Introduction

Low back pain is the most prevalent of all musculoskeletal conditions affecting nearly every one at some time in their life[1]. In fact 80% of population will suffer from at least one episode of LBP in their lifetime, most frequently in people between the ages of 20 to 50 yrs, but more common in older age group [2,3,4].

According to Len Kvaritz, "Low back pain is the pain in the low back area related to problems with lumbar spine, the disc between the vertebra, the ligaments around the spine, the spinal cord, the nerve roots, muscles of the low back, internal organs of pelvis and abdomen or the skin covering the lumbar area"[5].

The low back pain can be classified into A) Acute Low Back Pain (less than 6 weeks duration of pain. B) Sub acute Low Back Pain (6 wks to 12 wks duration of pain). C) Chronic Low Back Pain (Pain duration of 12 weeks and above) [6,7].

A myriad of potential causes of low back pain exists, eg strained back muscles & ligaments, from improper or heavy lifting or after a sudden awkward movement, delayed trunk muscle reflex response and poor postural control & hip rotation ROM deficits [3,8,9].

There are number of evidence to support the possibility of developing low back pain due to hip rotation deficits [10,11]

A number of Investigators have focused on the relationship between hip mobility and LBP, and found that patients who have greater external hip rotation and restricted internal hip rotation are more likely to have low back pain[12 13].

J rose & Sahrmann, postulated that one of the predisposing factors in low back pain is limited or excessive hip joint rotation ROM [13] And this was supported by the

findings of Chesworth et al, who noted that, In patients with unspecified low back pain the external hip rotation was greater than internal hip rotation bilaterally.[14]

Woerman and Porterfield and DeRosa have postulated that hip rotation asymmetry develops because of muscular imbalances between the hip rotator muscles[15,16].

pathological conditions in and around the hip joint plays an important role in producing low back pain because of its anatomic proximity and interdependence due to interconnections of muscles, like psoas , piriformis, quadratus lumborum, erector spinae & gluteus maximus within the hip joint & lumbo pelvic region [11,12].

Abnormality in of any of these structures or surrounding the hip joint causes contraction of these muscles, affecting the motion at the spine, pelvis and hip [11,12].

This limited hip motion will be compensated for by an increase in motion at the lumbo pelvic region causing, an increase in frequency of lumbo pelvic motion with hip motion, low magnitude loading in lumbar region, accumulation of tissue stress and eventually leading to low back pain symptoms.[11,12,17].

Model for Development of LBP

Kinesiopathologic model of movement (KPM) by Sahrmann SA is a conceptual framework for the mechanisms proposed to contribute to the development of musculoskeletal or low back pain**.** The musculoskeletal or low back pain develops as a result of loss of movement precision. and an alteration in appropriate biomechanics at one or more segments in a specific anatomic region. Loss of movement precision is proposed to develop when movements are repeated and postures are sustained in a particular direction(s) during everyday activities, inducing changes in neural and musculoskeletal components of the movement system. Such changes then result in adoption of direction-specific strategies of movement and alignment that become generalized across many activities. The specific loss of precision proposed for

development of LBP is an increase in flexibility of one or more lumbar segments in a specific direction(s), with a potential decrease in flexibility in other regions, for example the thoracic region or hips. The low magnitude loading with repetition in the same direction is considered to contribute to acceleration of accumulation of tissue stress in the lumbar region due to minimal time without loading, then micro trauma, and eventually leading to low back pain. Until this specific precision or movement loss is addressed or corrected the symptoms usually have the potential to persist or reoccur [18,19].

The common conservative medical treatment for low back pain includes analgesics and NSAIDS. Physiotherapy management comprises of electrotherapy modalities like IFT, SWD, Moist heat & exercises therapy which includes general stretching, and strengthening exercises, however there is only limited evidence indicating the efficacy of electrotherapy modalities & exercise therapy. [20,21.22].

The proposed treatment includes correcting the rotational asymmetries in hip by stretching the shortened lateral rotator muscles of the hip & strengthening the corrected muscles and thereby eliminating the undue excessive stress & strain on the lumbar spine predisposing to low back pain.

Conventional therapy comprising of IFT and SWD & general spinal strengthening exercises are widely recommended for low back pain patients. IFT is credited with the ability to reduce the pain by stimulating the pain gate mechanisms there by inhibiting the pain pathways at dorsal horn of the spinal cord and Peri Aqueduct Grey matter of the brain stem masking the pain symptoms[23]. where as SWD causes increase in local temperature of the tissues and causing vasodilatation of the blood vessels increasing

the circulation and there by washing out of the accumulated waste metabolites & relieving pain [24,25].

Strengthening exercises improve the strength of key spinal Stabilizers (Abdominals and back muscles) through activation & building strength which helps in decreasing the stress abnormal loads on the spine by improving posture. These exercises insists on proper Neuromuscular Control and Coordination which are essential for proper maintenance of body mechanics and posture when it is required to carry a load and to perform common daily activities[26,27].

However, The efficacy of correcting rotational asymmetries of hip in patients with unspecified Low Back Pain is not routinely practiced & well established.

There are few studies which indicate the efficacy of correcting the hip rotation asymmetry in sacroiliac joint component of low back pain patients in pain relief and improving function of patients[28,29,30].

Generally during the assessment of patients with unspecified low back pain, the evaluation of the hip rotation ROM are seen as insignificant or ignored. We assume that the evaluating and treating the loss of movement precision at hip will reduce the symptoms of pain and disability in patients with unspecified low back pain.

The purpose of my study was to evaluate the interrelationship & hip rotational range of motion asymmetry in patients with unspecified low back pain and the effect of correcting them in alleviating the symptoms in patients with unspecified low back pain.

Hypothesis

EXPERIMENTAL HYPOTHESIS

Correction of the hip rotation asymmetry along with conventional therapy brings about significant improvement in pain and disability in patients with unspecified low back pain.

NULL HYPOTHESIS

Correction of the hip rotation asymmetry along with conventional therapy brings about no significant improvement in pain and disability in patients with unspecified low back pain.

Objectives

1. To evaluate the prevalence of hip rotation asymmetry in patients with unspecified low back pain
2. To evaluate the effectiveness of correcting Hip rotation asymmetry in unspecified low back pain.
3. To evaluate the effectiveness of conventional therapy in patients with unspecified LBP with hip rotational asymmetry.

Literature review

Jennifer Barbee Ellison, Steven J Rose, Shirley A Sahrmann Conducted a research to characterize and classify the prevalence of passive hip rotation range of motion (ROM) asymmetry in healthy subjects (n=100) and in patients with low back dysfunction (n=50). They postulated that most of the patients of low back pain with SI joint involvement have greater external rotation than internal rotation when compared with healthy subjects. These results suggest that there is an association between hip rotation ROM imbalance and the presence of low back pain[13].

Hayden J, Van Tudler MW, Malmivaara A, Koes BW reviewed 61 randomized controlled trials (6390 participants) evaluating the exercise therapy for non specific low back pain i.e. Acute (11), Subacute (6), Chronic (43) Low Back Pain (1 unclear).The authors concluded that Exercise therapy appears to be slightly effective at decreasing pain and improving function in adults with chronic low-back pain, particularly in healthcare populations. In Subacute low-back pain there is some evidence that a graded activity program improves absenteeism outcomes, though evidence for other types of exercise is unclear. In acute low-back pain, exercise therapy is as effective as either no treatment or other conservative treatments[20].

T.Aalto, O.Airaksinen, T.Härkönen, J.Arokoski have conducted a study to examine the intra- and intertester and intra- and interday reliability of hip passive range of motion (PROM) measurements and the effect of passive stretch on the reproducibility of PROM measurements on Twenty volunteers (12 women, 8 men; age range, 18–45y). Results showed as the passive stretch increased significantly ($P<.05$ to $P<.001$) the PROM of the hip joint. Repetitive stretching increased significantly the PROM in hip flexion and inner rotation, but the reproducibility of the

PROM measurement did not improve. The hip flexion and the hip inner rotation PROM measurements had moderate to very high intra- and intertester reliabilities. The reliability of the PROM in hip extension and knee flexion was poor[31].

Deirdre A. Hurley etal A Randomized Clinical Trial of Manipulative Therapy and Interferential Therapy for Acute Low Back Pain To investigate the difference in effectiveness of manipulative therapy and interferential therapy for patients with acute low back pain when used as sole treatments and in combination. 240 subjects were included who were divided into 3 groups n=80 each. The results concluded that**,** For acute low back pain, there was no difference between the effects of a combined manipulative therapy and interferential therapy package and either manipulative therapy or interferential therapy alone as both the groups improved significantly in pain relief [32].

Lauridsen HH, Hartvigsen J, Manniche C, korsholm L, Grunnet-Nilsson N. studied cross cultural adaptation and validations of Oswestry Disability Index in 233 patients with Low back pain/leg pain. Patients are divided into primary sector and secondary sector and they completed a questionnaire booklet at base line, 1 day or 1 week and 8 weeks follow up. The booklet contains Danish version of ODI along with Roland Morris Disability questionnaire, the LBP rating scale, The SF 36 (physical function and bodily pain scales) and a global pain rating scale. For the ODI test – retest analysis (93 stable patients) resulted in an intra class correlation co efficient of 0.91, a mean difference of 0.8 and 95% limits of agreements of -11.5 to +13. The ODI showed satisfactory cross sectional discriminate validity when compared to the

external measures. The results concluded that the ODI is both a valid and reliable outcome instrument in two sectors of low back pain patients populations[33].

H N Debsarma. Conducted a study to compare the pain management in low back pain patients by two physical methods - deep heat modality viz Shortwave diathermy and superficial heat viz infrared therapy where comparative study of effectiveness of heat modalities is scant 14 males and 16 females, total 30 subjects with low back pain were taken in the study. Out of 30, a group of 15 each was treated for 10 days with same unit with deep heat - shortwave diathermy (SWD) continuously for 10 minutes and other group with superficial infrared (IR) heat therapy for 10 minutes Exercise therapy was suspended during the period At the end of the study evaluation of treatment efficacy to each subject was done by same method at the end of the study revealed significant response in pain relief by SWD group than IR group A positive relationship was shown between the measure of pain intensity relief following deep heat modality This study showed that deep heat modality is more effective than superficial heat in pain management in LBP patients[34].

Olaugun, Matthew et al Studied the reliability of rating low back pain with a Visual Analogue Scale (VAS) and a Semantic Differential Scale (SDS). 25 patients have been selected and their low back pain was rated using VAS & SDS before and after treatment of low back pain. The results showed strong intra tester correlations between VAS & SDS of each tester (p .05). Hence they concluded that these two scales are reliable and valid for clinical rating of low back pain[35].

Roach KE, Brown MD, Dunigan KM, Kusek CL, Walas M, conducted a study to determine the test retest reliability of a Visual Analogue Scale measure of pain intensity, a Pain Drawing measure of pain location, and the Pain Response to activity and Position Questionnaire. 53 subjects (28 men and 25 women) were recruited from an outpatient orthopedic clinic. They completed the questionnaire before and after the treatment by their physician. 33 subjects also completed the VAS and pain drawing measure that evening and next day morning. Test retest reliability of both the scales was examined using intra class correlation coefficient. Overall, the three pain measures demonstrated fair to good test retest reliability: 1) Visual Analogue Scale = 0.66-0.93, 2) Pain Drawing = 0.58-0.94, and 3), Pain Response to activity and Position Questionnaire = 0.46-0.89. The results of this study suggest that the reliability of these pain measures is sufficient.[36]

Vad VB, Bhat AL, Basrai D, et al. Investigated hip rotation deficits in a group of professional golfers to determine if these deficits correlated to LBP. LBP is the most common musculoskeletal complaint experiences by both amateur and professional players. Forty-two male, professional golfers were categorized as having no history of back pain or those with a history of low back pain greater than two weeks affecting play within the past year. 33% of golfers had previously experienced LBP. Researchers found that a statistically significant correlation was observed between a history of LBP and decreased lead hip internal rotation and FABER's position distance, and lumbar extension loss [44].

Michael T. Cibulka, David R. Sinacore, Gregory S. Cromer, Anthony Delitto Conducted a cross-sectional study to determine whether limited range of motion in the hip was present in 100 patients-one group with unspecified low back pain and another group with signs suggesting sacroiliac joint dysfunction. The results showed patients with low back pain but without evidence of sacroiliac joint dysfunction had significantly greater external hip rotation than internal rotation bilaterally, whereas those with evidence of sacroiliac joint dysfunction had significantly more external hip rotation than internal rotation unilaterally, specifically on the side of the posterior innominate. Lastly they concluded that the Clinicians should consider evaluating for unilateral asymmetry in range of motion in the hip in patients with low back pain. The presence of such asymmetry in patients with low back pain may help identify those with sacroiliac joint dysfunction[47].

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Methodology

Materials and Method

Study design: Crossectional & randomized experimental trial.

Pre test & Post test

Source of study: Department of physiotherapy, JSS Hospital, Mysore.

Definition of study subjects:

Patients diagnosed with sub acute or chronic unspecified low back pain.

Inclusion and exclusion criteria:

Inclusion Criteria

- Patients suffering from low back pain for more than 6 weeks of duration (sub acute & chronic)
- Age 20 to 70 years.
- Both male & female patients.
- Patients with hip rotation asymmetry.

Exclusion Criteria:

- Disc prolapse
- Spinal stenosis
- Postoperative conditions in the back and hip.
- History of severe trauma
- Inflammatory diseases
- Pregnancy
- Spondylolisthesis

Study sampling design, Method and Size.

Sample design: Convenient Stratified Random Sampling.

Method of collection of data: Personal Structured Interview.

Sample size: 71 patients

Follow up: **o**n last day of treatment session or (Day 14)

Parameters used for comparison and statistical analysis used:

Materials required

- IFT (Vectrodyne, Life line systems) 4 KHz, Spectrum 90 - 100 Hz. 10 Min[23].
- Short wave Diatheramy. (10 min/ session) [24,25].
- Visual Analogue Scale
- Universal Goniometer [37]
- Oswestry disability index [38]
- Treatment table
- Theraband
- Straps

Duration of study: May 2010 to Jan 2011.

PROCEDURE:

Ethical clearance for the study was obtained from the Ethical Committee of the JSS College of Physiotherapy. Seventy one(n=71) consecutive subjects referred to the physiotherapy department with unspecified low back pain were assessed for hip rotational asymmetries, which comprised of evaluation of bilateral passive hip rotation range of motion using Goniometer [39] (**Annexure 1**). 30 subjects, Out of the seventy one evaluated, who fulfilled the inclusion criteria (n=30) were included in the study and randomly divided into two groups A&B.

The objectives, outcome measures and treatment protocols of the study were explained to all the subjects of each group. A formal written consent was obtained from each subject and they were further evaluated for Pain, using VAS & disability using ODI.

GROUP 'A'& 'B' subjects received conventional therapy which included IFT (4KHz spectrum 90-100 hz) & SWD for lower back for 10 min each & back strengthening exercises consisting of trunk curls, quadruped with arm & leg raising & back extension in prone. Each exercise was performed in a series of 10 repetitions with 1 minute rest between the series.

Group A subjects received stretching & strengthening exercises specifically to correct the rotational Asymmetry In addition to the conventional therapy. This comprised , stretching of the hip lateral rotator group of muscles by the therapist, with the patient in prone on treatment table with hip in neutral & pelvis stabilized and knee bend to 90

degrees, the patients leg was moved into medial rotation till the end range were the therapist feels the tension & resistance to the further movement. Sustained stretch was applied at this range with hold time of 30 seconds / session for three repetitions[40] along with stretching subjects also received strengthening exercises for both internal & external rotators of the hip in the position mentioned above & resistance applied with theraband[41].

Both the group subjects received one session of treatment per day up to 2 weeks

At the end of the second week all the subjects were again evaluated for hip rotation ROM using Goniometer, Pain using VAS & disability using ODI. The data obtained was analyzed for within the group & between the groups variations using descriptive statistics, repeated measures ANOVA & paired sample t test[42].

Materials required

Figure 1: Short wave Diatheramy

Figure 2: Interferential therapy

figure 3: Theraband & Goniometer

figure 4: Strap applied over PSIS for stabilizing pelvis

Figure 5: Alignment of Goniometer to measure hip rotations ROM

Figure 6: Measuring passive ER ROM

Figure 7:Measuring passive IRROM

Figure 8: Back strengthening in prone

Figure 9: Trunk curls

Figure 10: Quadruped positions with alternate Arm & Leg Extensions

Figure 11: stretching of external rotators

Figure 13:strengthening of external rotator

Figure14: Strengthening of internal rotators

RESULTS

DATA ANALYSIS

Descriptive & inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented as Mean ± SD and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Repeated measures ANOVA has been used to find the significance of study parameters on continuous scale between groups, Paired Samples T test has been used to find the significance of pre- and post intervention of outcome variables within each group. The Crosstabs procedure forms tables and provides a variety of tests and measures of association for tables has been used to find the significance of parameters on categorical scale between two or more groups.

+ Suggestive significance (P value >0.05 but <0.10)

*** Moderately significant (P value > 0.01 but < 0.05)**

**** Strongly significant (P value < 0.01)**

Statistical software: The Statistical software namely SPSS 16.0, was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, & tables.

RESULTS

A total of seventy one patients (n=71), male (n=50) and female (n=21), with unspecified low back pain was evaluated for hip rotational asymmetry. Among these patients, 30 patients (42.25%) were found to be having hip rotational asymmetry, with the prevalence among female patients (n=8) being 38 % and 44 %among male patients (n=22). These patients was divided into two groups A&B. Group A**:** total (n=15) females (n=3) males (n=12) Group B : total (n=15) females (n=5) males (n=10**)**

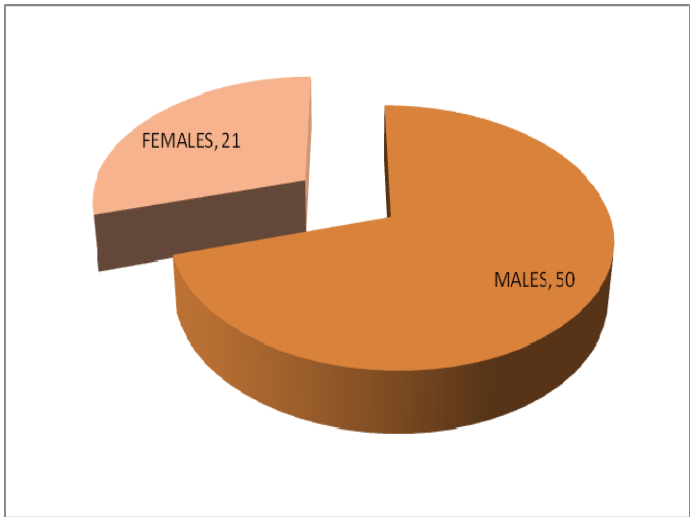
Among these subset of total population eleven (n=11) had left side asymmetry signifying the incidence of 36.67% and nineteen patients (n=19) 63.34% were having right sided asymmetry between internal and external rotation.

Paired sample t test has been done for both ,with in the group and between the groups to analyze the changes in pre test & post test parameters the results of group A are shown in table 4 & for group B in table 5.

Table 1

Evaluation of prevalence among total population

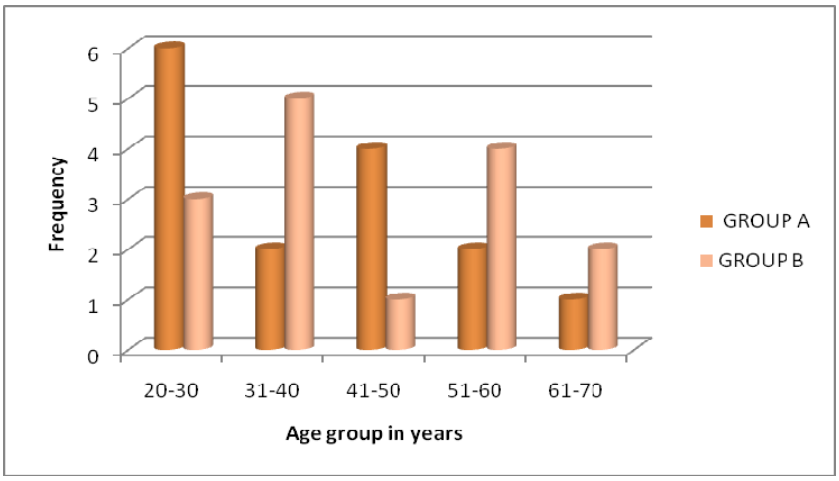
	AGE	INTERNAL ROTATION		EXTERNAL ROTATION	
		(RIGHT)	(LEFT)	(RIGHT)	(LEFT)
Mean	39.7183	35.3521	41.0563	47.5352	49.9296
Median	36.0000	40.0000	45.0000	45.0000	50.0000
Mode	28.00	45.00	45.00	45.00	45.00
Std. Deviation	14.29404	10.11802	9.36838	11.76907	5.76275
Range	50.00	30.00	40.00	40.00	30.00
Minimum	20.00	20.00	20.00	20.00	30.00
Maximum	70.00	50.00	60.00	60.00	60.00



Graph :1 Total number of patients evaluated.

Table 2
Comparison of age distribution

Age in years	Group A		Group B	
	NO	%	NO	%
20-30	6	40%	3	20%
31-40	2	13%	5	33%
41- 50	4	27%	1	7%
51-60	2	13%	4	27%
61-70	1	7%	2	13%
TOTAL	15	100	15	100

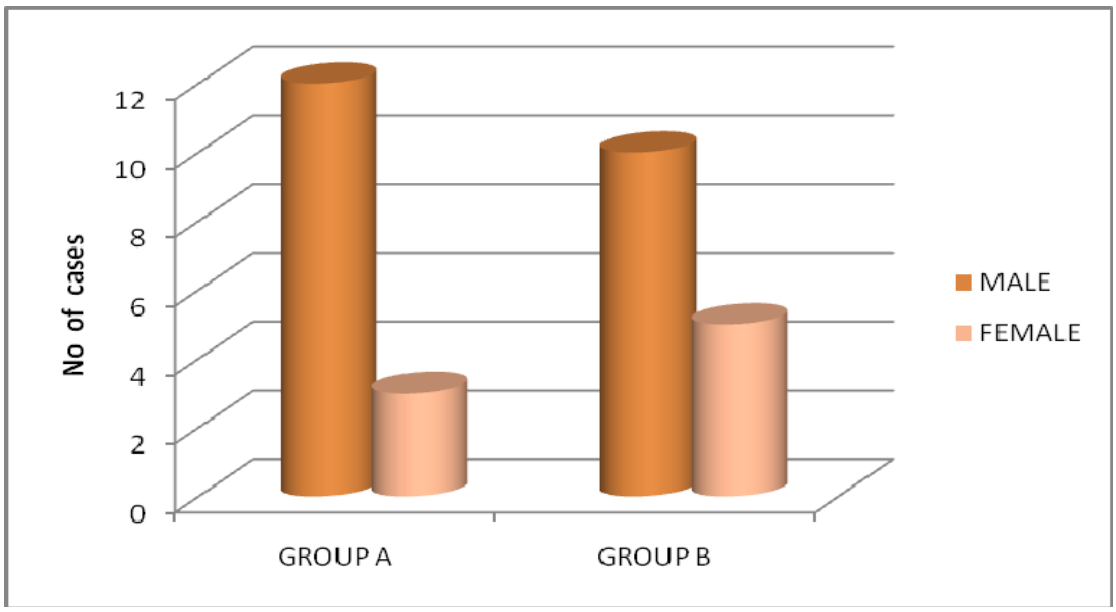


Graph 2: Comparison of age distribution.

Table 3

Comparison of Gender distribution

GENDER	Group A		Group B	
	NO	%	NO	%
MALES	12	80%	10	67%
FEMALES	3	20%	5	33%
TOTAL	15	100	15	100



Graph 3: Comparison of gender distribution.

Table 4: Evaluation of PRE and POST test variables in Group A

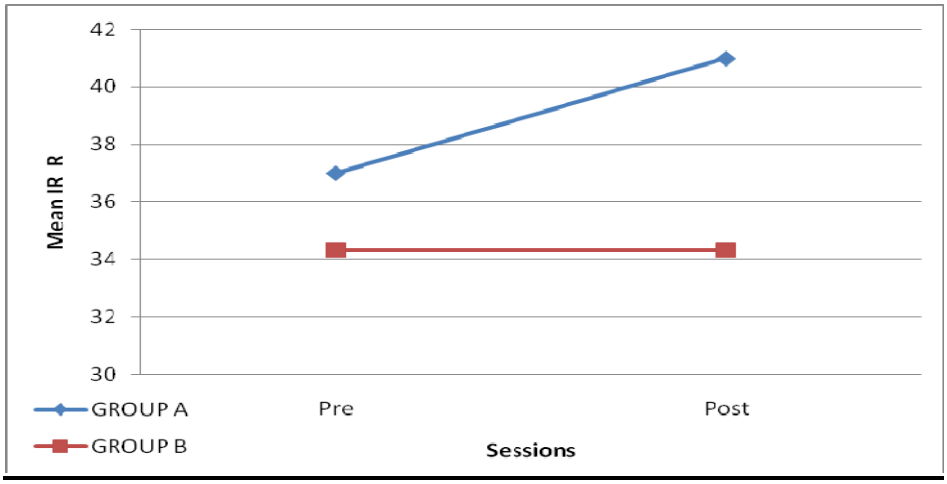
Variables	Mean	T value	P value
Internal Rot (Right)	8.0000	-3.167	.007
Internal Rot (Left)	5.0000	3.873	.002
External Rot (Right)	4.6667	-3.500	.004
External Rot (Left)	4.6667	3.500	.004
VAS	4.0000	20.494	.000
ODI	15.8867	10.281	.000

Table 5: Evaluation of pre and post test variables in group B

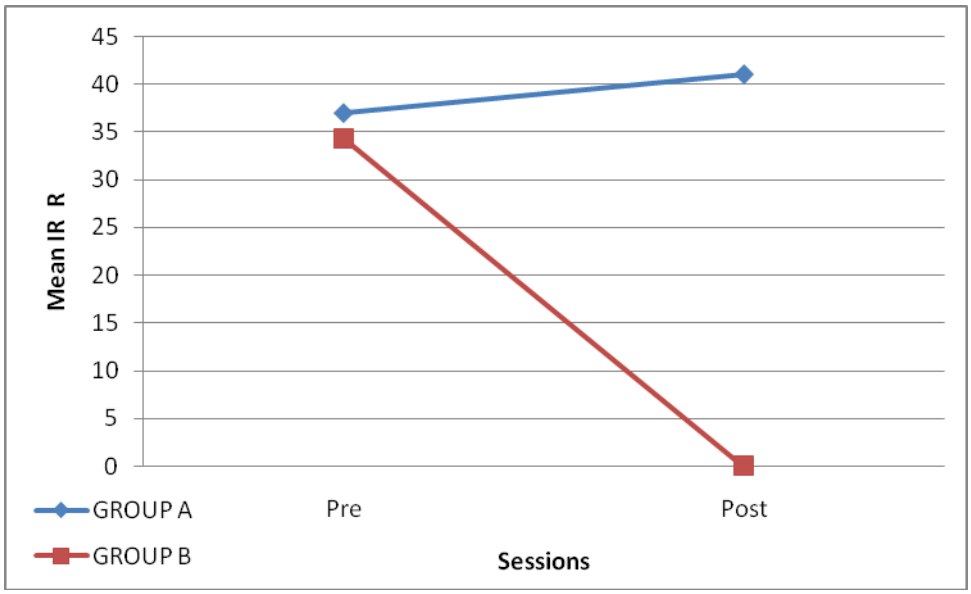
Outcome measures	Mean	t value	P value
Internal Rotation (Right)	-18.6667	-5.612	.000
VAS	2.3333	18.520	.000
ODI	7.0480	17.953	.000

Table 6: Analysis of pre and post variables within the subjects & between the groups.

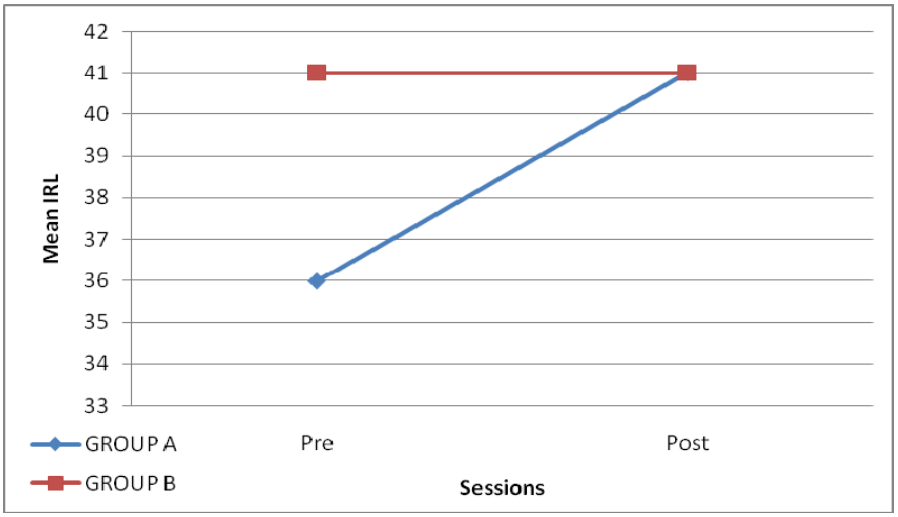
	Tests of	Mean[2] Change	F	Sig
Internal Rotation (Right)	Within subjects	60.000	5.508	.026
	Between groups	60.000	5.508	.026
External Rotation (Right)	Within subjects	93.750	15.000	.001
	Between groups	93.750	15.000	.001
Internal Rotation (Left0	Within subjects	81.667	12.250	.002
	Between groups	81.667	12.250	.002
External Rotation (Left)	Within subjects	81.667	12.250	.002
	Between groups	81.667	12.250	.002
VAS	Within subjects	150.417	743.253	.000
	Between groups	10.417	51.471	.000
ODI	Within subjects	1972.496	206.938	.000
	Between groups	292.958	30.735	.000



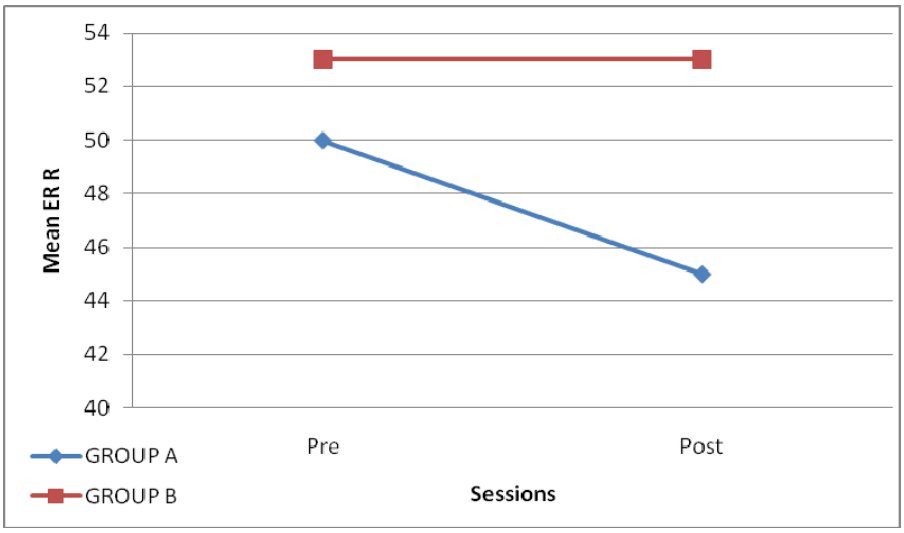
Graph 4:Difference in Pre and Post test right hip internal rotation ROM



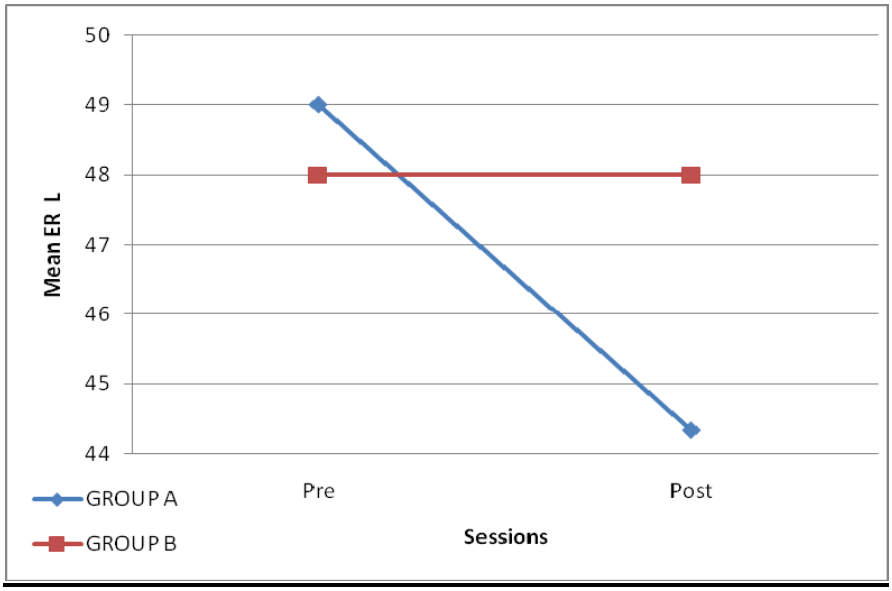
Graph 5: Difference in pre and post test right hip internal rotation ROM in group B



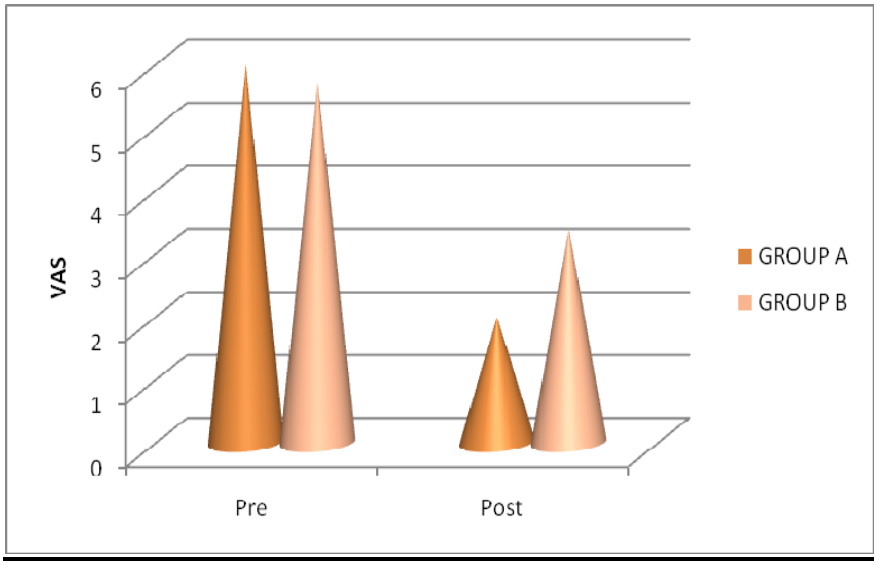
Graph 6:Difference in pre and post test left hip internal rotation ROM



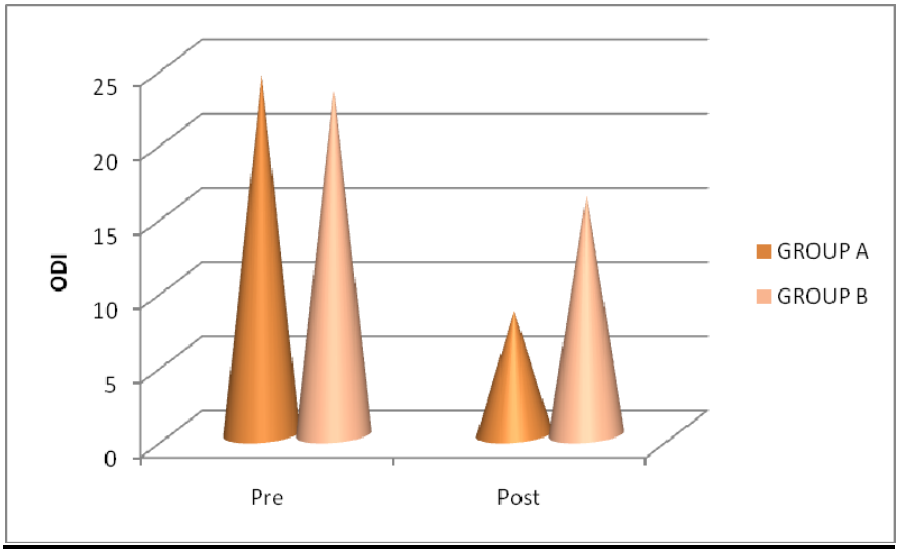
Graph 7: Difference in pre and post test right hip external rotation ROM



Graph 8:Difference in pre and post test left hip external rotation ROM



Graph 9:Difference in pre and post test VAS in GROUP A&B



Graph10:Difference in pre and post test ODI in GROUP A&B

Discussion

The primary objective of this study was to evaluate the prevalence of hip rotation asymmetry & efficacy of correcting it in patients with unspecified low back pain along with conventional therapy.

A myriad of causes for low back pain exist but one of the predisposing factors for LBP is restricted hip mobility which is generally ignored during evaluation of low back pain patient. Numbers of Investigators have supported these findings, where in they focused on the relationship between hip mobility and LBP, and have reported that patients who have greater external hip rotation and restricted internal hip rotation are more likely to have low back pain[12,13].

Based on these evidences we carried out our study to establish the occurrence of asymmetry in patient population with unspecified low back pain and the effect of correcting it on pain & disability.

We found that the asymmetry pattern i.e restricted internal rotation ROM and excessive external rotation ROM existed in as many as 42.25% of the population with unspecified low back pain , which was close to the findings of **Barbee Ellison eal**[13] where in they reported a prevalence of asymmetry in 48% of their study subjects with low back pain.

During the evaluation of patients with unspecified LBP nine patients had shown an interesting findings of having the characteristic asymmetry ie greater external rotation and limited internal rotation in each hip but maintained the symmetry between the left & right side despite severe restriction in the ROM(IR =20 ER=>50) These findings in our study concur with the findings of **chesworth et al, & cibulka et al** [14,40] who reported that Symmetry existed between the sides despite the asymmetry in internal rotation & external rotation of the same side

Although there is lack of strong evidence with respect to the efficacy of treating the hip for LBP, this relationship still warrants consideration, given the association of impaired hip ROM and LBP. **Nadler et al, vad et al, Murata et al**. **Yoshimoto et al.** [43,44 ,45,46].

In this study the proposed treatment of correcting asymmetry are impairment based, on the Kinesiopathologic model proposed by Sahrmann SA, which would be directed at correcting the neural and musculoskeletal components that appear to contribute to the development of asymmetry.

The results of this study shows that there is a significant Improvement in right & left internal rotation ROM with a mean increase in ROM from 37.0 to 45.0.& 36.3 to 41.0 and decrease in external rotation ROM with a mean decrease of 50.0 to 45.0.& 49.0 to 44.3 degrees in group A patients.

In group B (control group) there was significant increase in the mean of pre & post internal rotation ROM in right side with the mean increase in ROM from 34.33 to 53.0 with the mean value of (18.6667) & no change in mean of pre &post external

rotation ROM (53.0 to 53.0) however, there was no significant change was seen on the left side rotations ROM.

There was significant reduction in pain and disability scores in both the groups with a mean decrease in pain from 6.0 to 2.0 & disability from 24.22% to 8.34% in group A subjects. & mean decrease in pain from 5.7 to 3.4 & disability from 23.14% to16.10% (P=.000) in group B.

The significantly greater increase in the mean internal rotation ROM seen on the right side in group B subjects can be because of significant differences in the rotational asymmetry seen between the groups which was 13 in group A and 21 in group B.

Furthermore, during the initial evaluation of patients, the side determination or location of the pain was not taken in to consideration. The number of patients with right asymmetry were greater in group B compared to that of Groups A, where in the patients were more equally distributed and This could have also resulted in change in internal rotation ROM in group B.

The relationship between the low back pain & rotational asymmetry is not clear from the findings of our study & it forces us to rethink about the role of the asymmetry i.e. whether the asymmetry is causing the LBP or the other way round.

However, the reduction in pain & disability in conventional therapy group seen could be due to the improvement in strength & endurance of core musculature of lumbar spine, which in turn would have been resulted in decreased stress & abnormal

loading on the spine, by demanding a proper Neuromuscular Control and Coordination which are essential for maintenance of body mechanics and posture [26,27].

IFT stimulate the pain gate mechanisms & thereby mask the pain symptoms & SWD causes

increase in local temperature of the tissues and causing vasodilatation of the blood vessels

increasing the circulation and there by washing out of the accumulated waste metabolites

& relieving pain [23,24,25].

The significant reduction in pain & disability in group A patients compared to group B, can be attributed to be correction of asymmetry between the hip rotations, which In general, has

been proposed to be a potential mechanism for causing LBP due to an increase in flexibility of one or more lumbar segments in a specific direction with a potential decrease in flexibility in other regions causing increased frequency of loading of one or more lumbar segments on one side compared with the other.

Correcting asymmetry or improving the flexibility between the hip rotator muscles reestablishes the length tension relationship of the hip musculature & decreases the frequency of lumbo pelvic motion with hip motion, eliminating abnormal loading in lumbar region. This reduction in the abnormal stress or strain in the lumbar segments could in turn be one of the factors which helps in relieving pain & improving disability [11,12, 17].

The unique finding which was noted in group A patients was that there was reduction in external rotation ROM with improved internal rotation. This could be because of the re establishment of balance between internal rotation & external rotation muscle groups As the internal rotator muscles could have been weakened due to altered length tension relationship between the rotator muscles following asymmetry . The increase in muscular strength and tone of the internal rotators following strengthening could be the reason for the decrease in external rotation, further research in this regard is warranted.

According to results of this study both the groups showed significant improvement in the outcome variables, however there is significant improvement in pain & disability in group A subjects compared with that of group B ($p =<0.01$)

Hence the findings of our study strongly recommends that , while evaluating the patients with low back pain, the therapists should look at hip joint as a potential cause for the low back pain. The role of rotational asymmetry's & intervention comprising for restoring the symmetrical hip rotations as a part of treatment for unspecified or recurrent low back pain could help in the rehabilitation of patients with low back pain and will have an compounding effect when used along with conventional therapy in the outcome of recurrent or unspecified low back pain patients.

Conclusion

Rotational asymmetry existed in over 42 % of population with unspecified low back pain. Rotational asymmetry correction was effective in the management of pain & disability along with conventional therapy than conventional therapy alone in treatment of patients with sub acute/chronic unspecified low back pain.

LIMITATIONS & RECOMMENDATIONS

- The study population was small. Further studies should be conducted on large population for checking the prevalence of hip rotational asymmetry.
- The duration of treatment was less. further studies should be carried out for longer sessions.
- The area of pain or side determination was not considered which could have interfered with the final outcome, so future studies should take into consideration of the site & area of pain will help in localizing the effects.
- The range of age under consideration for this study was very wide 20-70 & could have altered the results, so further studies could be done by taking with a more age specific groups so that the wide variation produced by the age can be studied.
- This study was conducted on both the females and males, further studies should be done on separate male & female population to evaluate the prevalence rate and effect of intervention.

SUMMARY

The study was a crossectional, & experimental study where 71 subjects with unspecified Low Back Pain of Subacute /Chronic durations were assessed/evaluated for the hip rotational asymmetry. The subjects who fulfilled inclusion criteria were selected randomly for the study and divided into two groups A & B.(n =15) each. Both the Groups A & B received treatment included Conventional Therapy (IFT, SWD) and spinal strengthening exercises, In additional to this group A received stretching and strengthening exercises for hip to correct the rotational asymmetry. The subjects were explained about the treatment, experimental procedures, and outcome measures and were requested to fill the consent form. They were assessed for their hip rotation ROM by Goniometer, Intensity of Pain by VAS and Disability function through Oswestry Disability Index before and after the therapy sessions. The pre and post values of hip rotation ROM, pain & disability outcome measures were compared. Repeated measures ANOVA, paired sample 't' Test was used for statistical analysis and The results of the study showed significant improvement in reduction of pain & disability in both the groups p=<0.01) When inter group comparisons are made Group 'A' showed greater & significant improvements than Group 'B' after 2 weeks of therapy sessions.

Therefore, this study concluded that both the approaches are effective for decreasing pain and improving functional ability of patients with LBP however correcting hip rotational asymmetry was found to be more effective intervention along with conventional therapy in relieving pain and improving functional ability of patients with sub acute / chronic LBP in short term duration.

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ANNEXURE

ANNEXURE I

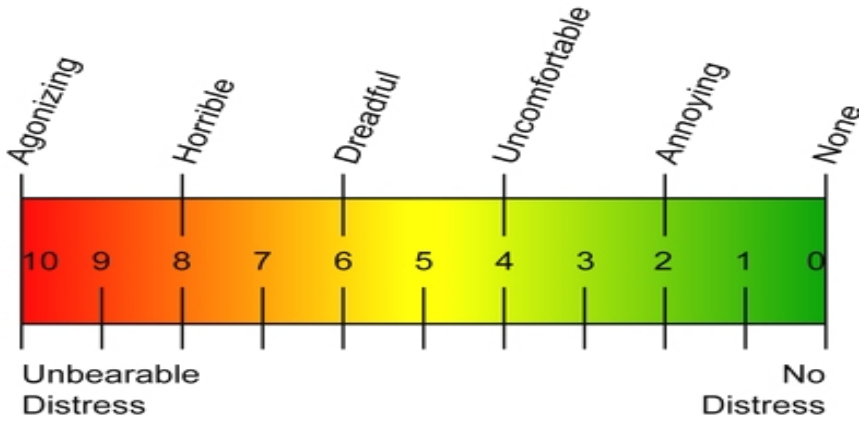
Measurement of hip rotation ROM:

Patient was made to lie prone on treatment table (because of better pelvic stabilization in prone position compared with that in sitting) . A strap was applied around posterior superior iliac spines to prevent movement of the pelvis. the hip to be measured was kept in neutral and knee bend to 90 degrees of flexion. While contralateral hip was abducted approximately to 30 degrees. Goniometer is aligned vertically along shaft of the tibia. The leg was passively moved to produce hip internal and external rotation till the end range and the values are noted.

ANNEXURE II

Visual analogue scale (VAS)

VAS attempts to represent measurement quantities / intensity of pain in terms of a straight line that is believed to range across a continuum of values and cannot easily be directly measured. Operationally a VAS is usually a Horizontally line, 100mm in length , anchored by word descriptors at each end.



ANNEXURE III

OSWESTRY DISABILITY INDEX

Section 1: Pain Intensity £ I have no pain at the moment £ The pain is very mild at the moment £ The pain is moderate at the moment £ The pain is fairly severe at the moment £ The pain is very severe at the moment £ The pain is the worst imaginable at the moment	**Section 6: Standing** £ I can stand as long as I want without extra pain £ I can stand as long as I want but gives extra pain £ Pain prevents me from standing for more than 1 hr £ Pain prevents me from standing for > 30 min. £ Pain prevents me from standing more than 10 min. £ Pain prevents me from standing at all
Section 2: Personal Care (eg. washing, dressing) £ I can look after myself normally without causing extra pain £ I can look after myself normally but causes extra pain £ It is painful to look after myself and I am slow and careful £ I need some help but can manage most of my personal care £ I need help every day in most aspects of self-care £ I do not get dressed, wash with difficulty and stay in bed	**Section 7: Sleeping.** £ My sleep is never disturbed by pain £ My sleep is occasionally disturbed by pain £ Because of pain I have less than 6 hours sleep £ Because of pain I have less than 4 hours sleep £ Because of pain I have less than 2 hours sleep £ Pain prevents me from sleeping at all
Section 3: Lifting £ I can lift heavy weights without extra pain £ I can lift heavy weights but it gives me extra pain £ Pain prevent me lifting heavy wts. off the floor I can manage if they are conveniently placed eg. on a table £ Pain prevents me lifting heavy weights but I can manage light to medium weights if they are conveniently positioned £ I can only lift very light weights	**Section 8: Sex Life (if applicable)** £ My sex life is normal and causes no extra pain £ My sex life is normal but causes some extra pain £ My sex life is nearly normal but is very painful £ My sex life is severely restricted by pain £ My sex life is nearly absent because of pain £ Pain prevents any sex life at all

£ I cannot lift or carry anything	
Section 4: Walking* £ Pain does not prevent me walking any distance £ Pain prevents me from walking more than 2 KM. £ Pain prevents me from walking more than 1 KM £ Pain prevents me from walking more than 500 mts £ I can only walk using a stick or crutches £ I am in bed most of the time	**Section 9: Social Life** £ My social life is normal and gives me no extra pain £ My soc life is normal bt increase the degree of pain £ Pain has no signif.. effect on my social life apart from limiting more energetic interests e.g. sport £ Pain has restricted my social life and I do not go out as often £ Pain has restricted my social life to my home £ I have no social life because of pain
Section 5: Sitting £ I can sit in any chair as long as I like £ I can only sit in my favorite chair as long as I like £ Pain prevents me sitting more than one hour £ Pain prevents me from sitting more than 30 minutes £ Pain prevents me from sitting more than 10 minutes £ Pain prevents me from sitting at all	**Section 10: Travelling** £ I can travel anywhere without pain £ I can travel anywhere but it gives me extra pain £ Pain is bad but I manage journeys over two hours £ Pain restricts me to journeys of less than one hour £ Pain restricts me to short necessary journeys under 30 minutes £ Pain prevents me from travelling except to receive Treatment

Score: / x 100 = %

This questionnaire has been designed to give us information as to how your back or leg pain is affecting your ability to manage in everyday life. Please answer by checking **one box/ response in each section** for the statement which best applies you. We realize you may consider that two or more statements in any one section apply but please just shade out the spot that indicates the statement **which most clearly describes your proble.**

Scoring:

For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5. If all ten sections are completed the score is calculated as follows

Example: 16 (total scored) / 50 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated:

16 (total scored / 45 (total possible score) x 100 = 35.5%

Source:

- Fairbank JCT & Pynsent, PB (2000) The Oswestry Disability Index.
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ANNEXURE IV

CONSENT FORM

I ..... hereby agree to provide my fullest consent and co-operation as a subject for the dissertation work of **MR. IMDAD MUBARAK** entitled **EVALUATION OF ROTATIONAL ASYMMETRY IN HIP & EFFICACY OF ROTATIONAL ASYMMETRY CORRECTION IN UNSPECIFIED LOW BACK PAIN.** Towards his post graduation in physiotherapy. The benefits and possible risks of the procedure and duration of the study have been explained to me. The questions and queries I have posed have been answered to my satisfaction and I am aware that I can discontinue the study at any time I wish to do so.

Place: **Signature of the participant**

Date:

ANNEXURE V

ASSESSMENT CHART

NAME _____ **AGE** _____ **SEX** M / *F*

IP/OP NO: _____ REFERRED BY_____

DATE OF ASSESSMENT:_____ OCCUPATION_____

ADDRESS_____

_____

CHIEF COMPLAINTS:_____

_____

DURATION (present since) _____ Improving/unchanging/worsening

HISTORY OF PRESENT ILLNESS_____

_____

PREVIOUS HISTORY/ TREATMENT: _____

_____

PAIN ASSESSMENT:

ONSET OF PAIN: SUDDEN / INSIDUOUS

QUALITY OF PAIN**:** **Burning / Throbbing / Dull shooting.**

RADIATING **Yes / No**

VAS score (0-10): 0 I----------I 10

SEVERITY OF PAIN: **Mild / Moderate / Severe**

FUNCTIONAL DISABILITY SCORE: (**Oswestry Disability Score):-**_____

ON OBSERVATION:

GENERAL:

AREA AFFECTED:

BUILT OF THE PATIENT: **Thin / Moderate / Well built / Obese _____**

POSTURE: *SITTING / STANDING* _____

LOCAL:

SWELLING_____REDNESS_____

WOUND/SCAR_____MUSCLE WASTING_____

DEFORMITIES_____ TROPHIC CHANGES_____

ON EXAMINATION

PALPATION:

TENDERNESS_____

MUSCLE SPASM_____

WARMTH_____

TIGHTNESS / CONTRACTURES:_____

RANGE OF MOTION:

HIP	RIGHT	LEFT
INTERNAL ROTATION:		
EXTERNAL ROTATION:		

FUNCTIONAL DISABILITY SCORE: (**Oswestry Disability Score):-_____**

NEUROLOGICAL

Motor Deficit _____Reflexes_____

Sensory Deficit _____

Selective tension procedures/ special tests/ provocative tests :-

SLR TEST: _____

LASEGUE'S TEST:_____

FABERS TEST:_____

GAENSLEN'S TEST_____

INVESTIGATIONS:

X-ray / CT / MRI :

_____

PROVISIONAL

DIAGNOSIS:_____

TREATMENT:

_____

_____

_____

PROGNOSIS

PRE TEST EVALUATION. DAY-1

DATE……

RANGE OF MOTION

HIP RIGHT LEFT

INTERNAL ROTATION:

EXTERNAL ROTATION:

VAS score (0-10): 0 I----------I 10

FUNCTIONAL DISABILITY SCORE: (**Oswestry Disability index):-_____**

POST TEST EVALUATION : (END OF 2nd WEEK) OR DAY 14

DATE……..

RANGE OF MOTION:

HIP RIGHT LEFT

INTERNAL ROTATION:

EXTERNAL ROTATION:

VAS score (0-10): 0 I----------I 10

FUNCTIONAL DISABILITY SCORE: (**Oswestry Disability Score):-_____**

ANNEXURE VI

MASTER CHART
TOTAL NUMBER OF PATIENTS EVALUATED

Si no	age	Sex	Internal rot		External rot	
			R	L	R	L
1.	21	F	45	30	45	55
2.	20	F	25	45	55	45
3.	28	M	30	45	50	45
4.	28	M	45	30	45	55
5.	27	M	45	30	45	55
6.	30	M	35	45	50	45
7.	40	M	50	30	50	55
8.	41	M	25	45	55	45
9.	42	M	30	45	50	45
10.	40	M	45	20	45	50
11.	46	M	30	45	55	45
12.	46	M	25	45	60	45
13.	55	F	45	20	45	50
14.	70	M	20	45	55	45
15.	51	M	45	25	45	55
16.	24	M	20	45	60	45
17.	27	M	45	25	45	50
18.	28	F	45	30	45	50
19.	35	F	35	45	55	45
20.	36	M	30	50	55	50
21.	31	F	35	45	55	45
22.	39	M	45	25	45	50
23.	40	M	35	50	55	50
24.	50	F	45	25	45	60
25.	52	F	30	45	60	45
26.	56	M	35	45	55	45
27.	57	M	20	50	50	50
28.	59	M	30	45	55	45
29.	63	M	35	45	55	45
30.	70	M	30	45	60	45
31.	20	M	45	45	45	45
32.	20	M	45	45	45	45
33.	22	M	40	40	50	50
34.	24	F	20	20	60	60
35.	27	F	25	25	55	55
36.	29	M	45	45	45	45
37.	30	M	45	50	45	50
38.	32	F	45	45	45	45
39.	34	M	40	50	40	50
40.	36	M	45	50	45	50

41.	36	F	45	50	45	50
42.	40	M	45	45	45	45
43.	28	M	40	40	30	30
44.	35	F	20	20	55	55
45.	24	M	20	45	60	45
46.	27	M	45	45	45	45
47.	28	F	45	45	45	45
48.	35	M	45	45	45	45
49.	36	F	50	50	50	50
50.	40	M	30	45	30	45
51.	44	M	40	45	40	45
52.	39	M	25	55	25	55
53.	40	M	25	55	25	55
54.	50	F	20	60	20	60
55.	52	M	20	20	60	60
56.	56	M	45	55	45	55
57.	57	M	45	55	45	55
58.	59	F	45	55	45	55
59.	63	M	20	20	60	60
60.	70	M	40	55	40	55
61.	42	M	45	45	45	45
62.	33	M	40	50	40	50
63.	56	F	45	50	45	50
64.	66	M	40	55	40	55
65.	44	F	30	45	30	45
66.	70	M	20	20	60	60
67.	21	M	20	20	60	60
68.	20	F	25	55	25	55
69.	28	M	20	20	50	50
70.	28	M	20	20	60	60
71.	27	F	45	55	45	55
72.						
73.						
74.						

MASTER CHART

Data collection group A

		Pre test						post test					
SI NO	AGE	ROM IR (R)	ER (R)	IR (L)	ER (L)	VAS	ODI	ROM IR (R)	ER (R)	IR (L)	ER (L)	VAS	ODI
1	21	45	45	30	55	7	37.7%	45	45	40	45	2	13.3%
2	20	45	55	45	45	7	36.5%	35	45	45	45	2	6.6%
3	28	25	50	45	45	5	26.6%	40	40	45	45	2	11.1%
4	28	45	45	30	55	6	18%	45	45	40	45	2	6%
5	27	45	45	30	55	7	33.3%	45	45	40	45	2	11.1%
6	30	35	50	45	45	6	18%	40	45	45	45	2	6%
7	40	50	50	30	55	6	16%	50	50	40	45	2	6%
8	41	25	55	45	45	5	16%	35	45	45	45	2	6%
9	42	30	50	45	45	4	14%	40	40	45	45	1	4%
10	40	45	45	20	50	7	28.8%	45	45	30	40	3	11.1%
11	46	30	55	45	45	5	18%	40	45	45	45	2	6%
12	46	25	60	45	45	7	34%	35	50	45	45	3	18%
13	55	45	45	20	50	7	26.6%	45	45	30	40	2	11.1%
14	70	20	55	45	45	6	15.5%	30	45	45	45	2	4.4%
15	51	45	45	25	55	5	24.4%	45	45	35	45	1	4.4%

MASTER CHART
PRE TEST data collection group B

SI NO	AGE	ROM IR (R)	ER (R)	IR (L)	ER (L)	VAS	ODI
	24	20	60	45	45	6	22.72%
2	27	45	45	25	50	6	26.6%
3	28	45	45	30	50	5	20%
4	35	35	55	45	45	6	20%
5	36	30	55	50	50	5	18%
6	31	35	55	45	45	7	31.1%
7	39	45	45	25	50	6	22%
8	40	35	55	50	50	5	16%
9	50	45	45	25	60	6	24.4%
10	52	30	60	45	45	4	17.7%
11	56	35	55	45	45	7	33.3%
12	57	20	50	50	50	6	22.2%
13	59	30	55	45	45	5	20%
14	63	35	55	45	45	6	26.6%
15	70	30	60	45	45	6	26.6%

POST TEST data collection group B

ROM IR (R)	ER (R)	IR (L)	ER (L)	VAS	ODI
20	60	45	45	3	15.5%
45	45	25	50	4	15.5%
45	45	30	50	3	14%
35	55	45	45	4	14%
30	55	50	50	3	10%
35	55	45	45	4	24.4%
45	45	25	50	3	14%
35	55	50	50	3	10%
45	45	25	60	4	17.7%
30	60	45	45	2	11.1%
35	55	45	45	4	26.6%
20	50	50	50	4	15.5%
30	55	45	45	3	15.5%
35	55	45	45	3	20%
30	60	45	45	4	17.7%