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A comparative study on shortwave diathermy with conventional exercises versus short wave diathermy with yoga exercises in chronic low back pain

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Abstract

The main objective of the study was to compare the effectiveness of conventional exercise therapy versus yoga therapy along with SWD in treating chronic low back pain in reducing pain on VAS, reducing disability on modified Oswestry low back pain disability question and improving range of motion. For this study 60 volunteers with chronic low back pain were recruited for the study. Those who were fulfilling inclusion and exclusion criteria. Subject divided into two groups by picking chits from a box. Both group A and group B were consisting of 30 chronic volunteers with chronic low back pain. Group A Modified conventional exercise therapy with SWD and group B received yoga therapy with SWD. Both the group samples were given conventional exercise therapy and yoga therapy exercise for duration of 4 weeks with each session of 45 minutes, thrice a week.

Conclusion: By statistical analysis it was found that there was significant improvement seen in (Group B) using SWD and yoga than (Group A) SWD with conventional exercises reducing pain and enhancing functional performance in patients with chronic low back pain.

Keywords: Visual analog scale (VAS) Range of motion (ROM) Short wave diathermy (SWD) low back pain Oswestry disability questionnaire (MODQ)

1. Introduction

The human spine is a complex structure its function is to protect the spinal cord and transfer loads from the head and trunk to the pelvis. In the spinal axis different anatomic component variably contribute to spinal stability which includes intervertebral disc joints, ligaments and muscles. Muscles in lumbar spine has major contribution proportionally the most important is muscle strength and important is for protecting the joint against excessive shear forces^[1, 2]. Low back pain which was known as an ancient curse is now known as a modern international epidemic^[3, 4]. It is one of the most common problems affecting around 80% of the population at sometime of the life^[5]. Low back pain is classified as acute low back pain which last less than 6 weeks, subacute low back pain which last between 6 and 12 weeks, chronic low back pain which last more than 12 weeks.^[5, 6] Low back pain is age related and hence seen in equally affecting both men and women. Most commonly affected age group is 30 to 50 years where occupation varies from physical hard-working population to sedentary population^[7].

There are a variety of causes for low back pain. When taking low back pain, it is caused by mechanical by chronic strain on muscles of lower back caused due to obesity, wear and tear, pregnancy, job oriented stooping, bending, stressful postures, malignancy^[8, 9].

Many studies have been done to overcome this long standing pain by means of various physical therapy interventions like electrical modalities, exercises therapy. In this study an effort has been made to compare shortwave diathermy with conventional exercises and shortwave diathermy with yoga exercises are effective in reducing pain increase range of motion and improving functional ability in chronic low back pain.

1.1 Conventional exercises

Research indicates an association between chronic low back pain and muscle weakness. Trunk and pelvic muscles are most affected.

Exercises are one of the most common treatments used for low back pain. Conventional exercises programs are designed to strengthen muscles, maintain and increase the range of movements, improve endurance, balance control the muscles and help to prevent recurrences in chronic low back pain^[10, 11]. Research also demonstrates the significance of paraspinal and deep muscles as important stabilizers. The paraspinal muscles and deep lumbar muscles act with a static contraction to resist any lumbar extension and rotational forces^[12, 13, 14]

1.2 Yogasana

Yoga serves to enhance alignment of the body, flexibility, mobility and stability in all muscles and joints that affect spinal alignment and posture. Yogasana work to stretch and strengthen the muscles that supports the spine and soft movements of yoga help to prevent further injury^[15, 16]. Yoga improves our endurance. Among forms of yoga, Hath yoga can relieve back and neck pain, Since the poses and postures gentle stretch and strengthen our neck and back muscles^[17].

1.3 Shortwave diathermy

Among various electrotherapy modalities used in clinical practice shortwave diathermy is one of the device which is proved efficient for treating chronic low back pain. Shortwave diathermy is a therapeutic device which produces heat in the connective tissues by electromagnetic waves. It is widely used and proved efficient for treating chronic low back pain. Shortwave diathermy is used to reduce muscle spasm, reduce pain by vasodilatation and excretion of metabolites, increase connective tissue elasticity, relieve musculoskeletal sprains and strains, increase joint range of motion and decrease joint stiffness^[18, 19, 20].

2. Materials and methodology

Study design comprised of comparative experimental study using randomized controlled trail where the patient with diagnosed chronic low back pain were taken into the study were patient refered from KIMS orthopedic department to KIPT OPD which consist of group of 60 subjects who were randomly assigned to two groups group A consist of 30 Chronic low back pain treated with conventional exercises and SWD group B consisted of 30 chronic low back pain treated with yoga and SWD

Sample method used was comparative randomized study where the samples were selected through simple random sampling technique by using chit method.

2.1 Material used

Consent form, couch, exercise mat, SWD, disc electrode, pillows, towels, measuring scale, inch tape

2.2 Inclusion criteria

Patient who were diagnosed with chronic low back pain. Both the genders were selected. Patient age group between 30-50 years. Low back pain should be more than 12 weeks. Patient should be independent in their ADL activities.

2.3 Exclusion criteria

Patient with traumatic low back pain, cauda equina syndrome, sciatica, pregnancy induced low back pain, any spinal or limb surgery, abdominal surgery, CNS impairment, cardiovascular and renal impairment. Patient who not give consent to take part in the study were excluded

2.4 Methodology

Patients were assessed for inclusion and exclusion criteria. Informed consent was taken from the patient, parent or guardian of patient were explained about treatment procedure. Two groups each consist of 30 patient with low back pain. One group treated with SWD and conventional therapeutic exercises and another group with SWD and yoga.

2.5 Measurement tools

On the first day of treatment procedure both the group were evaluated for pain, intensity using visual analogue scale and functional ability using modified Oswestry disability questionnaire and range of motion by using modified schober test for only lumbar flexion.

Visual Analogue Scale (VAS)

It was used to measure pain. It is a ten centimetre scale to measure the intensity of pain measure by the individual where 0 indicate no pain and 10 indicate worst pain^[21, 22]. Recording was taken day 1 and end of 4th week documented.

Range Of Motion (ROM)

Modified Schober test was used to assess range of flexion from neutral position. It is a technique for assessing spinal motion. This method was done by using a pen to mark the midpoint between the posterior superior iliac spine. Then use tape measure to identify and mark two point one that is 10cm superior to posterior superior iliac spine and one that is 5cm inferior to posterior superior iliac spine. First measure the distance between superior and inferior in neutral position using tape then as the client flexes the spine as far as possible measure and record the distance between the superior and inferior marks^[23]. Recording was done on 1st and end of 4th week.

Modified Oswestry Disability Questionnaire (MODQ)

MODQ was used to measure functional disability of patients with chronic low back pain. Ten questions describing the pain and its impact in daily life. Each section scored from 0 to 5 with higher values indicating more sever impact. Patient was asked to mark the answer for each question total score is sum points for all 10 questions disability in percent equal total score divided by 50 multiply by 100^[24]. Scores were recorded on day one and end of 4th week.

2.6 Interventions carried out on patients

A group of 60 patient who were randomly divided into group A and group B. Each group consisted of 30 patients each where group A low back patient were treated with conventional exercises with SWD and group B received yoga therapy with SWD.

Short wave diathermy was given to both groups. Patient was made to lie down in supine position over the couch using pillows for comfortness of the patient. Capacitive method of application using disc electrodes with proper spacing by suitable material such as folds of turkey towel was given. Spacing will be wide about 4cms of skin electrode distance. Position of electrode will be coplanar over dorsal lumbar region parallel to skin surface adjacent to the spine^[25]. Dosage of short wave diathermy should be sufficient to cause a thermal dose and duration of 15 to 20 minutes to be given. Conventional therapeutic exercises include four point kneeling, bridging, single leg extension from four point kneeling, alternate arm and leg lifts from four point kneeling, arm lifts, knee to chest exercise, upper and lower abdominal

strengthening exercises. The exercises are given 5 days a week 10 seconds for each exercises 3 repetitions 4 week of intervention.

Yoga exercises that is yogasana used in standing position were trikona asana, virabhadra asana, tadasana, adhrachandra asana. In sitting position were siddhasana, vajrasana, shashankasana. In lying position were shavasana, pavanmuktasana, The yogasana are given 5 days a week 3 repetitions 10 seconds foreach asanas 4week on intervention. The convectional exercises and yogasana improvement is measured by modified schobers test, VAS scale for pain and modified oswesry disability questionare for measuring disability.

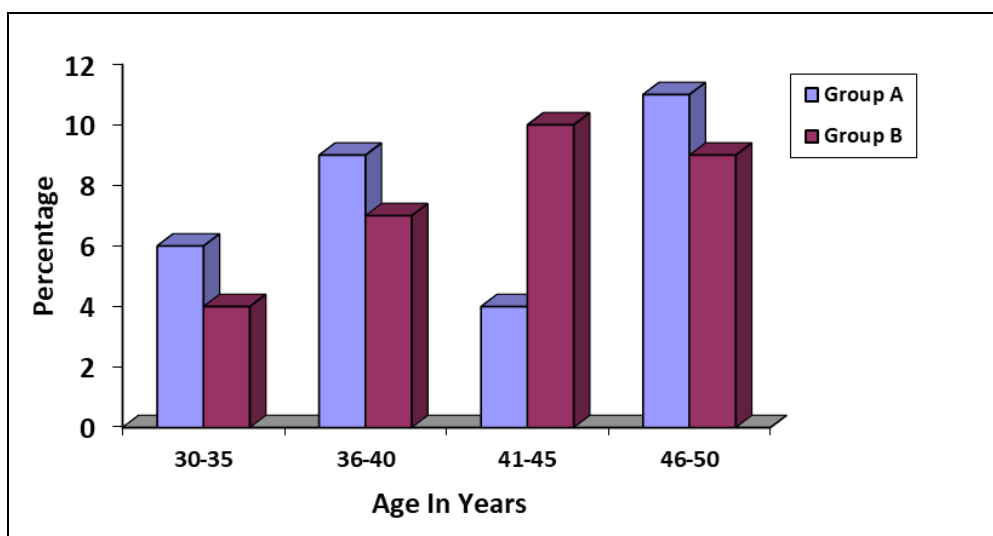
3. Statistical analysis

The analysis was done by using SPSS 16.0 software. The following are the statistical analysis Descriptive statistics was

used to calculate mean and standard deviation (SD). Student t test was used to find the significance of study parameters on continuous scale between the 2 groups (inter group analysis) on metric parameters. Mann Whiteny U test has been used to find the significance between 2 groups for parameters on non-interval scale.

Table 1: Frequency and percentage distribution of age for Group A and Group B

Age in Years	Group A		Group B	
	NO	%	NO	%
30-35	6	20.0	4	13.3
36-40	9	30.0	7	23.3
41-45	4	13.3	10	33.3
46-50	11	36.7	9	30.0
Total	30	100.0	30	100.0
Mean ± SD	42.33 ±6.69		42.90 ± 5.52	



Graph 1: Frequency and percentage distribution of age for Group A and Group B

Sample age are matched with P = 0.722

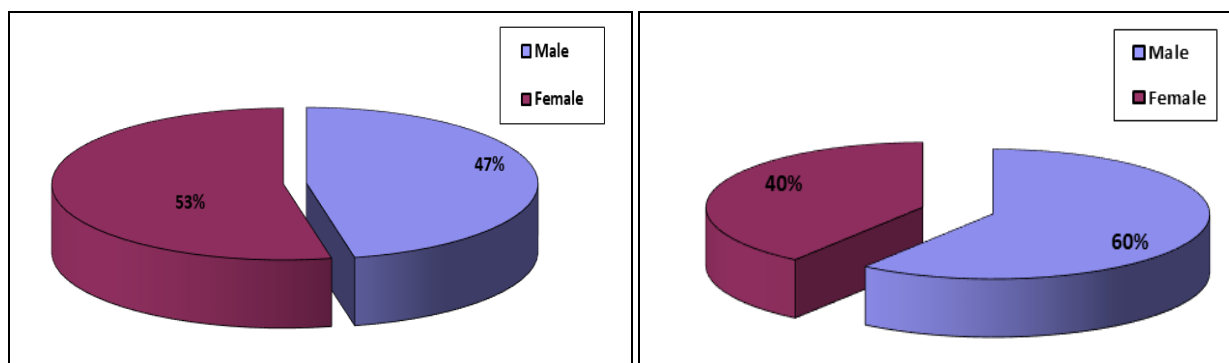
Descriptive analysis of age disturbance has been made between the two groups and has been presented in table 1. Mean age of Group A is 42.33 (SD:6.69) and mean age in Group B is 42.90(SD:5.52) samples are age matched with P= 0.722 and hence age is not a confounding variable.

The above graph represents the percentage distribution of age in both groups. The age group of study samples ranging from 30-35 years is 20% in Group A and 13.3% in Group B. The age group of study samples ranging from 36-40 years is 30% in Group A and 23.3% in Group B. The age group of study samples ranging from 41-45 years is 13.3% in Group A

and 33.3% in Group B. The age group of study samples ranging from 46-50 years is 36.7% in Group A and 30% in Group B. Therefore it shows that the mean age group of study samples ranges from 30-50 years.

Table 2: Frequency and percentage distribution of gender for Group A and Group B

Gender	Group A		Group B	
	NO	%	NO	%
Male	14	46.7	18	60.0
Female	16	53.3	12	40.0
Total	30	100.0	30	100.0



Graph 2: Frequency and percentage distribution of gender for Group A and Group B

Samples are gender matched with $P = 0.438$

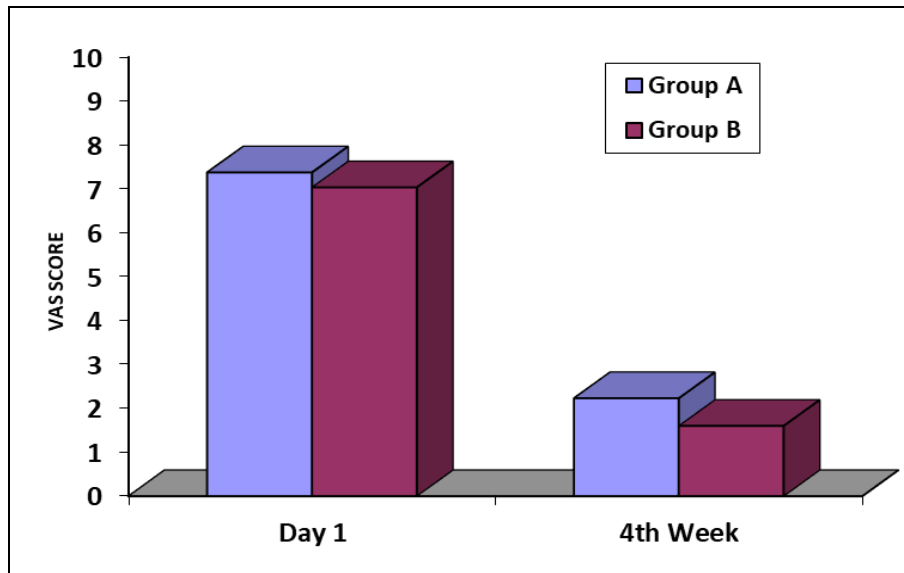
Descriptive analysis for gender has been presented in table 2. It shows that ratio of male and female is 14:16 in group A and 18:12 in group B, the samples are gender matched with $p=0.439$ and hence is not a confounding variable.

Figure shows the distribution of gender in both the group, Group A has more percentage of females than males i.e. females are 53.3% and male are 46.7%. Whereas Group B has more percentage of males than females i.e. males are 60.0%

and females are 40.0%.

Table 3: Comparison of VAS score in two groups of patients

VAS Score	Group A	Group B	P Value
Day 1	7.37 ± 0.85	7.03 ± 0.76	0.116
4th Week	2.23 ± 0.57	1.6 ± 0.56	<0.001**
P Value	<0.001**	<0.001**	

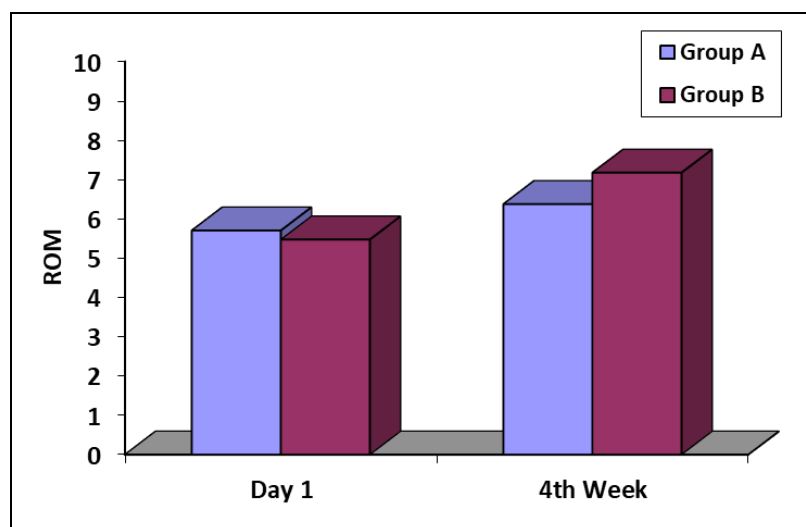


Graph 3: Comparison of VAS score in two groups of patients

Day 1 assessment of VAS score was 7.37(SD: 0.85) in group A while it 7.03(SD: 0.76) in group B. VAS score at 4th week assessment was 2.23(SD; 0.57) in Group A and 1.6 (SD: 0.56) in group B. Therefore VAS is significantly reduced in Group B with $p<0.001^{**}$

Table 4: Comparison of ROM in two groups

ROM	Group A	Group B	P Value
Day 1	5.7 ± 0.79	5.47 ± 0.9	0.291
4th Week	6.37 ± 0.61	7.17 ± 0.75	<0.001**
P Value	<0.001**	<0.001**	

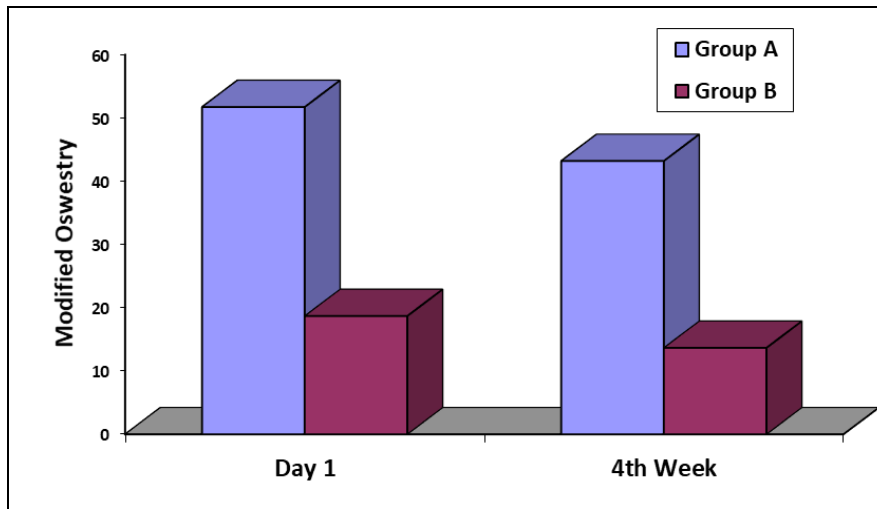


Graph 4: Mean Distribution of ROM Score for Group A and Group B

Mean ROM score was analyzed using Mann Whitney U test. Mean ROM at day I assessment was 5.7 (SD: 0.79) and in Group B it was 5.47(SD: 0.9) and in 4th week assessment, Mean ROM in Group A was 6.37 (SD: 0.61) and was 7.17 (SD: 0.75) in group B, It shows that it is significantly increased in Group B with $p<0.001^{**}$

Table 5: Comparison of Modified oswestry in two groups of patients

Modified oswestry	Group A	Group B	P Value
Day 1	51.73 ± 9.43	43.2 ± 8.43	<0.001**
4th Week	18.7 ± 3.5	13.67 ± 4.03	<0.001**
P Value	<0.001**	<0.001**	

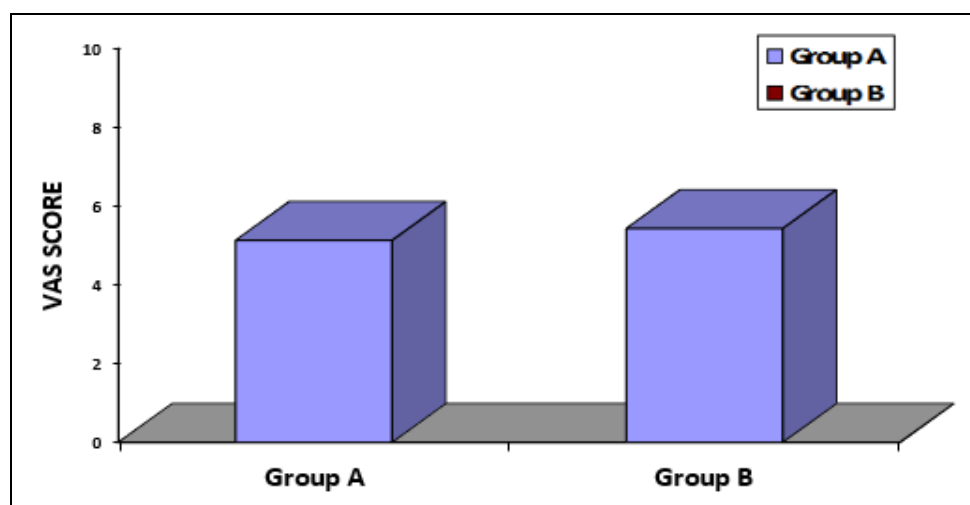
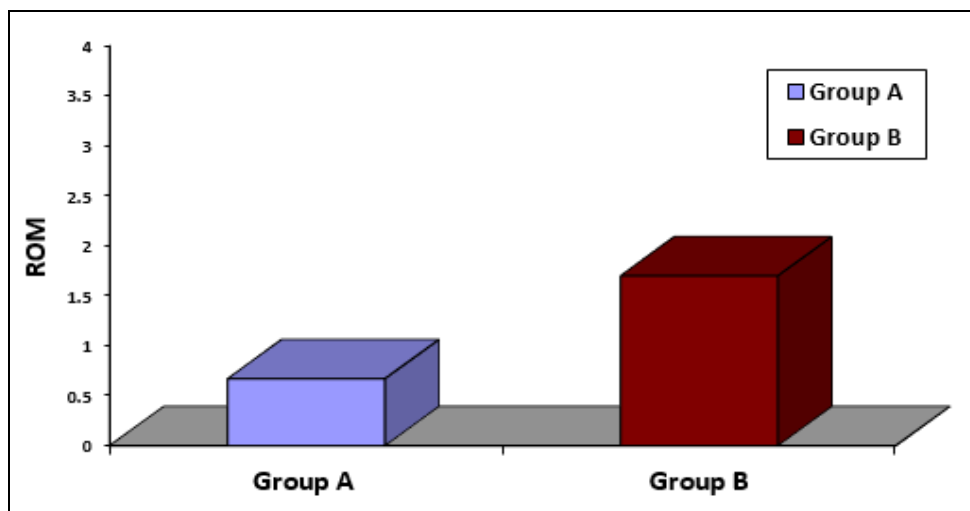


Graph 5: Comparison between Group A and Group B with Modified Oswestry score

Mean Modified oswestry score was 51.73 (SD: 9.43) in group A and 43.2 (SD: 8.43) in Group B for day1 assessment, while 4th week assessment it was 18.7 (SD: 3.5) in Group A and is significantly reduced to 13.67(4.03) in Group B with $p < 0.001^{**}$

Table 6: Comparison of Outcome (difference of pre and post) VAS Score, ROM and oswestry in two groups of pateints studied

Modified oswestry	Group A	Group B	P Value	Effect size
VAS Score	5.13±0.68	5.43±0.5	0.057	0.50(M)
ROM	0.67±0.92	1.7±0.9	<0.001**	1.11(L)
Modified Oswestry	33.03±7.46	29.53±6.34	0.055+	0.50(M)



Graph 6: Comparison of Outcome (Difference of 3 and Post) VAS Score, ROM and Modified Oswestry score in two groups of patients.

The outcome based on VAS, ROM and Modified oswestry was computed as difference 2 of day 1 assessment and the 4th

week assessment.

The outcome based on VAS was 5.43 in Group B compared

to 5.13 in Group A with $P=0.057+$ with moderate effect of 0.50 The outcome based on ROM was 1.70 in Group B compared to 0.67 in Group A with $P<0.001^{**}$ with large effect of 1.11 The outcome based on Modified Oswestry score was 29.53 in Group B compared to 33.03 in Group A with $P=0.005+$ with moderate effect of 0.50

4. Discussion

The study is intended to find and compare the effect if conventional exercises with SWD and yoga exercises with SWD in reducing pain increase range of motion and improving the functional ability with chronic low back pain with four weeks of intervention After analysis of result (table 1, table 2) in group A 14 males (46.7%) and 16 females (53.3%) had participated and in group B 18 males (60%) and 12 females (40%) has participated. In total 32 males and 28 females had participated in this study. Hence the mean age in group A was 42.5 in group B was 42.9. Therefore the age group of patients lies in between 30-50 years in this study.

Chronic low back pain is one which lasts more than 12 weeks and affects the age group of 30-50 years of both male and female equally and is age related. The risk of experiencing low back pain from disc diseases and spinal degeneration increases with age [26].

Taking into account epidemiological features stated that back pain is more prevalent in female (70.3 per 1000 population) than in male (57.3 per 1000 population). Lifetime recurrences of up to 85% reported by valkenberg and haanen with men having higher risk of recurrences than women and people aged 25-44years had the highest rate of recurrences.

Analysis of pain using VAS, ROM of flexion using modified schobers test and functional ability using modified oswestry disability questionnaire within the group A and B (table 6) showed that they were statistically significant improvement in both the groups when compared pre intervention to post intervention

Comparison of VAS in both the groups showed that there was significant reduction of pain in both the groups. When the mean values were compared for the improvement from pre intervention to post intervention with VAS. Group A showed mean value 7.37(SD:0.85) on day one and 2.23(SD:0.57) at end of fourth week and in group B 7.03 (SD:0.76) on day one and 1.60 (SD:0.56) at the end of fourth week. This implies that the subjects with SWD and yoga exercises were improved in pain reduction than compared to subjects with SWD and conventional exercise.

SWD is a deep heating modality of physical treatment for pain relief in chronic low back pain. A study conducted by department of physiotherapy, Queen's college, Glasgow, US stated that continuous SWD help to relieve pain and muscle spasm, increase joint range and decrease joint stiffness [27]. Treatment time of 20-30 minutes of SWD using coplanar method and intensity of the application should be sufficient to cause comfortable warmth to the patient and is beneficial in chronic cases for pain relief. He also suggested that treatment session can be carried out daily or on alternate days [28].

Comparison of ROM showed significant increase in both the group when the mean values were compared for the improvement from pre intervention to post intervention with ROM (table 4) group A showed mean value 5.7(SD: 0.79) on day one and 6.37(SD:0.61) at the end of 4th week and in group B 5.47(SD:0.9) on day one and 7.17(SD:0.75) at the end of 4th week. This implies that the subjects with SWD and yoga exercises were improved in functional ability than compared to subjects with SWD and conventional exercises.

Comparison of MODQ showed significant improvement in functional ability in both the groups. When the mean values were compared for the improvement from pre intervention to post intervention with MODQ (table5) Group A showed mean value 51.73(SD:9.43) on day one and 18.7(SD:3.5) at the end of 4th week and in group B 43.2(SD:8.43) on day one and 13.67(SD:4.03) at the end of 4th week. This implies that the subject with SWD and yoga exercises had an improved in functional ability than compared with SWD and conventional exercises. Modified oswestry disability questionnaire was more reliable and responsive in low back pain patients than quebec low back pain scale [29].

The limitation of the study is that this study is done in age group of 30-50 years other age groups were not included in the study. This study included only the patients with mechanical low back pain without consideration of any form of dysfunction. The duration of low back pain was not equal in all the subjects. This study would be challenging if it is done with the inclusion of higher percentage of disability level and high intensity exercises and ergonomic advices could be used in progression.

5. Conclusion

Since the mean score of VAS, Modified Schobers test and Modified Oswery Disability Questionare showed improvement in group B than group A. Hence by statistical analysis it was found that there is significant improvement in patient receiving yoga and SWD than conventional therapeutic exercise and SWD in reduce pain, improve ROM and functional ability in treating chronic low back pain.

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