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A COMPARATIVE STUDY TO FIND THE EFFECTIVENESS OF CORE MUSCLES ACTIVATION OVER CONVENTIONAL EXERCISES IN SUBJECTS WITH MECHANICAL LOW BACK PAIN

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ABSTRACT:

Background: Mechanical low back pain is the main common reason for referral to physiotherapy clinic, and a chief reason for people complains and both men and women are equally reported to be effected by this condition. It is proved that core stabilization exercises has got significant improvement when compared to conventional back care exercises in improving the function and in relieving pain.
Aims and Objectives: To see the effectiveness of core muscles activation over conventional exercises along with Interferential Therapy (IFT) in each group for the reduction of pain and to increase the range of motion and improve the disability in subjects with mechanical low back pain.
Methodology: This is an experimental study where pre and post design were used with 40 subjects with mechanical low back pain were taken considering the selection criteria and divided into two groups. 20 subjects in Group-A received Core muscles activation exercises with pre and post test analysis and 20 subjects in Group-B received Conventional exercises with pre and post test analysis. Visual Analogue Scale (VAS) for pain intensity, Revised Oswestry Disability Index (R-ODI) for the disability improvement and Goniometry for range of motion.
Results: Statistical analysis was done by using paired 't' test which showed significant improvement in reducing pain, improving the quality of life and increasing the ROM in Group-A as compared to Group-B but as $p > 0.05$ so it was non significant.
Conclusion: It is concluded that subjects in Group-A who received Core muscles activation exercises is more effective as compared to Group-B who received Conventional exercises and it is found that IFT with core activation exercises is very effective in reducing pain, increasing the ROM and improving the disability.

Keywords: Mechanical low back pain, Core muscles activation, Conventional exercises, IFT, VAS, R-ODI, Goniometry.

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1.Introduction

Mechanical low back pain (MLBP) refers to back pain that arises intrinsically from the spine, intervertebral disks, or surrounding soft tissues. Repetitive trauma and overuse are common causes of chronic mechanical low back pain, which is often secondary to workplace injury.[1] MLBP is a cumulative process resulting from poor posture coupled with sedentary habits that put the back under severe mechanical stress. [2] It is described as a musculoskeletal pain which varies with physical activities and not involving root compression or serious spinal diseases.[2,3] Most low back injuries are not the result of a single exposure to a high magnitude load, but instead due to cumulative trauma from sub-failure magnitude loads like repeated small loads (e.g. bending) or a sustained load (e.g. sitting).[4]

Interferential therapy (IFT) has been reported to be one of the most common electrotherapeutic modalities used by physiotherapists worldwide.[5] The concept of IFT is based on crossing two medium frequency currents (with a carrier frequency between 2 and 10 KHz, most commonly 4 KHz) that reportedly generates a low-frequency 'beating'(amplitude-modulated) effect between 0 and 150 Hz in the deep tissues.[6,7]These beat frequencies are believed to decrease pain in the region of the application and assist with the reduction of oedema and improvement of joint range of motion (ROM) depending on the selected frequency.[7] It is claimed that an amplitude-modulated interference wave is the active ingredient of IFT, and that if it is delivered at frequencies of 1 to 250Hz it will elicit physiologic mechanisms that lead to pain relief.[8]

Core activation or stabilization has become a well known fitness trend that has started to transcend into the sports medicine world. Broad benefits of core stabilization have been touted, from improving athletic performance and preventing injuries, to alleviating low back pain.[9] The core can be described as a muscular box with the abdominals in the front, paraspinals and gluteals in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom.[9,10] Core stability exercises have become a popular form of therapeutic exercise and are seen as a critical component to restoring proper kinetic function.[11] Core stability exercises that improve lumbopelvic stability may be included as a part of prevention and clinical rehabilitation for patients with LBP. Core stability exercises include a range of exercise programs with different approaches, having the common goal of improving lumbopelvic and abdominal control. These exercises are designed to enhance the ability of the neuromuscular and motor control systems to prevent spinal injury.[12] The conventional back care exercises decrease the pain and increase the strength of involved muscles, but results in frequent recurrence rates because of their effectiveness only up to one year and patients are left out with some residual pain and disability. [2,4] The conventional back exercises strengthen the involved muscles like the abdominals administering various back extension exercises like prone lying and lifting one leg, alternate leg and arm lifts, lifting upper trunk and both legs off the floor.[2,4,13] The conventional back exercises strengthen the involved muscles like abdominals, which are ineffective after 45 degrees of trunk curls.[14] The human spine buckles invitro during a

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compressive load of 90 N but the spine is loaded of about 4000 –6000 N, while administering various back extension exercises like prone lying and lifting one leg, alternate leg and arm lifts, lifting upper trunk and both legs off the floor.[15] The efficacy of general back exercises however, appears limited in achieving these goals.[16]

Hence, the purpose of this study is to compare the effectiveness of core muscles activation over conventional exercises in subjects with MLBP.

2. Methodology

2.1. Study design

The study was an experimental study and which was approved by the Institutional Research and ethical committee. All the experimental procedures were in accordance with the University's guidelines. Participants were recruited through random sampling.

2.2. Participants

All subjects were required to give a consent prior to the participation in the study. Pain intensity, functional disability and range of motion (ROM) of the lumbar region were assessed by Visual Analog Scale (VAS), Revised Oswestry Disability Index (ODI) and Goniometry respectively before commencement of the treatment (Pre-test) and after the final day of the treatment (Post-test). To carry out the study, a total number of 40 (Forty) subjects were taken with Mechanical low back pain selected according to the inclusion criteria of my study. There was a randomised control distribution among Group A and Group B containing 20 number of subjects in each group. Group A- 20 subjects (Experimental Group- IFT and core activation exercises). Group B- 20 subjects (Control Group- IFT and conventional exercises). The exclusion criteria were as follows: Any history of fracture of the spinal area in the past, Disc pathologies, Malignancy, Inflammation in the lumbar spine, Nerve root compression. Participants of either gender aged between 18 to 45 years with back pain not exceeding 3 months were included in the study.

2.3. Source of data

The subjects were taken from Physiotherapy OPD, Assam downtown University and Physiotherapy OPD, Downtown Hospital.

2.4. Interventions

The subjects were allocated in two different treatment groups, Group-A (IFT & Core Activation exercises) and Group-B (IFT & Conventional exercises) by random sampling, consisting of 20 subjects in each group, demographic data was collected. The demographic data was collected and the assessment before the intervention was taken from the subjects. According to the taken data the intervention has been started for each groups for the duration of 12 weeks for each subject. After completion of the 12 weeks intervention period, the post –

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intervention data has been collected from the subjects. Each group received Interferential Therapy for 15 minutes followed by the respective group of exercises.

Core muscles activation: Under this, there were four exercises where in the first one the subject was made to lie over the swiss ball with both the hands behind the head and ask them to raise the trunk upwards. In the second one, the subjects were made to lie on the couch with both the calves resting on the ball and ask them to move the ball sideways rolling the ball. In the third one, subjects were made to lie on the couch with both the feet together resting on the ball and straightened the leg, In the fourth one, the subjects were made to lie prone over the ball and asked to raise one leg and one arm in the alternate way. All these exercises were maintained for 10 seconds and repeated 10 times.

Fig 1: Supine with trunk lift

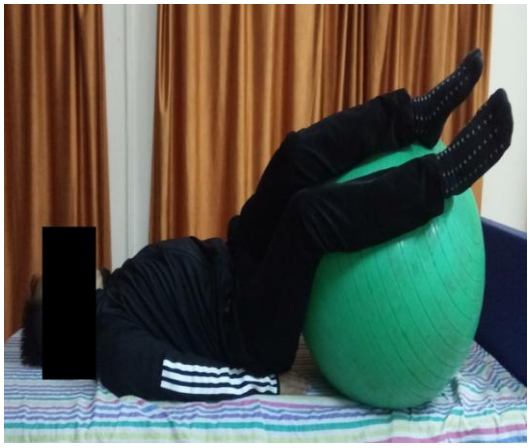

Fig 2: Rocking the ball in either side

Fig 3: Supine and straightened the legs

Fig 4: Alternate arm and leg lift

Conventional exercises: Under this, the first exercise, the subjects were made to lie supine on the couch with both the legs raising upwards and hold the position. In the second exercise, the subjects were made in crook lying with both the hands behind the head and raise the trunk and bent sideways reaching the knees. In the third one, the subjects were made to lie prone and ask them to raise the leg one by one and hold the position, In the last one, the subjects were asked to lie in a prone position and asked to raise the trunk upto shoulder level. All these exercises were maintained for 5 seconds and repeated 10 times.

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Fig 5: Supine with leg lifts

Fig 6: Crook lying with Crunches

Fig 7: Prone lying with leg lifts

Fig 8: Prone with trunk lifts

2.5. Outcome measures

Visual analogue Scale (VAS), Revised Oswestry Disability Index (R-ODI) and Goniometry were included as the outcome measures for Pain , Disability percentage and the Range of motion respectively.

2.6. Data analysis

Descriptive data was presented as mean±standard deviation and number (percentage). The paired sample t-test and independent sample t-test was used to compare the results after 12 weeks in each group. The significance level of this study was set at $p<0.05$.

3. Results

The present study was undertaken to find out the effectiveness of Core muscles activation over Conventional exercises. The subjects were randomly allocated and divided into two groups i.e Group-A where the subjects received IFT with Core muscles activation exercises and Group-B where the subjects received IFT with Conventional exercises. The effect of Group-A and Group-B was compared by VAS score, Revised ODI for functional ability and Goniometer for Range of Motion.

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40 mechanical low back pain patients were selected randomly and they were included for analysis after the informed consent was given by the patients. Considering Group-A (Core muscles activation) where N = 20 and Group-B (Conventional exercises) where N = 20.

Results for the comparison of Visual Analogue Scale (VAS) between both the groups has been demonstrated in Table 1. A change of outcomes in both the groups is evident although, there was no significant difference.

Table 2 shows the comparison between both the groups in Revised Oswestry Disability Index (R-ODI) to find the percentage of disability and quality of life in both the groups. It shows that there is reduction in the disability of subjects in group-A as compared to group-B but there was no significant difference in the p value.

Table 3 shows the comparison between both the groups in Range of Motion (ROM) using goniometry which shows that there is increase in the range of motion after the intervention for group-A as compared to group-B but as the p value is greater than 0.05 it is considered non significant, which means there is no significant difference between both the groups.

Table 1

Comparison of Group-A and Group-B in VAS

Post test	Mean ± SD	N	t statistic	df	P value	Remarks
Group-A	5.75 ± 1.039	20	-1.160	19	0.26	NS
Group-B	6.1 ± 1.042	20		19		

*NS= Non significant

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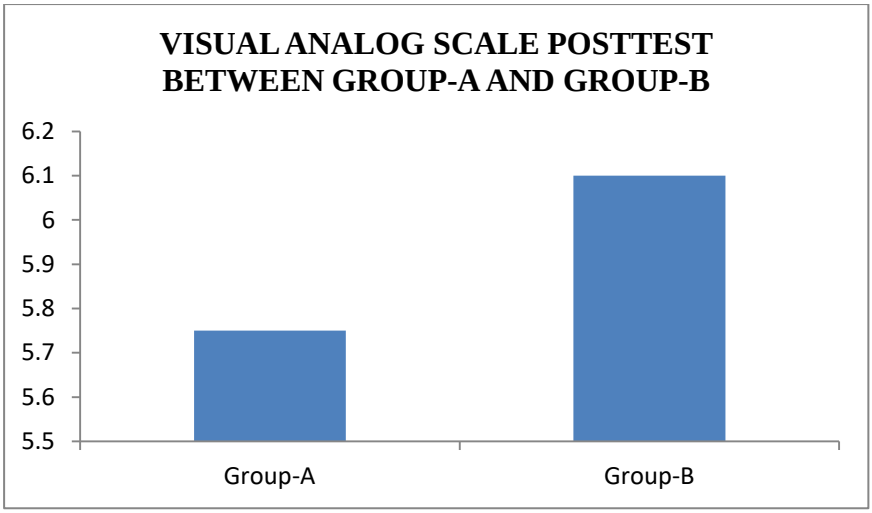

Fig 9: Graph showing comparison of Group-A and Group-B in VAS

Table 2

Comparison of Group-A and Group-B in R-ODI

Post test	Mean ± SD	N	t statistic	df	P value	Remarks
Group-A	0.45 ± 0.031	20	-0.660	19	0.51	NS
Group-B	0.49 ± 0.027	20		19		

*NS= Non significant

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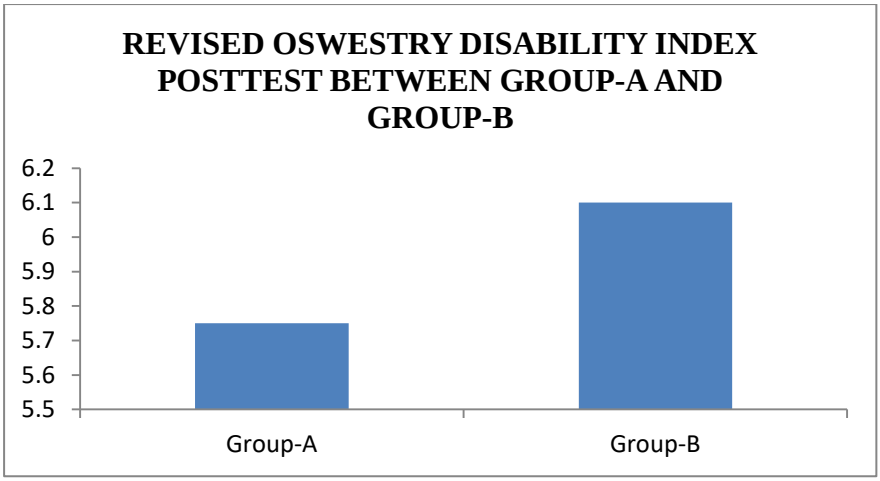

Fig 10: Graph showing comparison of Group-A and Group-B in R-ODI

Table 3

Comparison of Group-A and Group-B in Goniometry for ROM

Measure	Group	Mean ± SD	N	t statistic	df	P value	Remarks
Flexion	A	54.6 ± 17.936	20	1.697	19	0.10	NS
	B	51.55 ± 40.576	20				
Extension	A	23.6 ± 4.989	20	-1.421	19	0.17	NS
	B	24.3 ± 2.010	20				
Rt. Lat. F	A	24.85 ± 0.239	20	1.853	19	0.07	NS
	B	24.15 ± 2.871	20				
Lt. Lat. F	A	24.8 ± 0.378	20	-0.438	19	0.66	NS
	B	24.85 ± 0.45	20				
Rt. Rot.	A	18 ± 0	20	1.831	19	0.08	NS
	B	17.85 ± 0.134	20				

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Lt. Rot.	A	17.9 ± 0.094	20	0	19	1	NS
	B	17.9 ± 0.094	20				

*NS= Non significant

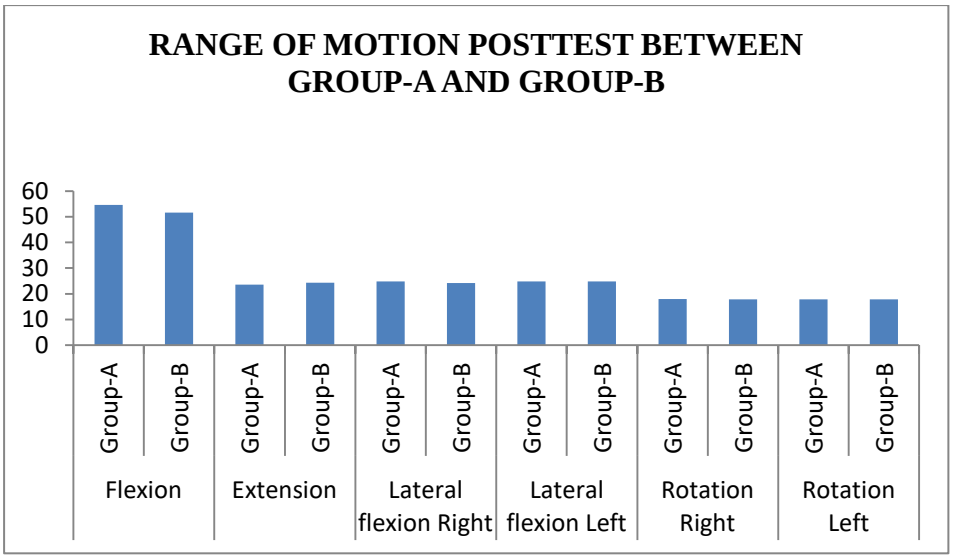

Fig 11: Graph showing comparison of Group-A and Group-B in Goniometry for ROM

4. Discussion

The purpose of the study was to find the effectiveness of Core muscles activation over Conventional exercises in subjects with mechanical low back pain. The results would agree with the evidence that Group-A (core muscles activation) is more effective in reducing pain, increasing the range of motion and improving the disability of the lower back region than Group-B (conventional exercises) according to the mean values of all the outcomes. But according to the p value in post test of all the outcomes i.e $p > 0.05$ which shows that it is not statistically significant.

Our results shows that Group-A has much more effectiveness than Group-B in reducing pain, improving the disability and increasing the range of motion but the p value for all the outcomes in post intervention is not significant.

Comparing both Group-A and Group-B, it is found that both the treatments are benefitted in the study but in comparison with Group-B, Group-A has much more effectiveness in improving all the outcome measures.

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Einstein Jerome et al (2015), reported that the core stabilization group showed significant improvement when compared to the conventional exercises group in improving function and in relieving pain.

Both Group-A and Group-B showed significant improvement in relieving the pain, improving the disability and increasing the range of motion but in case of Group-A, the amount of interventions was higher with decrease in pain intensity, improving the quality of life and increasing the range when compared to Group-B. For this study paired 't' test was used during the analysis and both male and female subjects participated in the study.

Sobhy M Aly (2017) also reported that the core stabilization exercises are more effective in improving the strength and endurance of the trunk muscles than the dynamic exercises in patients with low back pain.

Inter group analysis of both the groups post-test in Range of motion (Goniometer) has been found that all the ranges are non significant because $p > 0.05$ but looking at the grapf and the mean values of all the ranges it is found that Group-A has much more effectiveness than Group-B in relieving the pain, improving the quality of life and increasing the range of the trunk.

As per the result, it is found that the group with Core muscles activation (Group-A) has got more effect along with the use of an electrotherapy modality for reduction of pain as compared to the Conventional exercises group (Group-B). The only advantage of both the exercises is that both the core activation and conventional exercises can be done by the patient himself if he/she is able to do it.

5. Limitations and future scope

Limitations for this study includes that the sample size was small in the study, all measurements for a given subject in the study were measured by the same individual, the study didn't include a long term follow up, the inclusions of all the subjects are from the limited number of places, there was no follow up for the interventions. Whereas the future recommendations include. future studies can be done with a large sample size, this study was done in both male and female subjects but in future we can recommend a separate study for male and female subjects, follow up and recording of the effects of the interventions may give more better results for the patients with mechanical low back pain, should not be limited to only one particular community, study can be done with larger sample size with more longer duration to have more luminous outcome and also to prove the effective result of the therapy interventions used, further studies can be done with young adults to find the prevalence of mechanical low back pain in young age group.

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6. Conclusion

This study has shown that subjects who received Core activation exercises (Group-A) is more effective when comparing the other group Conventional exercises (Group-B). Although the choice of treatment modalities might vary according to the therapist but here it is found that the use of IFT along with the Core activation exercises is very effective in reducing the pain and increasing the range of motion and for improving the disability as well.

Conflict of interest statement

No potential conflict of interest relevant to this study was reported.

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