(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 4, Issue 4, Page No: 350-360
July-August 2021

IJMSCR

Effectiveness Of William's Flexion Exercises and Motor Control Exercises on Pain and Function in Subjects with Non-Specific Low Back Pain Among Student Population

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Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Objective: Low Back Pain is the highest global burden of disease related to living with disability worldwide. Non-Specific Low Back Pain is defined as the back pain results from poor postures due to which proper function of the muscle alters, it becomes dysfunctional after experiencing back pain. So it requires stabilization exercises. Evidence suggests that William's Flexion Exercises and Motor Control Exercises are effective in treating Non-Specific Low Back Pain (NSLBP).

Methods: Prospective study design 80 subjects with mean age of 23 years having a clinical diagnosis of NSLBP were randomly allocated into two groups. Group A received William's Flexion Exercises (WFE) and Group B received Motor Control Exercises (MCE) are given thrice a week for 8 weeks. The outcomes of these Interventions were measured by Visual Analogue Scale (VAS) for Pain and Oswestry Disability Index (ODI) for function.

Result: Independent's' test was used to compare the mean significance difference between continuous variables. Paired' test was used to assess the Statistical significance difference in pre and post test scores. Statistical analysis of this data revealed that within group comparison both groups showed significant improvement in all parameters whereas in between group's comparison MCE showed better improvement compared to WFE.

Conclusion: The present study was concluded that after 8 weeks of Intervention of both WFE and MCE showed significant improvement in decreasing Pain and improving function. Hence, we conclude that MCE is more effective than WFE in subjects with NSLBP.

Keywords: Non-Specific Low Back Pain (NSLBP), (VAS), (ODI), William's Flexion Exercises (WFE), Motor Control Exercises (MCE)

INTRODUCTION

Low Back Pain (LBP) is one of the most common musculoskeletal disorders and a leading cause of activity limitation that can eventually result in disability, decreased quality of life, and work absenteeism[1]. LBP is estimated that 80% of the population will suffer atleast one episode of LBP at some point during their lives[2]. According to World Health Organization (WHO) LBP is the leading cause of disability[3]. The overall burden of LBP arising from ergonomic exposures at work was estimated at 21.8 million disability adjusted life years in 2010[4]. LBP is classified as Mechanical Non-Mechanical and Psychogenic Mechanical Low Back Pain may be Specific or Nonspecific. About 90% of LBP is

considered as Non specific[5]. Non-Specific Low Back Pain (NSLBP) is defined as the pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal fold of unknown etiology[6].In Global Burden of Disease (GBD) 2010. LBP ranked highest in terms of Global Disability[7]. In the clinical practice as well as in literature Nonspecific Low Back Pain is usually classified by the duration of the complaints[8]. NSLBP is classified on the basis of duration as Acute (pain lasting less than 6 weeks) Sub Acute (6 to 12 weeks) and chronic (more than 12 weeks) [9]. The etiology of Low Back Pain is still unknown, but it is believed to be multifactorial. Non-Specific Low Back Pain does not have a pathoanatomical cause; treatment focuses on reducing pain and its consequences. Many factors effecting NSLBP such as physiological structure, genetic factors, anthropometrics, psychological characteristics, age, gender, smoking status, the duration of watching Television (TV), using the computer, carrying backpacks, lumbar support usage, sitting postures, obesity, physical activity and socio economic situations[12]. The diagnosis of Non-Specific Low Back Pain (NSLBP) is dependent on the clinician being satisfied for not having any specific cause. Physiotherapy is the main interventions used to maintain conservative treatment which uses different modalities and Various Therapeutic are used to regain function and strengthen, stabilize the spine. Due to highly demanding curriculum during the studies, medical students are exposed to stress, sedentary lifestyles, and long hours of hospital wards and clinics which may lead to high prevalence of Low back pain in student population. Recent evidence shows that the exercise therapy includes William's Flexion Exercises and Motor Control Exercises have been proved effectively in reducing symptoms of Non-Specific Low Back Pain.

William's Flexion Exercises is also called Lumbar Flexion Exercises. Williams explained, the patient to perform exercises and adhere to postural principles which serve to decrease the lumbar lordosis to a minimum thereby reducing the pressure on the posterior elements on the lumbar spine. These exercises outlined to accomplish a proper balance between the flexor and extensor groups of postural muscles. These exercises used for lumbar flexion to avoid lumbar extension and strengthen the abdominal and gluteus musculature to manage low back pain[10].

Motor control exercises has become the most popular treatment method in spinal rehabilitation Physiological studies have demonstrated that patients with Low Back Pain exhibit a delayed onset of activity of the deep trunk muscles (e.g., transverses abdominis, multifidus) when the stability of the spine is challenged in dynamic tasks. Moreover, it was found that patients with low back pain tend to increase the spinal stiffness to compensate for the lack of stability from the deep muscles by increasing the activity of the superficial muscles. Finally, the patients who recovered from an episode of acute low back pain are more susceptible to recurrence and chronicity if these changes were not treated with motor control exercise[11]. Motor control exercises are used in improving function of specific trunk muscles that controls inter-segmental movement of the spine, including transverses abdominis, multifidus, the diaphragm and pelvic floor muscles[12]. Both William's Flexion Exercises and Motor Control Exercises are effective in decreasing Pain and improving Function in Subjects with Non-Specific Low Back Pain. But there are very limited studies by comparing these two exercises so the need of the study arises.

MATERIALS AND METHODS

Study Design: Prospective Study

Ethical Clearance and Informed Consent: The Study protocol was approved by the Ethical Committee of GSL Medical College Rajamahendravaram (Annexure-I); the principal investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participation in the study (Annexure-II). All the participants signed the informed consent and the rights of the included participants have been secured.

Study Population: Subjects clinically diagnosed with Non-Specific Low Back Pain (NSLBP) by Orthopaedician.

Study Setting: The study was conducted at our Department of Physiotherapy, GSL Medical College, Rajamahendravaram, Andhra Pradesh, India.

Study Duration: The study was conducted during the period between June 2019 and June 2020.

Sampling Method: Simple Random Sampling

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Intervention Duration: Thrice a week for 8 weeks includes William's Flexion Exercises and Motor Control Exercises.

Sample size (n): A total number of 150 subjects are screened in that 80 subjects were recruited who are willing to participate in the study. Recruited participants were explained purpose and relevance of the study. Those willing to voluntarily be included in the study after obtaining informed consent. All the eligible Participants were consecutively randomized to either William's Flexion Exercises Group or Motor Control Exercises Group with 40 subjects in each group inclusion criteria and willing to participate in the study.

MATERIALS USED:

Examination Couch, Consent form, Data collection, VAS score sheet, ODI Questionnaire.

INCLUSION CRITERIA

- Subjects clinically diagnosed as Non-Specific Low Back Pain referred by Orthopaedician.
- The area should be localized between the Posterior aspect of 12th rib and buttockcrease.
- Age groups of 18-29 years areincluded.
- Both Male and Female students areincluded.
- Acute and Sub Acute Pains areincluded.
- No particular anatomical cause forPain.
- Able to walkindependently

EXCLUSION CRITERIA

- Known or suspected serious pathological injuries, such as nerve rootcompressions.
- Psychiatric patients that prevent active participation in exercise programme.
- Ankylosing Spondylosis, Inflammatory and Rheumatological diseases.
- Any previous Spinal (or) Lower limb surgeries (or) scheduled forsurgery.
- Spondylolisthesis, Spondylosis, Spinal Stenosis,Osteoporosis.
- Vertebral fractures and Infections should beexcluded.
- Pregnancy, malignancy, Trauma, Discherniation.

STUDY PROCEDURE: The study consists of 8 weeks of Intervention which includes William's Flexion Exercises (Group-A) and Motor Control Exercises (Group-B). The outcomes were measured by using VAS for pain, ODI for Function. All the eligible participants were consecutively randomized into either Group-A and Group-B.

Treatment Duration: 60 minutes which includes 5-10 minutes of warm up and 5-10 minute of cool down exercise session and 30-40 minutes of exercise training with 2 minutes of rest time in between the sets [13].

Common Warm up Exercise's protocol for both the Groups 5 - 10 minutes: Warm up period consists of spot jogging, followed by some free exercises, diaphragmatic breathing exercise and light stretches held for 15 seconds (Hamstring, Hip flexors and low back muscles).

Common cool down Exercise's protocol for both the Groups 5 - 10 minutes: At the end of each session, subjects were asked to do cool down exercises, which followed by stretching exercises.

GROUP A - WILLIAM'S FLEXION EXERCISES[14]. These exercises include: Pelvic tilt, Single knee to chest, Double knee to chest, Partial sit up, Hamstring stretch, Hip flexor stretch, Squat.

1. PELVIC TILT: Lie on your back with knees bent; feet flat on the floor flatten the small part of your back against the floor without pushing down with the legs hold for 5-10 seconds.

2. SINGLE KNEE TO CHEST: Lie on your back with knees bent feet flat on the floor slowly pull your right knee towards your shoulder and hold 5-10 seconds.

3. DOUBLE KNEE TO CHEST: Begin as in previous exercise after pulling right knee to chest and hold both knees for 5-10 seconds slowly lower one leg at a time.

4. PARTIAL SITS UP: Do the pelvic tilt and while holding this position slowly curl your head and shoulders of the floor. Hold briefly and return slowly to the normal position.

5. HAMSTRING STRETCH: Start in long sitting position with toes facing towards the ceiling and knees fully extended slowly lower the trunk forward over the

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legs keeping knees extended arms over stretched over the legs and eyes focus ahead.

6. HIP FLEXOR STRETCH: Place one foot in front of the other with the left leg (front) knee flexed and right leg (back) knee extended hold rigidly straight. Flex forward through the trunk until the left knee contracts the axillary fold (arm pit region) repeat the right leg forward and left legback.

7. SQUAT: Stand with two feets parallel about shoulders width apart attempting to maintain the trunk as perpendicular as possible to the floor, eyes focused ahead and feet flat on the floor, the subject slowly lowers his body by flexing his knees.

GROUP B: MOTOR CONTROL EXERCISES[15]
Subjects in Group-B received Motor Control Exercises. The subjects were asked to perform Motor Control Exercises thrice a week for 8 weeks under supervision by the physiotherapist.

Stage 1: 8 repetitions 5-10 second's hold: It involves exercises aimed at retraining transverse abdominus, and multifidus. These exercises were supplemented with exercises for the pelvic floor muscles, breathing control and control of spinal posture.

EXERCISE 1: Isolation of Transverse Abdominis Training: Position of the Subject: Supine position Subjects were instructed to lie on their back with spine in neutral position (gentle anterior curve in the lumbar spine).

EXERCISE 2: Isolation of Multifidus. Position of the subject: Side lying position. Subjects will be in a side lying position with the spine in neutral posture, Hips are flexed. Therapist palpated the multifidus to isolate. If multifidus deficit it will feel like a hole or soft spot compare to the oppositeside.

Stage 2: 15reps with 5-10 sec hold: As the Subjects has learned to isolate the Transverse abdominis and Multifidus muscle. They were instructed to practice isolation of these muscles in Sitting and Standing position then progressed by targeting the coordination of trunk and limb movement and maintenance of trunk stability. Strengthen the co activated core Subject lies on the back or side or sit with the spine in a neutral posture.

EXERCISE 1: Position of the subject: side lying position. Subjects were instructed to keep their ankles together and lift their top knee, then the ankle, then extend leg, then flex the leg, return the ankle While maintaining connection to multifidus, with included pelvic floor contraction and this connection was held throughout themovement.

EXERCISE 2: Position of the subject: Supine position. Subject in Supine with knees and hips flexed subjects was instructed to lift the right foot off the floor and then the left foot off the floor and asked for the Alternate leg extension which included pelvic floor contraction and this connection was held throughout the movement along with a proper strategy for core stabilization. Subjects were asked to exert with exhalation and to breathe in to rest orhold.

STATISTICAL ANALYSIS

All statistical analysis was done by using SPSS software version 21.0 and Microsoft Excel 2007. Descriptive Statistical data were presented in the form of mean +/- Standard deviation and Mean difference were calculated and presented.

BETWEEN THE GROUPS: Independent Student "t"- test was performed to assess the statistically significant difference in the mean values of between the groups for (VAS for pain and ODI for function).

WITH IN THE GROUPS: Paired Student "t"-test and was performed to assess the statistical significant difference in the mean values of between the groups for Pain (VAS) and Function (ODI) score from Pretest and Posttest values.

For all statistical analysis P-Value < 0.05 was considered as statistically significant.

RESULTS

The aim of the study was to find the effectiveness of William's Flexion Exercises and Motor Control Exercises on Pain and Function in Subjects with Non-Specific Low Back Pain. The consort flow chart of the study showed the study organization in terms of subjects screening, Random allocation and analysis following theIntervention.

A total of 150 subjects were screened for eligibility, amongst 80 subjects were included in the study trail. All the 80 subjects who metinclusion criteria have undergone baseline assessment and included subjects were randomized into two equal groups consisting 40subjects completed training in Group-A and Group-B were analyzed based on VAS for Pain and ODI for function.

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DISCUSSION

The aim of the study was to evaluate the effectiveness of William's Flexion Exercises and Motor Control Exercises on Pain and Function in subjects with Non-Specific Low Back Pain. Our study is supported by Mohan Kumar et al stated that William flexion exercise program yielded significant reduction of pain and improvement of spinal range of motion in subjects with nonspecific low back pain[21]. Rouholah Fatemi et al states that the findings show that Williams corrective training can be considered as a useful and valid method for restoring and refining back deformities in lumbar areas. William's Flexion Exercises include six therapeutic exercise programs that reduce lumbar lordosis and were used to treat back pain for many years. These exercises increase the abdominal and gluteal strength and reduce the stress on the dorsal parts of the lumbar spine. Exercises can cause adaptation and adaptability of the body tissues to stress throughout the life. In most cases back pain is mechanical functional treatment will have long term effects .these exercises keep the spine in neutral position and prevents putting too much pressure on the dorsal parts of the lumbar spine and reducing thepain[16]. These William's exercise restore motion and the strength of the lower back and is helpful in relieving pain and preventing reoccurrence of low back pain it also strengthens back and abdominal muscles which maintains all the structures and prevents overloading of posterior element of the lumbar spine and these exercises by Using Valsalva maneuver was particularly beneficial for patients with lumbar lordosis[17].William's Exercises are beneficial to help sand often used for correcting spinal abnormalities. William's believes that the effect of the main causes and factors such as weakness of the muscles of the abdominal wall, the amount of curvature or arch increased and flexibility of hips thighs, especially hamstring muscle or act in when the person does not perform correct activity the virtue being disturbed and the joint movement between hip and waist area as a result cause back pain, so the William's reduce curvature or back arch, strengthening the muscles of the abdominal region and creating flexibility in the muscles around the hips and buttocks, plans therapeutic movements[19].Pelvic tilt requires moderate activity of the internal and external oblique muscles this helps to generate intra abdominal pressure; curl ups maximum activity of external and rectus abdominal muscles[20]. Our study is supported by Aravind Kumar et al while comparing the evaluated report and effects of Motor Control Exercise technique is a statistically significant technique which is helpful in improvement of functional disability, severity of pain and lumbar flexion range of motion[21]. Motor Control Exercises targets the specific Deep stabilizing muscles of lower back region, multifidus, transverse abdominis and pelvic floor. Particularly these become dysfunctional after experiencing back pain. Reprogramming the brain for optimal stabilization, targets right muscles for right task. And this controls the equilibrium of spine and mechanical stability[22]. These are progressive phases to this protocol and patients can only progress when specific criteria are met for each phase. Initially promotion of independent contraction of the deep stabilizing muscles such as Transverse Abdominus and multifidus being facilitated by pelvic floor contraction leading to their co contraction is encouraged. Patients will be given instructions to control breathing with resting tidal volumes throughout deep trunk activation maneuvers. Progression is achieved by precision of contraction in static tasks and the implementation of deep muscle contraction into dynamic tasks[23]. Regarding explanation of reduction of pain and disability there is internal structural changes are present in type 1 multifidus fibers in patients. Results of multifidus muscles biopsies of the patients with poor outcome showed muscle atrophy and an increase infrequency of pathologic changes in the multifidus, especially for moth- eaten type 1 fibers and able to provide segmental stiffness and control motion in the neutral zone, and it is contributed two thirds of the increased stiffness imparted by contraction of muscles. These exercises increase strength and endurance and reduce pain instability by decreasing the pathological changes in type 1 muscle fiber Motor control training change trunk muscle behavior during functional task. The mechanism includes reduced load and improved quality of movement. Plastic changes at the brain due to exercising the specific muscle[24].

CONCLUSION

After 8 weeks of Interventions of this study showed both Group A (William's Flexion Exercises) and Group B (Motor Control Exercises) are statistically significant in reducing Pain and improving Function in subjects with Non Specific Low Back Pain. However, Group B (Motor Control Exercises) showed more

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percentage of improvement when compared to William's Flexion Exercises in reducing Pain and improving Function in subjects with Non Specific Low Back Pain among Student Population.

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TABLES

Table-1: Analysis of Mean Scores of VAS from Pre test to Post test within Group-A

GROUP A	MEAN	S.D	P VALUE	INFERENCE
PRE VAS	6.95	1.060962	0.000 *1	SIGNIFICANT
POST VAS	2.825	0.873763		

Table-2: Analysis of Mean Scores of VAS from Pre test to Post test within Group-B

GROUP B	MEAN	S.D	P VALUE	INFERENCE
PRE VAS	6.65	1.144664	0.000 *2	SIGNIFICANT
POST VAS	4.175	0.930605		

Table-3: Comparison of Mean Score of VAS in between the Groups (Pre test) at Baseline Measurement for Groups-A&B

GROUP A & B	MEAN	S.D	P VALUE	INFERENCE
PRE VAS	6.95	1.125641	0.227771	INSIGNIFICANT
PRE VAS	6.65	1.1310256		

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Table-4: Analysis of Mean Scores of VAS in between the Groups at Post Test for Groups-A&B

GROUP A & B	MEAN	S.D	P VALUE	INFERENCE
POST VAS	2.825	0.763462	0.000 *3	SIGNIFICANT
POST VAS	4.175	0.866026		

Table-5: Analysis of Mean Scores of ODI from Pre test to Post test within Group-A

GROUP A	MEAN	S.D	P VALUE	INFERENCE
PRE ODI	39.0825	6.558763	0.000 *9	SIGNIFICANT
POST ODI	20.78	3.401674		

Table-6: Analysis of Mean Scores of ODI from Pre test to Post test within Group-B

GROUP B	MEAN	S.D	P VALUE	INFERENCE
PRE ODI	41.46	7. 849083	0.000 *8	SIGNIFICANT
POST ODI	36.9525	6.776581		

Table-7: Comparison of Mean Score of ODI in between the Groups Pre test at baseline Measurement for Groups-A&B

GROUP A & B	MEAN	S.D	P VALUE	INFERENCE
PRE ODI	39.0825	43.01738	0.145676	INSIGNIFICANT
PRE ODI	41.46	61.6081		

Table-8: Analysis of Mean Score of ODI in between the Groups Post test for Groups-A&B

GROUP A & B	MEAN	S.D	P VALUE	INFERENCE
POST ODI	20.78	11.57138	0.000 *2	SIGNIFICANT
POST ODI	36.9525	45.92204		

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FIGURES:

Figure-1: Analysis of Mean Scores of VAS from Pre test to Post test within Group-A

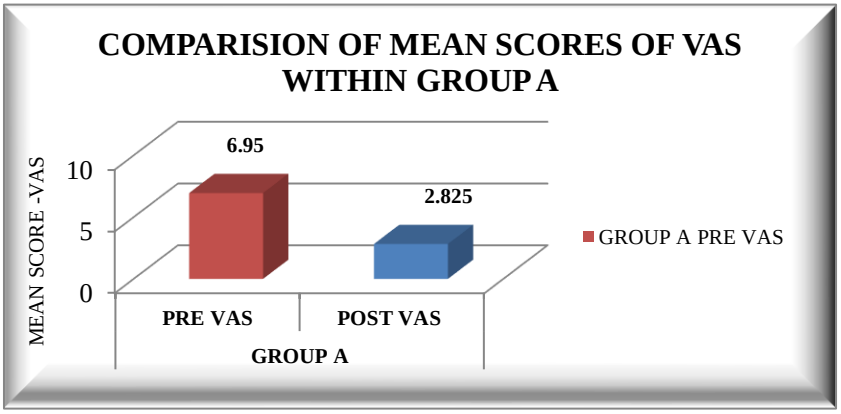

Figure-2: Analysis of Mean Scores of VAS from Pre test to Post test within Group-B

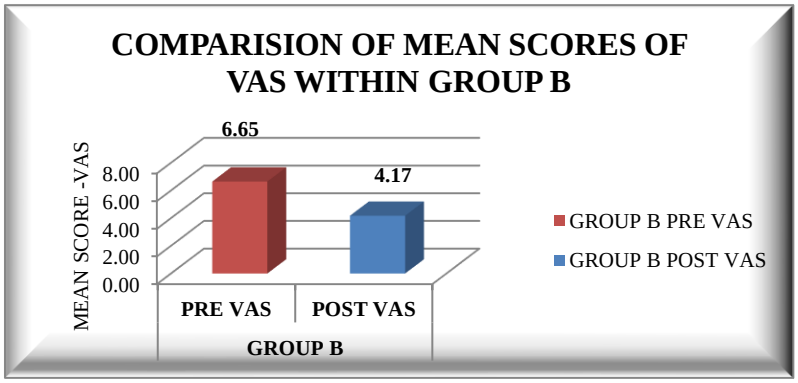

Figure-3: Comparison of Mean Score of VAS in between the Groups (Pre test) at Baseline Measurement for Groups-A&B

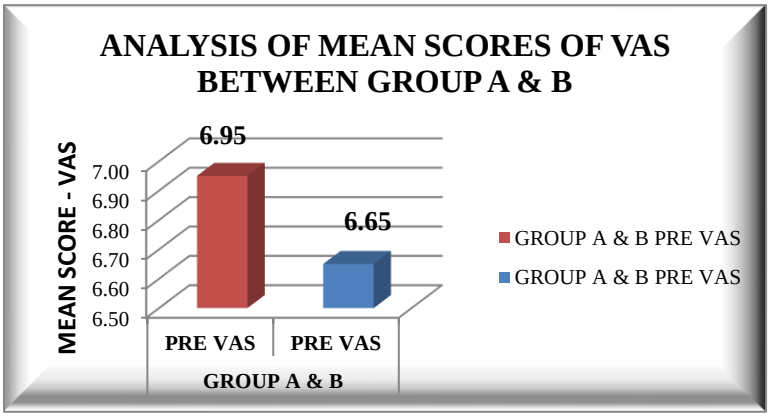

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Figure-4: Analysis of Mean Scores of VAS in between the Groups at Post Test for Groups-A&B

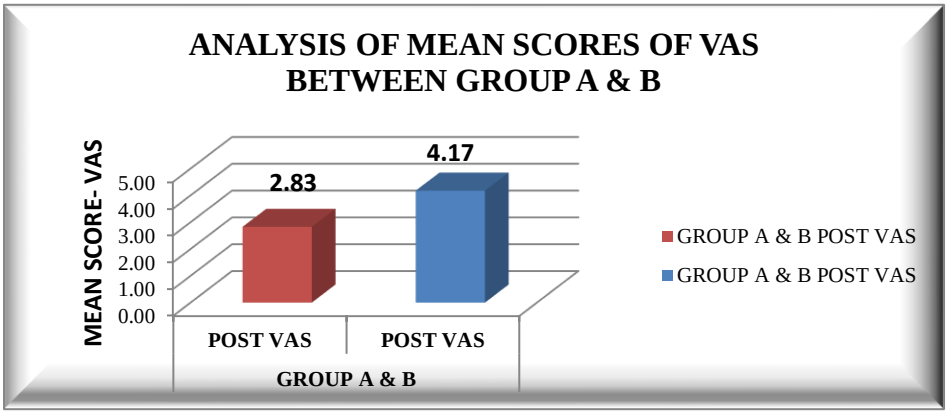

Figure-5: Analysis of Mean Scores of ODI from Pre test to Post test within Group-A

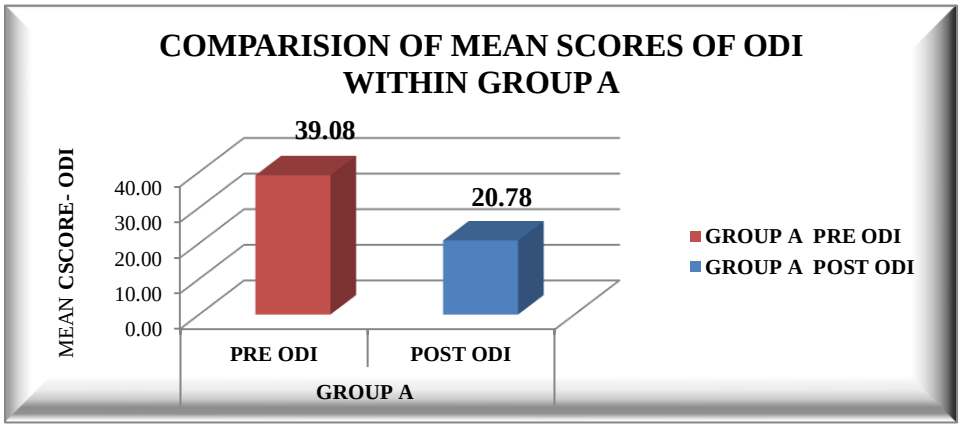

Figure-6: Analysis of Mean Scores of ODI from Pre test to Post test within Group-B

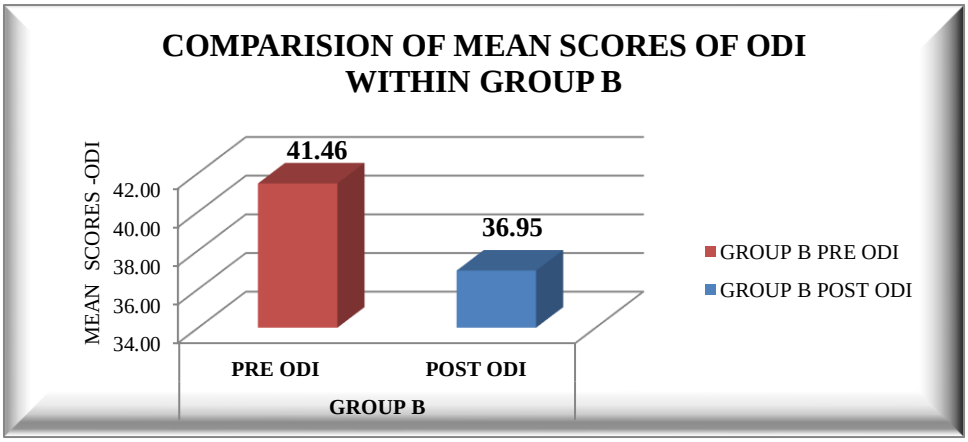

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Figure-7: Comparison of Mean Score of ODI in between the Groups Pre test at baseline Measurement for Groups-A&B

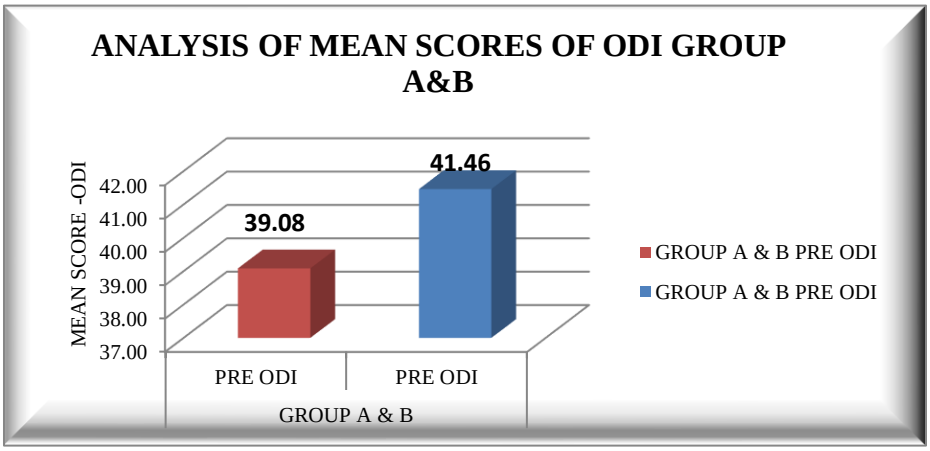
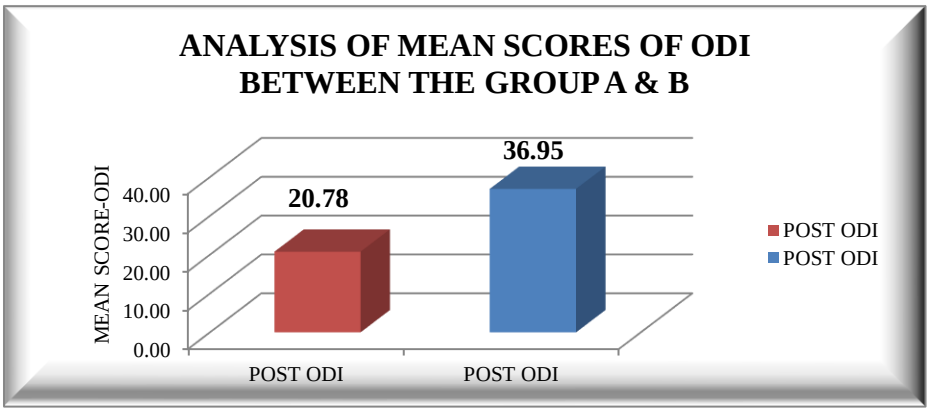


Figure-8: Analysis of Mean Score of ODI in between the Groups Post test for Groups-A&B



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