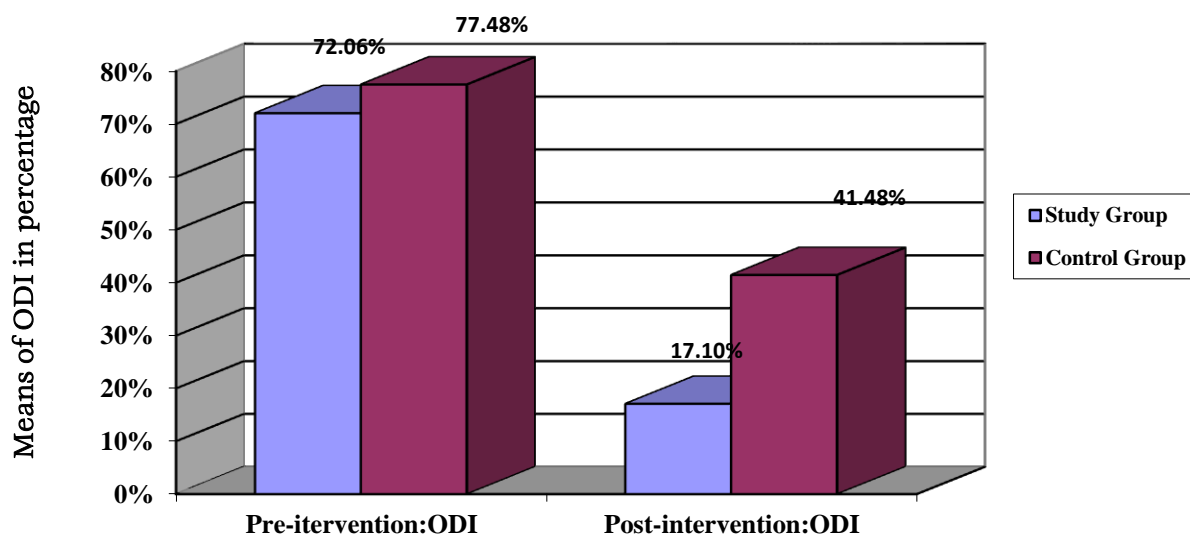
Graph 1: Comparison of means of VAS between Study and Control Groups



The graph-1 shows that there is no statistically significant difference in means of Visual analogue score for pain when pre intervention means were compared between study and control groups.

There is a statistically significant difference when post-intervention VAS score means were compared between the groups.

Graph 2: Comparison of means of ODI between Study and control Groups



The graph-2 shows that there is no statistically significant difference in means of ODI score when pre-intervention means were compared between study and control groups. There is a statistically significant difference when post-intervention ODI means were compared between the groups.

DISCUSSION

It is found that there is statistically and clinically significant improvement in pain and functional disability in study group subjects who received 2 weeks of hip joint mobilization along with stretching exercises and in control group subjects who received 2 weeks of only stretching exercises for Chronic non-specific low back pain associated with Hip Impairment. However, greater percentage of improvement was found in the study group than the control group.

In study group, the improvement could be because of combined effect of hip joint mobilization and

stretching exercises. Mobilization induces motion into articular structures which increases proprioceptive input. This tends to decrease the central transmission of pain from adjacent spinal structures by closing the gate thereby inhibiting pain transmission. The manual therapy like mobilization has been shown significantly greater improvements in outcome in patients with chronic low back pain. It produces a treatment-specific initial hypoalgesic and sympathoexcitatory effect beyond that of placebo or control.^{18,26,27} Sean Hanrahan et al studied on mechanical low back pain patients and concluded that joint mobilization reduced subjects' pain and increased force production in the short-term stages of mechanical low back pain.²⁸

Biomechanical studies of the spine stated that mechanical loads are transferred through "Lumbo Pelvic Hip Complex" (LPHC) from the hips, pelvis, and low back across the thoracolumbar Fascia, to

the upper back, shoulders, and arms in an "X" shaped fashion. Control imbalances resulting from the LPHC musculature leads to improper movement down the kinetic chain.²⁸ Common compensation patterns leading to LPHCD have been previously described as an "anterior pelvic tilt," "lower cross syndrome," and "excessive lordosis".²⁸ When the long erector spinae muscles get too tight combined with abdominal muscle weakness, causes an excessive lumbar lordosis, often with the pelvis anteriorly tilted.²⁹ This will compress the lumbar facets and irritate them. Lumbar spine will tend to move more, potentially creating irritation of the discs or facets. The tightness in erector spinae muscle limit certain movements such as bending become very painful affecting functional activities. In addition hamstrings shortening due to muscle spasm results in posterior inclination of the pelvis.^{25,29} Essentially, the simultaneous contraction of the two muscles reduces flexibility of the pelvis and increases lumbar stress.¹⁵ When these muscle were stretched during two week program that might have improved the flexibility. The discomfort due to pain and tightness might have reduced after giving the stretching program that shows improvement in functional ability. According to Sahrman's movement balance system approach, active stretching is purported to increase the flexibility of the tight muscles while concomitantly improving function of the antagonistic muscles.¹⁶

In control group, the improvements could be due to the effect of stretching exercise. The stretching exercise which are beneficial as it decreases future back injury, helps to mobilize spine which leads to reduces pain and improves functional capacity.^{15,16}

Pre intervention comparison of means of VAS score and ODI between the hip joint mobilization with stretching exercises and stretching exercises group found that there is no statistically significant difference. Whereas, comparison of post-intervention means of pain and functional disability found there is statistically significant difference with clinically significant difference found by large effect size. The Hip joint Mobilization with Stretching found greater percentage of improvement than only stretching. Subjects in Hip joint Mobilization with Stretching Group showed reduced pain level by a VAS of -77.73% and -50.28% in only Stretching Group. The participant's functional ability was increased with ODI score by 76.26% in Hip joint Mobilization with Stretching Group and -55.56% in only Stretching Group. Therefore, in study group, Hip joint mobilization with stretching for chronic non-

specific low back pain was found to be added effective than the only Stretching.

Therefore, based on the findings the present study found that there is a statistically significant effect hip joint mobilization with stretching exercises on improving pain and functional disability than stretching exercises alone. Hence, the present rejects null hypothesis.

LIMITATIONS OF THE STUDY: Even if the study has found improvement in outcome, there are limitations of the study. Standardization of dosage of mobilization and stretching exercises was not uniform to all subjects and it was varied based on individual subjects level of symptoms. The finding is limited to measurement of pain and disability. The Subjects with wide range group between 18 to 45 years of age were considered for the study, thus results cannot be generalized to individual age. The study was short duration and follow-up was not done therefore long term effects were not found.

RECCOMENDATION FOR FUTURE RESEARCH: Further study on effect of hip joint mobilization with strengthening exercises needed to find for individual with chronic non-specific low back pain. Studies are needed to find the long term effect of combined hip joint mobilization and stretching exercises. Further study can be carried to find the effects of these techniques using various other outcome measurements such as location of pain, sensitivity of pain, hip and lumbar ROM and quality of life.

CONCLUSION

The present study concluded that the two weeks duration of combined hip joint mobilization with stretching exercises significantly effective on improving pain and functional disability than only stretching exercise regimen for chronic non-specific low back pain associated with Hip impairment. The regional interdependence approach considering the hip-spine relationship should be considered in individuals with LBP based on the extensive body of literature supporting the anatomical connections and neuromuscular control between the lumbar spine and the hips. It is clinically important to consider combined hip joint mobilization as an adjunct to stretching exercise program for patients in chronic non-specific low back pain associated with hip rotation dysfunction.

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Conflicts of interest: None

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