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The Effect of Core Stability Exercises on Patients with Chronic Lumbar Spondylosis

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ABSTRACT

Background: *Chronic lumbar spondylosis is reported to be a major health problem worldwide.* ***Purposes:*** *To investigate the effect of core stability exercises on reducing pain severity, improving the quality of life through increasing functional ability and active back range of motion in patients with chronic lumbar spondylosis.* ***Study Design:*** *A pre test post test control group research design.* ***Subjects:*** *Thirty patients from both sexes aged between 41-60 years and diagnosed as chronic lumbar spondylosis selected from outpatient clinic at Al-Kasr Al-Aeiny Hospital participated in this study.* ***Methods:*** *Patients were assigned randomly into two equal groups: group A, fifteen patients received core stability exercises. Group B, fifteen Patients received back extensors strengthening exercise. Treatment was done 3 times a week for 4 weeks. Patients were assessed before and after treatment by Visual Analogue Scale (for Pain) Oswestry disability questionnaire (for functional performance), and modified- modified Shober test and tape (for back range of motion).* ***Results:*** *There were significant differences within the two groups before and after treatment as pain level decreased, functional performance improved and lumber range of motion of flexion and extension and side bending increased. While there were no significant differences between the two groups as regard to reducing pain, improving functional disability and increasing range of motion. Percent of improvement in pain in group A was 44.8% while in group B were 36.2%. Percent of improvement in functional disability in group A were 35.5% while in group B were 31.35%. Percent of improvement in ROM of flexion, extending and side bending were 22.6%, 25.4 % and 3.32% respectively while in group B were 21%, 20.8% and 3.45% respectively.* ***Conclusion:*** *Both Core stability exercise and back strengthening exercises are effective in the treatment of patients with chronic lumbar spondylosis.*

Key words: *Chronic Lumbar spondylosis, Core stability exercises, Back extensors strengthening exercise.*

INTRODUCTION

Lumbar spondylosis means a degenerative joint disease affecting the lumbar spine, causing local pain and stiffness, sometimes with sciatic radiation due to nerve root pressure by protruding discs or osteophytes and having degenerative changes in the lumbar spine[1]. The Causes of Lumbar spondylosis are by degenerative changes within the intervertebral discs. In the body, the soft, elastic material dries out and loses height. Thickening of the ligaments that surround the disc occurs. In addition to that alterations of the alignment of the joints that connect the back of the spine are also seen. Other ligaments undergo further degenerative changes, thickening and potential chemical change. All these symptoms occur when an individual experiences old age. Lumbar spondylosis emerges to be a nonspecific aging phenomenon[2].

Lumbar spondylosis appears to be a nonspecific aging phenomenon. Most studies suggest no relationship to old age, lifestyle, height, weight, body mass, physical activity, cigarette and alcohol consumption, or reproductive history. It is seen that persons reaching over 40 years of age are more prone to developing lumbar spondylosis.

Excessive weight also plays a foremost role in causing Lumbar spondylosis. Overweight puts excess load on the joints as the lumbar region carries most of the body's weight, making a person prone to lumbar spondylosis. Other factors such as sitting in one position for prolonged time puts pressure on the lumbar vertebrae and highlight the risk of developing the disease[3]. Spondylosis is not normally caused by external factors. Rather it is part of the normal ageing process during which the intervertebral discs undergo a gradual loss of fluid and elasticity. External factors can cause spondylosis if present in childhood. Infections of the disc or disc and vertebrae at a young age can cause spondylosis. Similarly, congenital vertebral anomalies present from birth or arising during childhood may lead to local premature spondylosis[4]. Biomechanical stress of the back can be caused by heavy work such as lifting[5]. Long-term exposure to vibration[6], or sedentary or monotonous job functions[7,8]. The biomechanical model of chronic pain assumes a relationship between external strain, body posture, muscle activity and intravertebral pressure[9].

Exercise has been recommended and is a common management strategy for people with lumbar spondylosis. Exercise is a nonspecific term and includes activities that vary in type, frequency, intensity, mode and environmental requirements. It may be viewed as a series of specific movements with the aim of training or developing the body by a routine practice or as physical training to promote physical health[10]. Several groups of muscles are targeted, particularly the transverses abdominis (TrA), lumbar multifidi and other paraspinal, abdominal, diaphragmatic and pelvic musculature. Given the widespread clinical use of LSE, it is necessary to critically assess the evidence of their efficacy in patients with chronic lumbar spondylosis[11].

The core musculature includes the muscles of the trunk and pelvis that are responsible for maintaining the stability of the spine and pelvis. These include: the abdominals and the muscles of the hips and spine. Core Stability is having a strong transverse abdominus muscle that acts like a corset, taking the pressure off the back and pulling the other abdominal muscles into place. It focuses on small controlled movements, stabilizing the torso[12]. A working definition of the core stability is the optimal alignment and control of the spine and pelvis region to ensure efficient transfer of momentum and summation of forces across the segment, resulting in greater precision and safety of dynamic activity[13].

Low back pain (LBP) has been shown to cause muscle atrophy and altered neural control of the spine musculature. Theoretically, this leads to altered spine biomechanics and thus, delayed return to performance. Strengthening and activation of the core muscles is fundamental in the rehabilitation of spine injuries. Several studies have indicated the importance of a few muscles (transverses abdominis (TA) and the multifidi). However; all muscles are needed for proper movement through the full range of motion. Any weakness or imbalances along the kinetic chain can also serve as a source of pathologic instability. Fortunately, a comprehensive strengthening program can help correct these abnormalities and instabilities[11].

Core strengthening is widely used for both injury prevention and rehabilitation of the lumbar spine. The core has been described as a box with the diaphragm on top, pelvic floor on bottom, abdominals in front and paraspinal and gluteal muscles in back[14].

Strengthening exercises have been shown to be beneficial for individuals with CLBP with wide ranges of muscular capacities at treatment onset[15].

The lumbar extensor muscles have been considered the "weak link" in lower trunk function[16]. In CLBP, the lumbar extensors are weak, highly fatigable, atrophied, display abnormal activation patterns and exhibit excessive fatty infiltration and histopathological changes[17]. Thus, it is reasonable to focus on conditioning these muscles through supervised progressive resistance exercises (PREs) during the treatment of CLBP to improve the physiological and structural integrity. Through appropriate resistance training programs, reversal of these muscular dysfunctions and structural abnormalities has been documented in patients with CLBP[18].

So the purpose of this study was to investigate The Effect of Core Stability Exercises on Patients with Chronic Lumbar Spondylosis on reducing pain, increasing the active range of motion of the back and improving the functional disability.

MATERIALS AND METHODS

Subjects:

Thirty patients of both sexes, seventeen female and thirteen male that were diagnosed as chronic lumbar spondylosis were referred by orthopedic surgeons from outpatient clinic at Al-Kasr Al-Aeiny Hospital. Their age ranged from 41 years to 60 years. Their body mass index (BMI) ranged from 25.3 to 39.2. Their duration of illness persisted more than 3 months. Patients were assigned randomly into two groups: The first group (A) were15 subjects received core stability exercise .The second group (B) were 15 subjects received back strengthening exercise. Informed consent form were read and signed by each patient before starting the study.

Exclusion Criteria:

Subjects with the following criteria were excluded from the study:

1- Discogenic patients with radiculopathy or not.
2- Underlying disease such as malignancy.
3- Back pain caused by viscerogenic causes.
4- Infection or systemic disease of the musculoskeletal system.
5- Any Sensory problems or sensory disturbances.
6- Evidence of previous vertebral fractures or major spinal structural abnormality.
7- Neuromuscular disease like multiple sclerosis.

Instrumentations:

1- Visual analog pain scale (VAS) to determine pain intensity (19).
2- Oswestry disability scale index (ODI) to assess the functional ability of the patients(20,21).
3- The modified-modified Shober test to measure lumbar flexion and extension (22).
4- Tape measurement to measure lumbar side bending (23).

The Assessment Procedures:

The patient was assessed just before and after 4 weeks of treatment. The assessment procedures included the following items.

1- Pain assessment

Pain was assessed by the visual analogue scale (VAS). It is 10 cm horizontal line with one end described as (no pain=0) and other end (worst pain=10). VAS was considered a valid way of assessing pain; it allows graphic representation and numerical analysis of the collected data[19].

2- Functional disability assessment

Functional disability of each patient was assessed by Oswestrey disability questionnaire. Oswestry disability scale asses the functional disability of patients. It consists of 10 multiple-choice questions of back pain include disability in daily functions and leisure time activities, for each question. The patient selects one sentence out of six that the best describe his or her disability. The maximal score is 50 (maximum disability) and the result was taken as percentage from the total score .Higher scores indicate greater disability. Scores from 0 to 20% indicate minimal disability, scores from 20 to 40% represent sever disability, scores from 60 to 80 represent crippled disability and scores from 80 to 100% represent patients that are confined to bed Fairbank[20] and Guermazi[21] translated the ODI into Arabic and validated it for assessing low back pain in Arab population.

Range of motion assessment:

a- The active lumber flexion range of motion was assessed using modified-modified Shober test. The investigator stood behind the standing patient to identify the posterior superior iliac spine with his thumbs and then an ink mark was drawn along the midline of the lumbar spine horizontal to the posterior- superior iliac spines. Another ink mark was made 15 cm above the original mark. The tape measure was lined up between skin margins .With the tape pressed firmly against the subject skin and while holding the tape measure with his finger tips, the distance between superior and inferior skin marks was measured. Then the patient was instructed to bend forward to full lumbar flexion (within the limit of pain) and the new distance between the superior and inferior skin marks was measured. The change in the difference between marks was used to indicate the amount of lumbar flexion. This test was performed for three consecutive times and the mean value was considered as the lumbar flexion range of motion[22].

b- The active lumber extension range of motion was assessed using modified-modified Shober test. The investigator stood behind the standing patient to identify the posterior-superior iliac spine with his thumbs. Then an ink mark was drawn along the midline of the lumbar spine horizontal to the posterior- superior iliac spines. Another ink mark was made 15 cm above the original mark. The tape measure was lined up between skin margins .With the tape pressed firmly against the subject skin and while holding the tape measure with his finger tips, the distance between superior and inferior skin marks was measured. Then the patient was instructed to bend backward to full lumbar extension (within the limit of pain) and the new distance between the superior and inferior skin marks was measured as a straight line. The change in the difference between marks was used to indicate the amount of lumbar extension. This test was performed for three consecutive times and the mean value was considered as the lumbar extension range of motion[22].

c- The active lateral flexion was measured as the distance from the tip of the index finger to the floor at maximal comfortable lateral flexion (within the limit of pain) This test was performed for three consecutive times for each side and the mean value for each side was considered as the lateral flexion range of motion[23].

The Treatment Procedures:

The patient in group (A) received the core stability exercise program

The program included a warm up period followed by performance of core stability training program. The warm up period incorporated light stretching exercise for hamstring and local muscles[24]. The exercises were (Isometric co contaction of multifidus and transvsus abdominus, Curl-up, Right side bridge with abdominal brace and Birdog with abdominal brace).

The holding time of these exercises was 10 seconds to a point where the patient became able to perform 10 contractions.

(1) Isometric co contaction of multifidus and transvsus abdominus

The specific isometric transversus abdominis–multifidus co-contraction by means of various instructions that cue the correct action (pull your navel in towards your spine, or draw your abdomen in[25]. Patient was in crock lying position with feet flat on the treatment table. the investigator sat beside the patient with thumb placed anteriorly and inferiorly to the anterior superior iliac spine, lateral to the rectus abdominus. the patient was instructed to inhale and after exhalation ,he was instructed to pull his navel up and backwards.

(2) Curl-up

The curl-up has been shown to induce greater activity in the rectus abdominus (RA)(bilaterally) compared to the other abdominal muscles[24]. Subjects were positioned in supine with the right knee flexed to 90° and hands under the lumbar spine to detect any spinal movement. Instructions were given to gently lift the head and shoulders off the table (keeping the head and neck as a rigid block, leaving the elbows on the table and avoiding head/neck protraction) and concentrate on pivoting the upper body through the mid thoracic region.

A normal breathing pattern was maintained throughout the curl up.

(3) Right side bridge with abdominal brace

The side bridge targeted unilateral activation of the back extensor and abdominal muscles, on the right side which supports the lateral bend moment of the side bridge[24,26]. Subjects rested on their right elbow and hip (with knees flexed to 90°) and braced their abdominal muscles before lifting the pelvis off the table to achieve a position where the torso formed a straight line between the bottom shoulder, hip and. Verbal cues were given to form a plank with the trunk between the shoulder and knee without allowing rotation of the body.

(4) Birdog with abdominal brace

In four-point kneel, subjects performed an abdominal brace and lifted their left arm and right leg simultaneously until they were parallel to the floor. The birdog has been shown to activate the contralateral multifidus, obliquus externus abdominis (OE) and the ipsilateral thoracic erector spinae (TES)[24]. No rotation, flexion or lateral flexion of the trunk was permitted and subjects were instructed to maintain normal breathing throughout the task.

The patient in group (B) received the trunk extension exercise program:

Exercise training for trunk extensors

The starting position for all exercises was prone. The exercise training was carried out once daily, four times weekly. There were five different exercises of increasing levels of difficulty where the positions of the upper and lower limbs were altered. All subjects began the exercise training program with the first exercise position, but they progressed to the next exercises at their own when they could hold a given position for 10 seconds and perform 25 repetitions (with a 3 second rest between the exercises). On reaching the fifth progression, they continued with the fifth progression until the end of the exercise program.

The following were the five exercise progressions:

1- The patient lying in prone position with both arms by the sides of the body and lifting the head and trunk off the plinth from neutral to extension.
2- The patient lying in prone position with the hands interlocked at the occiput so that shoulders are abducted to 90° and the elbows flexed, and lifting the head and trunk off the plinth from neutral to extension.
3- The patient lying in prone position with both arms elevated forwards, and lifting the head, trunk and elevated arms off the plinth from neutral to extension.
4- The patient lying in prone position and lifting the head, trunk and contralateral arm and leg off the plinth from neutral to extension.
5- The patient lying in prone position with both shoulders abducted and elbows flexed to 90°, lifting the head, trunk and both legs (with knees extended) off the plinth [27].

Statistical analysis

The collected data were statistically analyzed using descriptive analysis in form of mean and standard deviation was performed to measure the tendency and homogeneity of each variable. Paired t-Test was used to determine significant differences within each group. Unpaired t –Test was used to determine significant differences in each variable between the two groups. Level of significance for all tests were set at P value was < 0.05.

RESULTS

Demographic data of subjects in both groups:

A total of 30 patients with chronic lumbar spondylosis were assigned randomly into 2 groups 15 patients in each group.

<u>Group (A) Core stability exercises:</u>

Fifteen chronic lumbar spondylosis patients were included in this group which received core stability exercises. Their ages ranged from (41–60) years with mean age was (52.4±5.9) years. Their weights ranged from (50-99) with mean weight (79.6±13.9) kg. Their heights ranged from (152-185) with mean height (167.5±10.1) cm. Their body mass index (BMI) ranged from (26.1-34.6) with mean BMI (29.6±2.2) as shown in table (1) and figure (1).

<u>Group (B) Back extensors strength exercises:</u>

Fifteen chronic lumbar spondylosis patients were included in this group which received back extensors strength exercises. Their ages ranged from (42–60) years with mean age was (52.5±5.6) years. Their weights ranged from (65-105) with mean weight (85.6±12.6) kg. Their heights ranged from (155-185) with mean height (168.9±9.1) cm. Their BMI ranged from (25.3-39.2) with mean BMI (29.5±3.5) as shown in table (1) and figure (1).

There was no significant difference in physical characteristics between both groups (P>0.05).

Table (1): Physical characteristics of patients in each group.

Items	Group A	Group B	MD	Comparison		Sig.
	Mean ±SD	Mean ±SD		t-value	P-value	
Age (years)	52.46±5.95	52.53±5.68	-0.07	-0.03	0.9	NS
Weight (Kg)	79.60±13.90	85.60±12.64	-6	-1.23	0.2	NS
Height (cm)	167.5±10.14	168.93±9.17	-1.40	-0.39	0.6	NS
BMI	29.69±2.24	29.5±3.5	0.11	0.1	0.9	NS

SD: standard deviation MD: mean difference P: probability S: significance NS: non-significant.

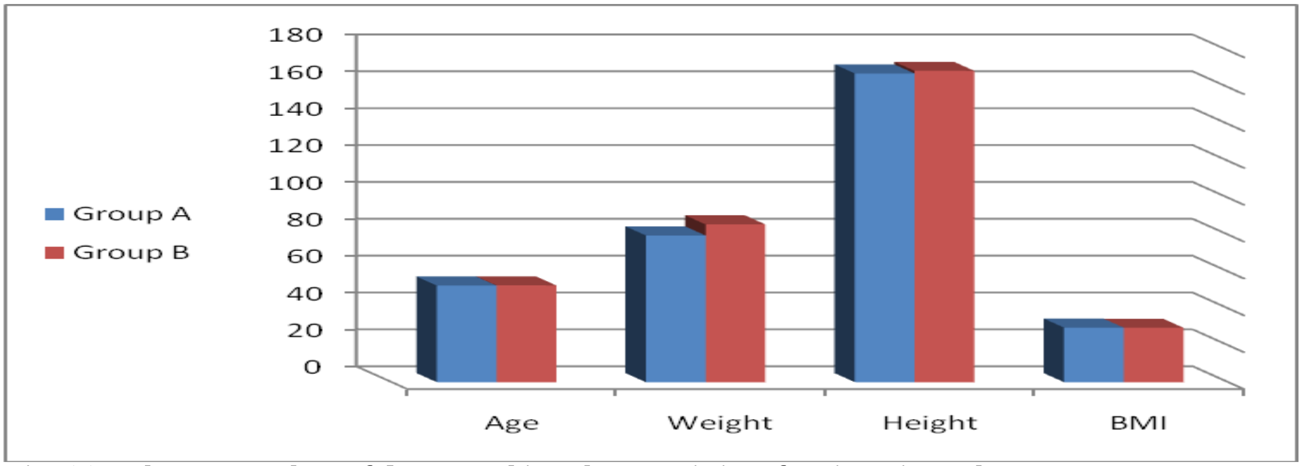

Fig. (1): The mean values of demographic characteristics of patients in each group.

Differences in pain level, function disability level and lumber ROM of flexion, extension and side bending limitation pre and post treatment for group A:

1- Pain level:

The results of the paired t-Test revealed that there were significant differences in the pain level in the group (A) before and after treatment as the pain level decreased where the t value was (5.15) and P was (0.0001) as shown in table (2) and figure (2).

2- Function level:

The results of the paired t-test revealed that there were significant differences in the functional performance in the group (A) before and after treatment as the functional limitation improved where the t value was (5.51) and P was (0.0001) as shown in table (2) and figure (3).

Table (2): Differences in pain level and functional disability level pre and post treatment for group A.

Group (A)	Mean ± SD		MD	% of change	t	p	Sig.
	Pre	Post					
Pain	6.16±1.72	3.4±2.89	2.76	44.8	5.15	0.0001	S
Function disability	20±9.51	13.73±9.06	6.27	31.35	5.51	0.0001	S

Sig.: significance S: significant MD: mean difference t: t value P: probability

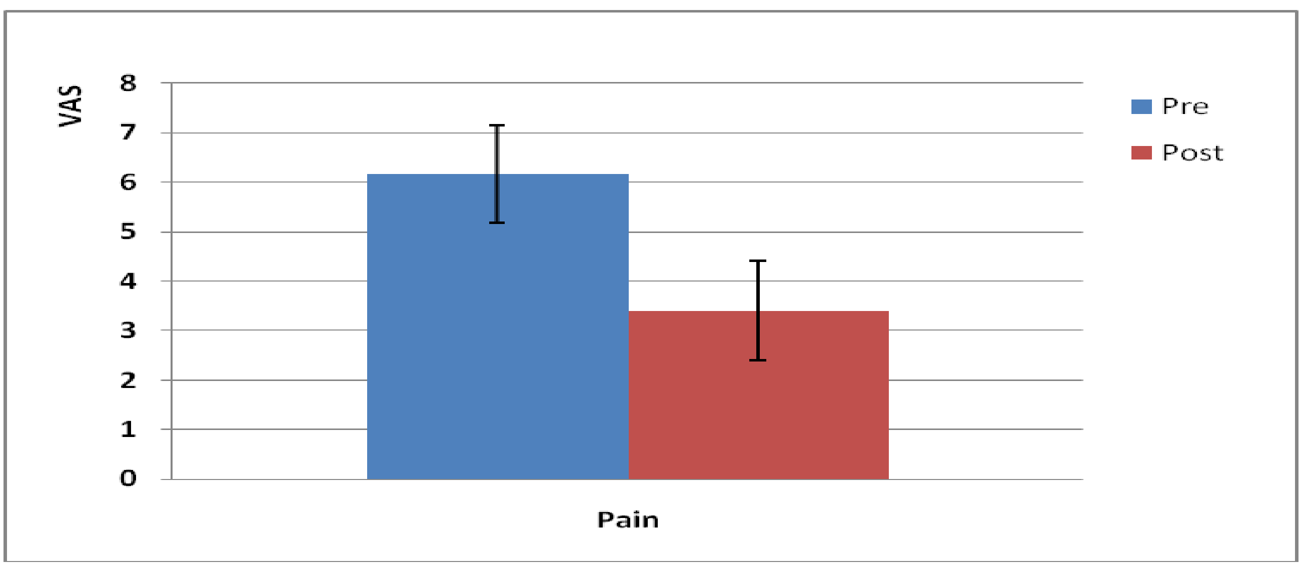

Fig. (2): Differences in pain level pre and post treatment for group A.

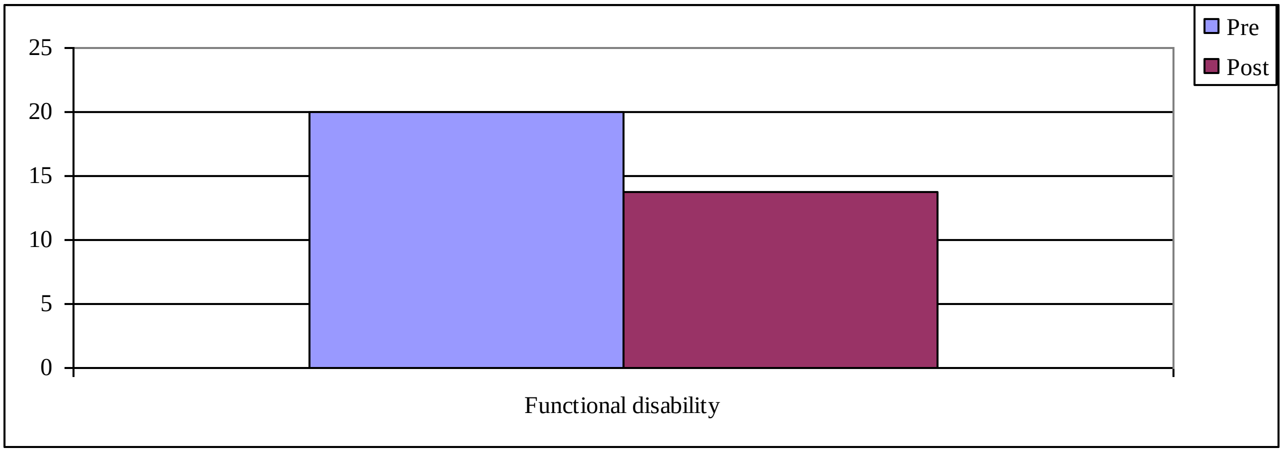

Fig. (3): Differences in functional disability level pre and post treatment for group A.

3- <u>Lumber range of motion:</u>

The results of the paired t-Test revealed that there were significant differences in range of motion in lumbar flexion and extension in the group (A) before and after treatment as the ROM increased where the t value was (5.19) and (3.9) and P was (0.0001) and (0.002) for the lumbar flexion and extension respectively. Also there was significant difference in the side bending limitation before and after treatment as the side bending limitation decreased where the t value was (2.82) and the P was (0.14) as shown in table (3) and figure (4 and 5).

Table (3): Differences in mean lumber range of motion (flexion- extension-side bending limitation), pre and post treatment for group A.

Group (A)		Mean ± SD		MD	%of change	t	P	Sig.
		pre	post					
ROM	Flexion	3.88±1.04	4.76±1.13	-0.88	22.68	-5.19	0.0001	S
	Extension	2.20±0.59	2.76±0.49	-0.56	25.45	-3.90	0.002	S
	Side bending limitation	48.06±5.68	46.46±6.41	1.6	3.32	2.82	0.01	S

Sig.: significance S: significant MD: mean difference t: t value P: probability

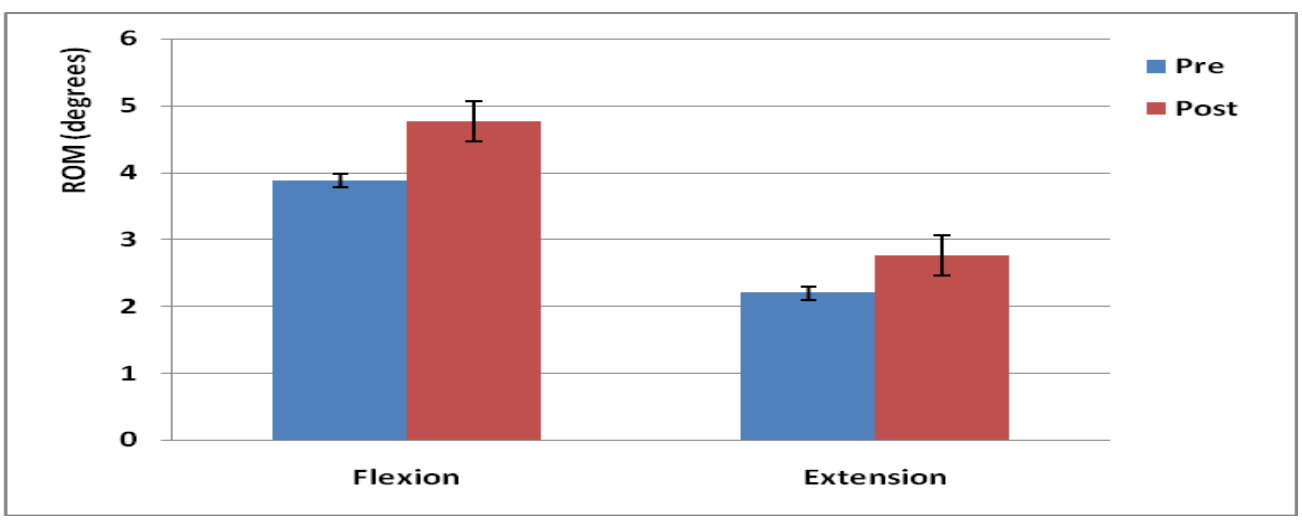

Fig. (4): Differences in lumber ROM of flexion and extension pre and post treatment for group A.

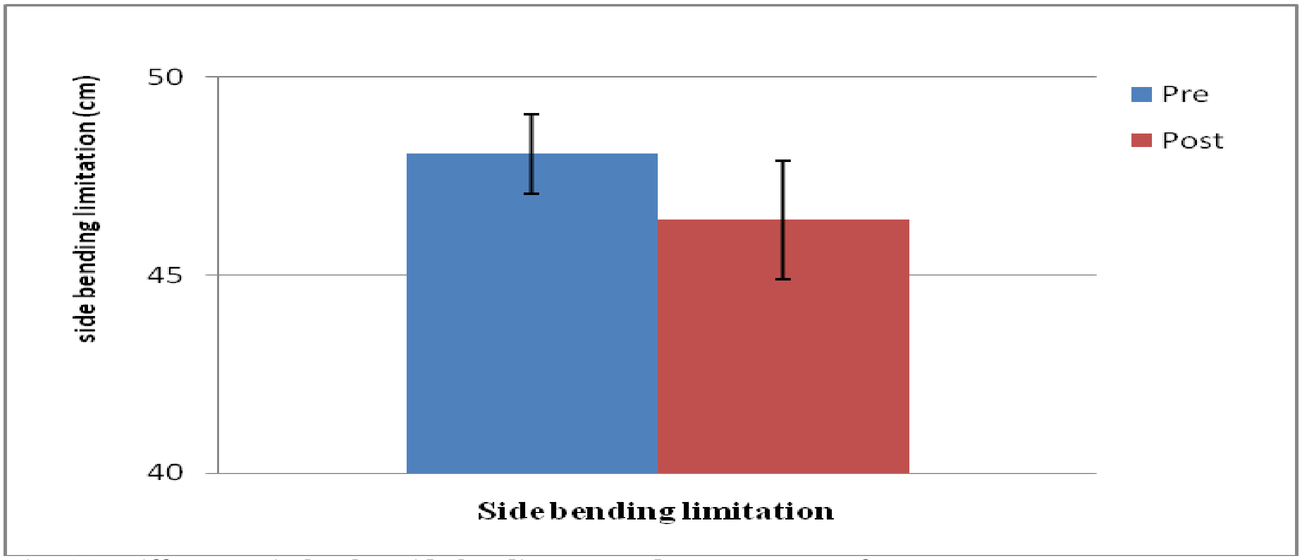

Fig. (5): Differences in lumber side bending pre and post treatment for group A.

Differences in pain level, function disability level and lumber ROM of flexion, extension and side bending limitation pre and post treatment for group B:

1- Pain level:

The results of the paired t-test revealed that there were significant differences in the pain level in the group B before and after treatment as the pain level decreased where the t value was (-4.8) and P was (0.0003) as shown in table (4) and figure (6).

2- Function level:

The results of the paired t-test revealed that there were significant differences in the functional performance in the group B before and after treatment as the functional performance improved where the t value was (-3.34) and P was (0.004) as shown in table (4) and figure (7).

Table (4): Differences in mean pain level and functional disability level pre and post treatment for group B.

Group (B)	Mean ± SD		MD	%of change	t	P	Sig.
	pre	post					
Pain	4.8±2.24	3.06±2.63	1.74	36.25	-4.8	0.0003	S
Function disability	15.66±6.14	10.1±7.55	5.56	35.50	-3.34	0.004	S

Sig.: significance S: significant MD: mean difference t: t value P: probability

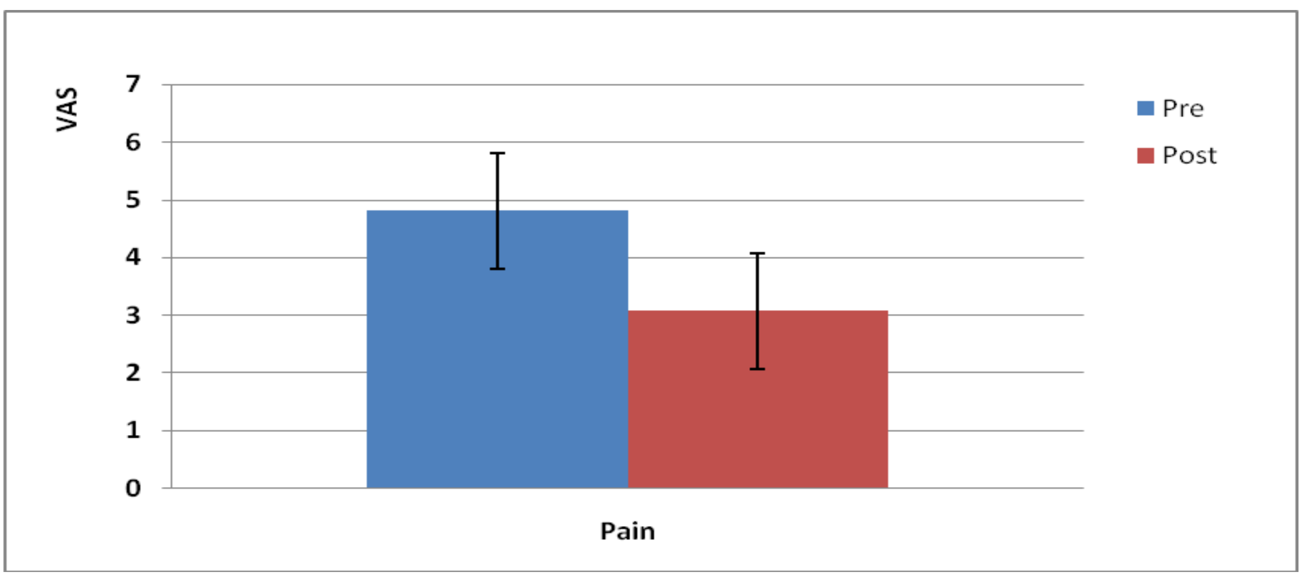

Fig. (6): Differences in pain level pre and post treatment for group B.

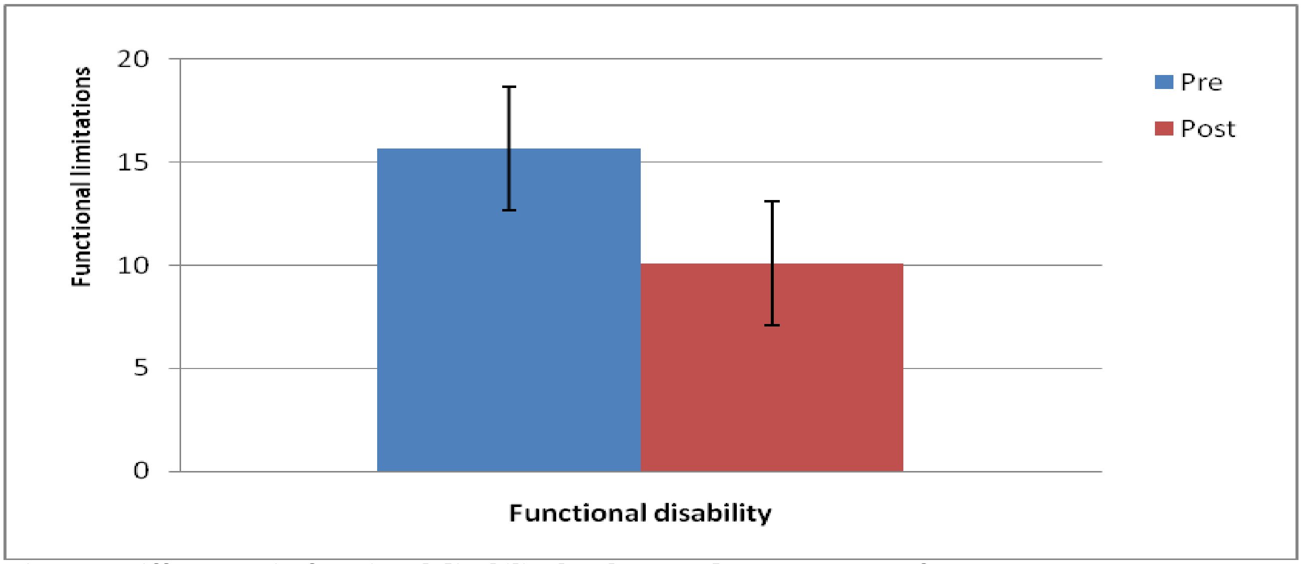

Fig. (7): Differences in functional disability level pre and post treatment for group B.

3- Lumber range of motion:

The results of the paired t-test revealed that there were significant differences in range of motion in lumbar flexion and extension in the group (B) before and after treatment as the ROM increased where the t value was (-3.52) and (-3.62) and P was (0.003) and (0.002) for the lumbar flexion and extension respectively. Also there was significant difference in the side bending limitation before and after treatment as the side bending limitation decreased where the t value was (3.61) and the P was (0.003) as shown in table (5) and figure (8).

Table (5) Differences in mean lumber range of motion (flexion- extension, side bending limitation), pre and post treatment for group B.

Group (B)		Mean ± SD		MD	%of Change	t	P	Sig.
		pre	post					
ROM	Flexion	4.13±0.61	5±0.88	-0.87	21.06	-3.52	0.003	S
	Extension	2.4±0.47	2.9±0.54	-0.5	20.83	-3.62	0.002	S
	Side bending limitation	44.6±3.62	43.06±3.8	1.54	3.45	3.61	0.003	S

Sig.: significance S: significant MD: mean difference t: t value P: probability

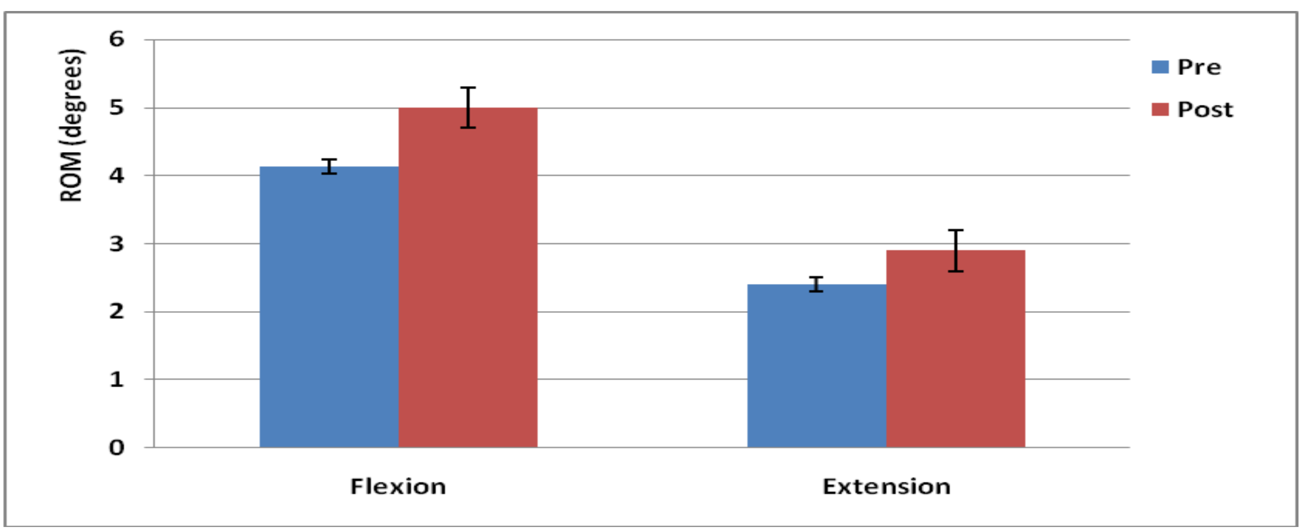

Fig. (8): The mean differences in lumber range of motion (flexion- extension), pre and post treatment for group B.

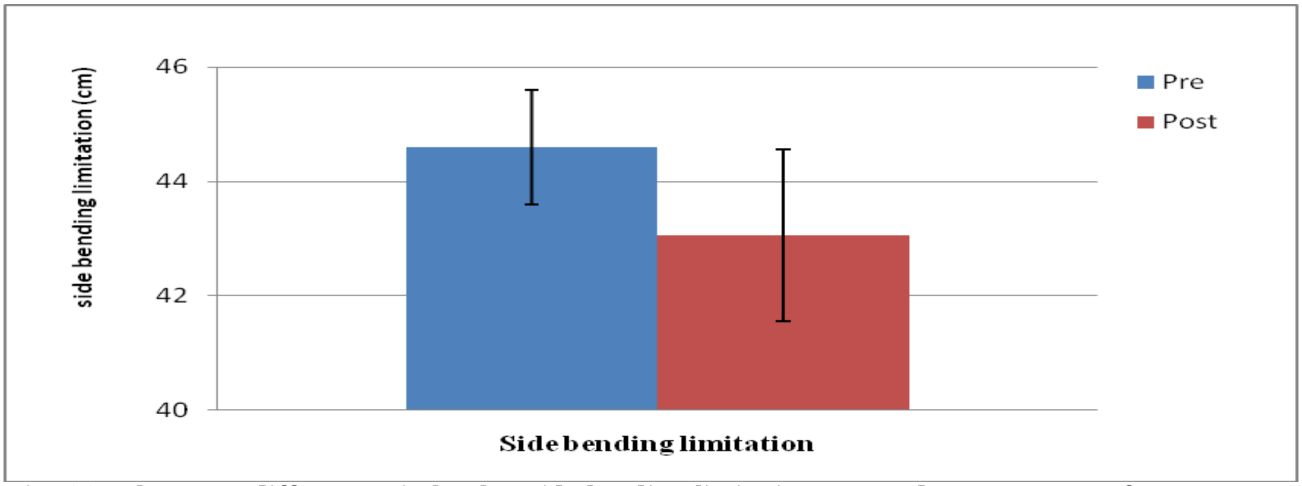

Fig. (9): The mean differences in lumber side bending limitation, pre and post treatment for group B.

Differences in pain level function level and lumber ROM of flexion extension and side bending limitation post treatment between the two groups

1- Pain level:

The results of the t- Test between the two groups revealed that there were no significant differences in pain post treatment where the T value was (1.86), while P was (0.74) as shown in table (6) and figure (10).

2- Function level:

The results of the t-Test between the two groups revealed that there were no significant differences in function level post treatment where the t value was (1.19), while P was (0.24) as shown in table (6) and figure (11).

Table (6): Results of t -Test for pain and functional level between the two groups post treatment.

	Mean ± SD		MD	% of change	t	P	Sig.
	Group (A)	Group (B)					
Pain	3.4±2.89	3.06±2.63	0.34	10	1.86	0.74	NS
Function disability	13.73±9.06	10.1±7.55	3.63	26.87	1.19	0.24	NS

Sig.: significance NS: Non significant P: probability

3- Range of motion:

The results of the t -Test between the two groups revealed that there were no significant differences in range of motion in lumbar flexion, extension and side bending limitation before treatment where the t value was (-0.62), (-0.70) and (1.76), while P was (0.53), (0.48), and (0.08) for the lumbar flexion extension and side bending limitation respectively as shown in table (7) and fig. (12,13).

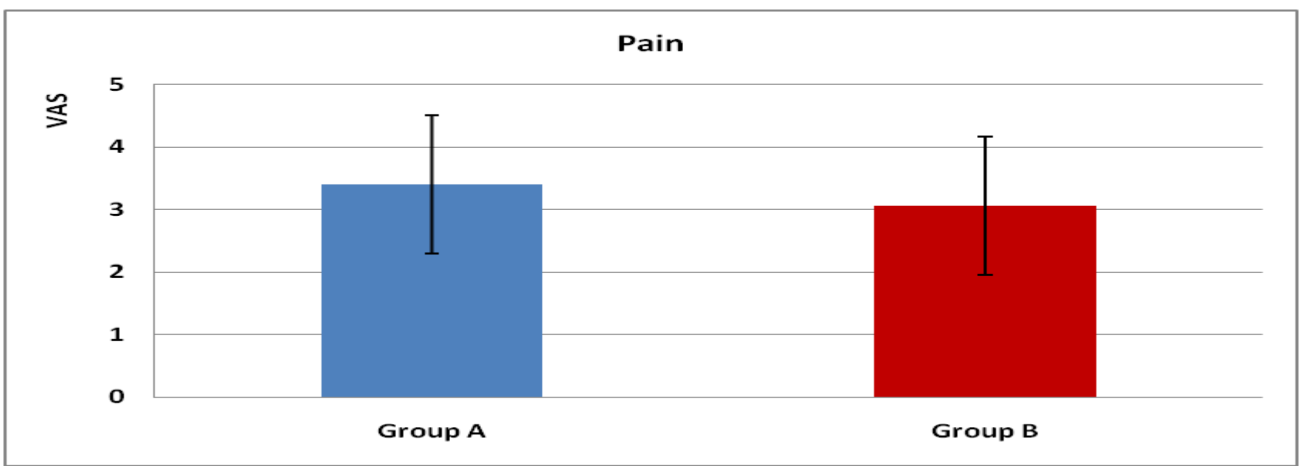

Fig. (10): The mean differences in pain level post treatment for both groups.

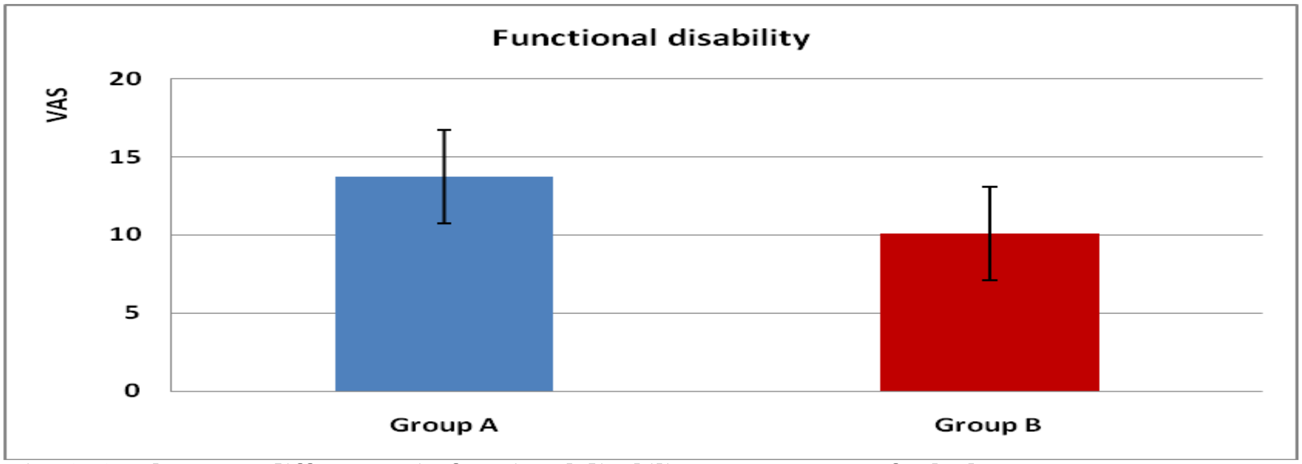

Fig. (11): The mean differences in functional disability post treatment for both groups.

Table (7): Results of T test for pain, function level and lumber ROM (flexion-extension- side bending limitation) between the two groups post treatment.

		Mean ± SD		MD	% of change	t	P	Sig.
		Group (A)	Group (B)					
ROM	Flexion	4.76±1.13	5±0.88	-0.24	5.04	-0.62	0.53	NS
	Extension	2.76±0.49	2.9±0.54	-0.14	5.07	-0.70	0.48	NS
	Side bending limitation	46.4±6.41	43.06±3.8	3.34	7.19	1.76	0.08	NS

Sig.: significance NS: Non significant P: probability

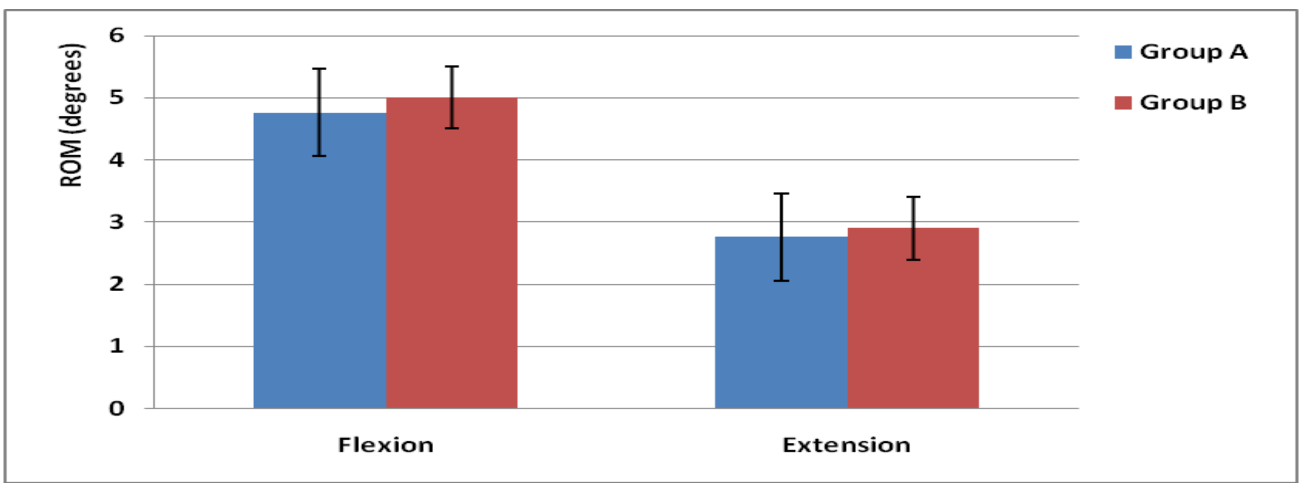

Fig. (12): The mean values of lumber ROM (flexion-extension) between the two groups post treatment.

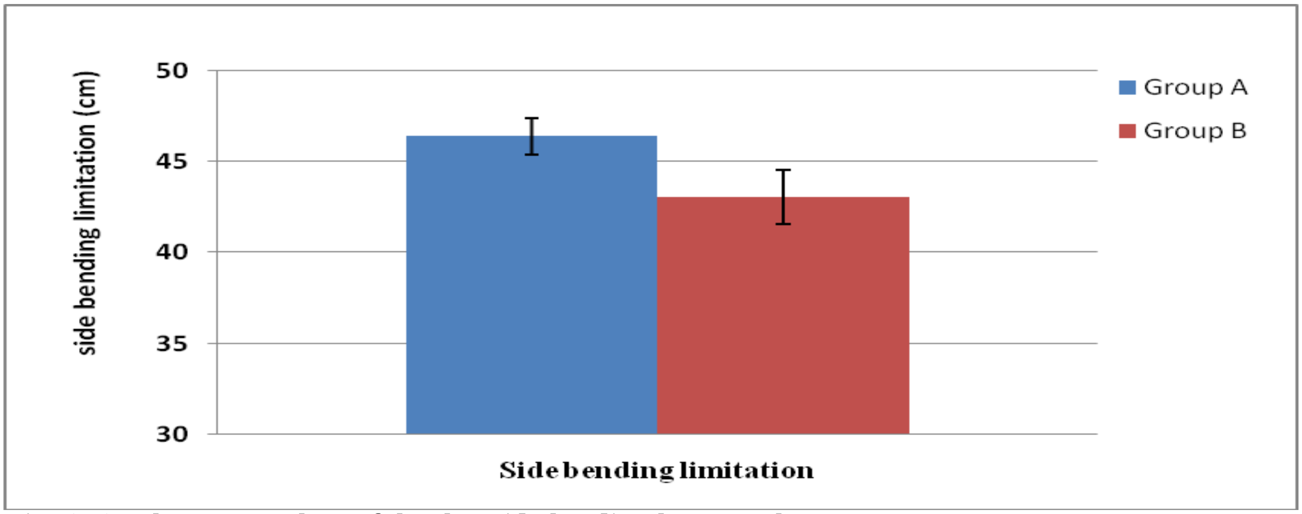

Fig. (13): The mean values of lumber side bending between the two groups post treatment.

DISCUSSION

This study was held to compare between the efficiency of core stability exercise and back extensors strengthening exercise in decreasing pain, improving function and increasing back range of motion in chronic lumbar spondylosis. The results obtained from this study showed that both the core stability exercise program and the back extensors strengthening program were effective in reducing pain severity and functional disability and improving back ROM.

The first outcome measures of the current study was pain intensity that was recorded by VAS which is usually recommended in literature as valid and reliable feedback of improvement in chronic arthritis[28]. The functional outcomes usually connected to the pain level. In group A, The biggest benefit of core training is to develop functional fitness that is essential to both daily living and regular activities. Core stability training is to effectively recruit the trunk musculature and then learn to control the position of the lumbar spine during dynamic movements. Other researchers found that the MF muscle showed poor recruitment in back injury patients, again showing how the recruitment of these deep trunk muscles is very important[29,30].

In a recent literature review of efficacy of stabilization exercises Ferreira[31] concluded that the later may well lead to a decrease of pain and functional scores in patients with chronic LBP and a lower risk of LBP recurrence after an acute episode.

Several authors have studied the benefits of a lumbar stabilization program for patients with LBP. Research included 64 patients suffering from herniated lumbar intervertebral disc in an aggressive physical rehabilitation program consisting of back school and stabilization exercise training. Follow-up data indicated good or excellent outcome in 90% of patients more than 30 months after the beginning of the study[32]. According to Hides[33] the stabilization program for patients reporting a first episode of acute LBP allows for more rapid and complete multifidus recovery in comparison with a control group whose muscle cross-sectional area remained lower after 10 weeks. Moreover, a longitudinal follow-up indicated that the "stabilized" group reported less recurrent LBP than the other group[34].

O'Sullivan[35] compared two groups of patients with LBP who were submitted for 10 weeks to either a stabilization program or a more traditional physical training program (global exercises, swimming, walking). The authors reported better results in the "stabilization" group with regard to pain intensity and functional disability levels which were maintained throughout a 30-month follow-up.

Fritz[36] randomized patients with LBP to an intervention involving manipulation or stabilization exercises. Authors observed that in the "stabilization" group, only patients with hypermobility presented a significant decrease of symptoms.

A study compared specific spinal stabilization exercises, manual therapy, and minimal care for patients 18 to 65 with CLBP (12 wk) at two sites in the United Kingdom. Improvements were noted from baseline in pain and function within groups, the authors concluded that spinal stabilization exercise was more effective than manual therapy or minimal care[37].

A multicenter randomized controlled trial from Australia compared general exercise, motor control (stabilization) exercise, and spinal manipulative therapy (SMT) in Patients 18 to 80 with CLBP greater than 3 months. The authors concluded that motor control exercises (stabilization) and SMT result in slightly better short-term function and perception of effect than general exercise for patients with CLBP, but not better medium or long-term results. This was a high-quality study and clinically relevant[38].

Regarding to range of motion of lumbar flexion, extension and side bending:

There was significant difference between the patients before and after treatment with core stability exercises. There was improvement in the range of flexion, extension, and side bending this may be attributed to the improvement in pain which may limit the range of motion.

These results may be supported by Hides[33] they reported increase in the range of flexion, extension and side bending after lumbar stabilizing exercises. These results are contradictory to O'Sullivan[35] who reported no change in the lumbar ROM after treatment with stabilizing exercises.

Regarding to pain severity and functional disability for group (B) back extensors strengthening exercises group:

Most of patients in the back strengthening exercises group reported decrease in their pain level in the visual analogue scale and decreased in the functional disability as measured by Oswestry disability scale before and after treatment.

The lumbar extensor muscles have been considered the weak link in lower trunk function. In CLBP, the lumbar extensors are weak, highly fatigable, atrophied, display abnormal activation patterns, and exhibit excessive fatty infiltration and histopathological changes .Thus, it is reasonable to focus on conditioning these muscles through PREs during the treatment of CLBP to improve the physiological and structural integrity. Through appropriate resistance training programs, reversal of these muscular dysfunctions and structural abnormalities has been documented in patients with CLBP[39].

Lumbar extensor PREs provide sufficient isolation and overload stimulus to improve lumbar muscular strength or endurance. Also an increase in cross-sectional area of the musculature was noted[40].

In an Randomized controlled trials (RCT) by Risch[18], 54 individuals with CLBP were randomized to receive lumbar extensor strengthening exercise performed isolated lumbar extensor progressive resistance exercises (PREs) on a variable resistance dynamometer machine 1 to 2/wk for 10 weeks. The control group was wait listed and received no intervention. Outcomes included pain intensity, psychosocial function, and lumbar extensor strength. At 10 weeks, the lumbar strengthening exercise group displayed significantly greater improvements in pain intensity, lumbar extensor strength, and psychosocial function on one of several scales.

Lumbar extensors strengthening exercises administered alone or with co-interventions are more effective than no treatment and passive modalities in improving lumbar muscle strength and endurance[18]. High-intensity lumbar strengthening exercise appears to be superior to low intensity in improving muscular strength and endurance. To improve the strength and endurance of the isolated lumbar extensor muscles in CLBP through safe, gradually loaded, and measurable PREs, lumbar dynamometer machines appear to be the best option[41].

Regarding to range of motion of lumbar flexion, extension and side bending. There was significant difference between the patients before and after treatment with back extensors strengthening exercises. There was improvement in the range of flexion, extension, and side bending. This may be explained by the reason that the extension program include exercise that improve mobility also it improves pain and function and so it improve range of motion.

There were no significant differences in both the two groups of exercises in improving range of motion this can be explained as following:

Intensive exercise programs had large, short term effects on pain and large effects on ROM (short- and long-term), compared with other treatments. ROM usually improves due to pain decrease[42].

ROM usually improved as a result of decreasing pain and both groups showed a pain decrease, so there were no significant differences between the two groups in improving ROM.

Conclusion

From the results of this study, it can be concluded that both core stability exercises and back strengthening exercises are effective in reducing pain severity, functional disability and improving range of motion in chronic lumbar spondylosis patients.

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الملخص العربي

تأثير تمارين التثبيت المركزية على مرضى خشونة الفقرات القطنية المزمنة

الخلفية : تعتبر خشونة مفاصل الفقرات القطنية المزمنة من المشاكل الصحية الكبيرة على مستوى العالم . **الأهداف :** يهدف البحث إلى دراسة تأثير تمارين التثبيت المركزية علي تخفيف حد ة الألم و تحسين الأداء الوظيفي وزياد ة المدى الحركي للفقرات القطنية عند مرضي خشونة الفقرات القطنية المزمنة تصميم الدراسة اختبار قبل العلاج وبعد العلاج مع المجموعة الضابطة **العينة :** ثلاثون مريضا من مرضى خشونة لفقرات القطنية المزمنة من الجنسين تراوحت أعمارهم بين 41 إلى 60 سنة تم تحويلهم من العيادة الخارجية لمستشفي القصر العيني. **الوسائل :** تم تقسيم المرضي إلى مجموعتين متساويتين بطريقه عشوائية . مجموعه (أ) تكونت من 15مريض تم علاجهم بتمارين التثبيت المركزية ومجموعه (ب) تكونت من 15مريض تم علاجهم بتمارين تقوية العضلات الباسطة للظهر ، وكان العلاج ثلاث مرات أسبوعيا لمدة 4 أسابيع . تم قياس مدى قوة الألم بواسطة استخدام المقياس البصري للألم وتم قياس الأداء الوظيفي من خلال أخذ بيانات مؤشر العجز الأوسويستري للمجموعتين وقياس مدى الحركة للفقرات القطنية باستخدام اختبار شوبر المعدل وباستخدام مازورة القياس قبل وبعد العلاج . **النتائج :** أظهرت النتائج وجود اختلافات ذات دلالة في المجموعتين في مقارنة ما قبل وبعد العلاج وعدم وجود اختلافات ذات دلالة بين المجموعتين قبل وبعد العلاج . وكانت نسبه التحسن في الألم للمجموعة (أ)44.8 % بينما للمجموعة (ب) كانت36.2% و نسبه التحسن في العجز الوظيفي كانت 35.5% للمجموعة (أ) و31.35% للمجموعة (ب) وتحسن المدى الحركي للمجموعة (أ) كان22.6% للثني و25.4% للفرد و3.32% للثني الجانبي وللمجموعة (ب) كان التحسن 21% للثني و20.8 للفرد و3.45 للثني الجانبي . **الخلاصة :** تعد تمارين التثبيت المركزية و تمارين تقوية العضلات الباسطة للظهر لها نفس الأثر في تقليل شدة الم الظهر وتقليل العجز الوظيفي وتحسين المدى الحركي في مرضى خشونة الفقرات القطنية المزمنة .

الكلمات الدالة: خشونة الفقرات القطنية المزمن – تمارين التثبيت المركزية – تمارين تقوية العضلات الباسطة للظهر.