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Effect Of Kitchen Table Exercise Program On Pain, Range Of Motion And Strength Of Lumbar Spine Among Bank Workers With Chronic Mechanical Low Back Pain

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Abstract: Bank workers are the employees who are subjected to risk factors like long working hours, static posture, poor office ergonomics and repetitive nature of work leading to pain and discomfort. Approximately 40.4% of bankers reported of mechanical low back pain in various studies conducted. Thus, to study the effect of kitchen table exercise program on pain, strength and range of motion Bank workers with chronic mechanical low back pain is essential for the well-being and to reduce discomfort in them.

The subjects were selected according to the inclusion criteria and divided into two groups. Pre-test and post-test assessment was done in which Visual Analogue Scale was used for pain, goniometer for range of motion and stabilizer pressure biofeedback for strength were used. The study was conducted on 62 subjects in two groups where Group A was given Kitchen table exercise program and Group B was given conventional exercises for 12 weeks each.

Both groups showed significant improvement in pain, range of motion and strength but group A showed more improvement than group B.

This study concludes that there was a significant reduction in pain and significant increase in range of motion and strength in bank workers with chronic mechanical low back pain.

Keywords **–** Kitchen table exercise, pain, range of motion, strength, bank workers

I. INTRODUCTION

Musculoskeletal disorders rank approximately fourth in terms of their global health impact on the population [(1)]. Musculoskeletal disorders can be minor physical disability used to describe a variety of conditions effecting the muscles, bones and joints with varying severity [(2)]. These may involve the affection of shoulders, arms, elbows, wrists, hands, back, legs and feet. Low back pain is a prevalent issue that affects a vast majority of people at some stage in their life. This can lead to reduced quality of life, deterioration in physical activity and many socio-economic problems. Low back pain can be defined as a feeling of pain in the lumbar region which may or may not radiate to the lower limb [(3)]. It can be classified as specific and non-specific or mechanical.

Mechanical low back pain can be defined as back pain caused by strain and abnormal stress arising intrinsically from the spine, intervertebral disks or surrounding soft tissues [(4)]. The commonly observed symptoms are tenderness, aches and pain, stiffness and swelling. Typically, mechanical low back pain arises due to strain or overuse, core weakness or muscle imbalance, work environment, poor posture, poorly designed seating, incorrect bending and lifting motions causing an abnormal stress on the muscles of the back [(5)]. The abnormal stress to the spine can affect the body mechanics, trunk strength, flexibility, strength of the

muscles of the pelvic arch and lower extremities [5]. If pain persists for more than 12 weeks or 3 months then it is be termed as chronic mechanical low back pain.

Chronic low back pain has been seen to affect up to 23% of the global population, among these 70% to 80% of patients have a recurrence within one year [3,6]. It has an influence in all aspects of life including physical, mental and social aspects. The condition in which a person works plays a very crucial role in development of mechanical low back pain.

A study concluded that 58% of world's population invests one third of their life span working [7]. The swift advancement of technology in utilizing electronic data has impacted both the employees and the workplace as it has changed the environment in which the employee work drastically. Repetition, force, awkward/static postures and duration of exposure are some occupational risk factors which have been perceived.

In the recent era, the use of computers has changed the work environment drastically causing improper posture and prolonged hours of sittings in front of these computers leading to eye strain, muscle fatigue and various work-related musculoskeletal disorders. Work related musculoskeletal disorders are disorders of the muscles, skeleton and related tissue which are suspected to have been caused by work place activity [8]. The factors leading to pain and discomfort were long working hours, static posture, poor office ergonomics and repetitive nature of work [7]. The population that was seen to be at the highest risk were bankers, computer workers, dentists and nursing facilities.

Various epidemiological studies have been performed in which suggested that about 76% of bankers from India have work related musculoskeletal discomforts [7]. A study conducted in Punjab India, on bankers concluded that the prevalence was highest of low back (40.4%), which was followed by upper back (39.5%), neck (38.6%), hand/wrist (36.8%), shoulders (15.2%) and knees (2.2%) [2].

The kitchen table exercise program was founded by the University of Queensland in Australia and was designed to be self-directed exercise program by a physiotherapist. This program only needs a table, a chair, a towel and a chalk. This program is designed by physiotherapists which has six exercises and each exercise has six different levels. The program uses neck movements, arm movements during reach outs, trunk movements, core muscles and ankle movements. It was initially designed to improve strength and balance.

II. NEED OF STUDY

Bank workers are the employees who are subjected to various physical demands and prolonged poor sitting and standing postures which leads to mechanical low back pain. Approximately 40.4% of bankers reported of mechanical low back pain in various studies conducted. Mechanical low back pain is associated with working postures which included bending heavily with one's trunk, bending and twisting simultaneously with one's trunk, a bent and twisted posture for long periods, and making repetitive movements with the trunk. Average working hours of a banker is between 6-7 hours per day making them neglect exercise and physical activity. The kitchen table exercise program is an exercise program which is less time consuming and easy to administer. Thus, to study the effect of kitchen table exercise program on pain, strength and range of motion Bank workers with chronic mechanical low back pain is essential for the well-being and to reduce discomfort in them.

III. AIM

To find the effect of kitchen table exercise program on pain, range of motion and strength of lumbar spine among bank workers with chronic mechanical low back pain.

IV. OBJECTIVE

To determine the effect of kitchen table exercise program on pain, range of motion and strength of lumbar spine among bank workers with chronic mechanical low back pain.

V. HYPOTHESIS

Null hypothesis (h_0): There will be no significant change in pain, range of motion and strength of lumbar spine after use of kitchen table exercise among bankers with chronic mechanical low back pain.

Alternate hypothesis (h_1): There will be significant change in pain, range of motion and strength of lumbar spine after use of kitchen table exercise among bankers with chronic mechanical low back pain.

VI. METHODOLOGY

- Type of study – interventional
- Study design – pre-test post-test
- Sampling method – convenient
- Place of study – in and around Pune
- Sample size – 62
- Study duration – 6 months

VII. MATERIALS

- Table
- Chair
- Pen
- Written consent
- Data collection sheet
- Visual analogue scale
- Goniometer
- Stabilizer pressure biofeedback
- Yoga mat

VIII. INCLUSION CRITERIA

- Both male and female
- Age group between 30 to 45year
- BMI between 18.5 – 24.9
- Bank workers
- Desk sitting for more than 6 hours
- Mechanical low back pain for more than 3 months (VAS = 3 – 7)
- Reduced range of motion of lumbar spine (flexion =20 – 40, extension= 10 – 20)
- Reduced strength (less than 6 mm hg)

IX. EXCLUSION CRITERIA

- Lumbar spine diseases (for example, disc prolapse or spondylolisthesis)
- Abnormal neurological sign in lower extremities
- Radicular pain in the lower limb
- Pregnant women
- Vertebral fractures
- Recent surgery of the spine in last 6 months

X. PROCEDURE

- The study was presented in front of the ethical committee of PES Modern College of Physiotherapy and was continued forward after the clearance from the ethical committee.
- According to the inclusion and exclusion criteria the subjects were selected and the study was explained to them.
- A written consent form was taken from the subjects.
- The data was collected from the subjects according to the data collection sheet.
- The subjects were divided into two groups with the help of chit method.

- Group A was given kitchen table exercise program and group B was given conventional exercises for a duration of 12 weeks and post-test data was collected.
- All the data was analysed and conclusions were drawn.

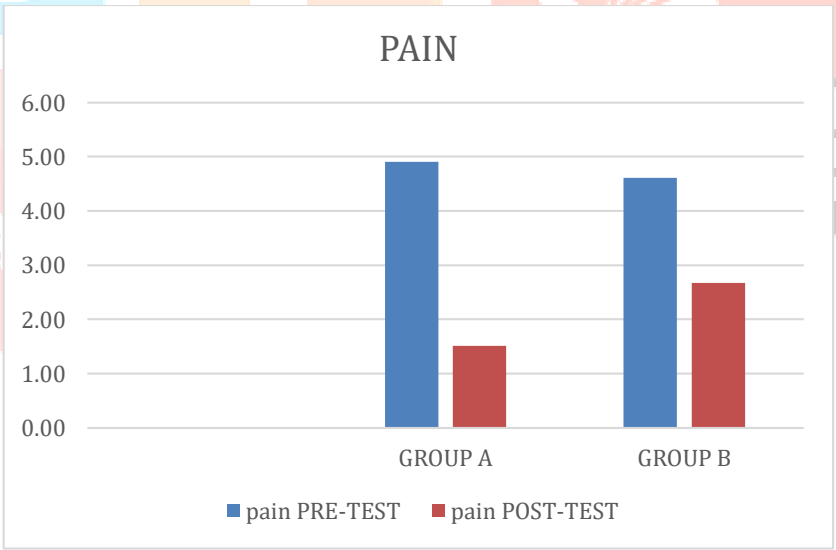
XI. RESULT

The data that fulfilled the inclusion criteria was further analysed. 62 subjects were included in the study according to the inclusion criteria. The statistical analysis of VAS, goniometer and stabilizer pressure biofeedback by t-test.

1) Visual Analogue Scale

Table 1: Pain score

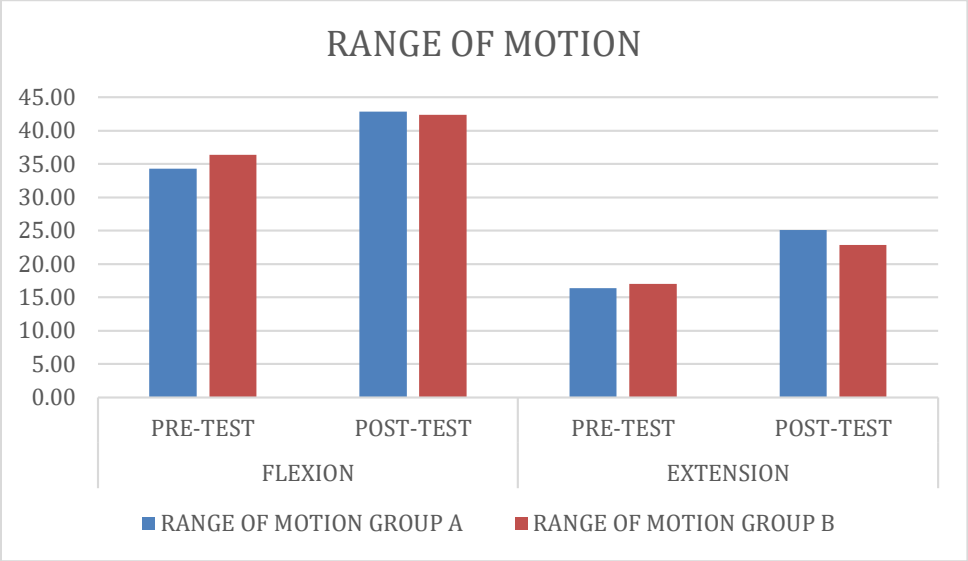
PARA METERS	PRE		POST		P VALUE	T VALUE	RESULT
	MEAN	SD	MEAN	SD			
Pain (group A)	4.90	0.85	1.5	0.75	<0.0001	24.79	EXTREMELY SIGNIFICANT
Pain (group B)	4.61	1.06	2.67	1.17	<0.01	17.13	SIGNIFICANT



The pre-test mean of group A is 4.90 that of group B is 4.61 and post-test mean of group A is 1.52 and that of group B is 2.68. The p-value of group A is <0.0001 extremely significant effect on pain and group B is <0.01 which indicates significant effect on pain.

2) Goniometer

Table 2: Range of motion



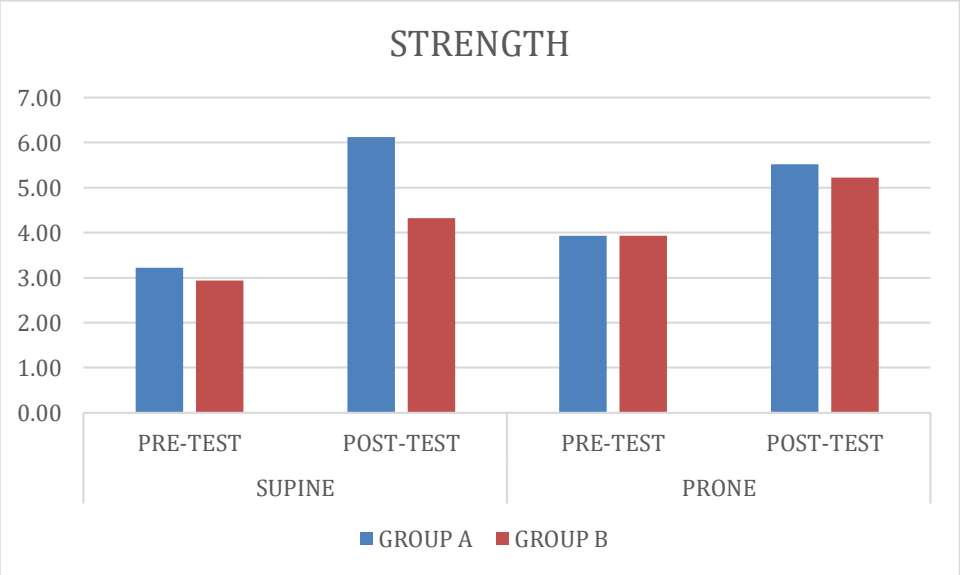
The p-value for group A is <0.0001 which indicates extreme significance and group B is <0.01 which indicates significance for flexion range of motion. The p-value for group A <0.0001 which indicates extreme significance and group B is <0.01 which indicates significance for extension range of motion.

3) Stabilizer pressure biofeedback

Table 3: Strength score

PARAMETERS	**PRE**		**POST**		**P VALUE**	**T VALUE**	**RESULT**
	MEAN	SD	MEAN	SD			
SUPINE (Group A)	3.23	0.94	6.13	1.01	<0.0001	23.08	EXTREMELY SIGNIFICANT
SUPINE (Group B)	2.94	0.72	4.32	0.089	<0.01	13.83	SIGNIFICANT
PRONE (Group A)	3.94	0.91	5.52	1.07	<0.0001	10.38	EXTREMELY SIGNIFICANT
PRONE (Group B)	3.94	1.05	5.53	0.94	<0.01	9.72	SIGNIFICANT

PARAMETERS	**PRE**		**POST**		**P VALUE**	**T VALUE**	**RESULT**
	MEAN	**SD**	**MEAN**	**SD**			
FLEXION(Group A)	34.29	5.12	42.81	6.84	<0.0001	8.24	EXTREMELY SIGNIFICANT
FLEXION(Group B)	36.39	3.45	42.39	3.33	<0.01	20.45	SIGNIFICANT
EXTENSION(Group A)	16.39	3.13	25.10	2.48	<0.0001	18.48	EXTREMELY SIGNIFICANT
EXTENSION(Group B)	16.97	3.08	22.81	3.39	<0.01	15.72	SIGNIFICANT



The p-value for group A is <0.0001 which indicates extreme significance and group B is <0.01 which indicates significance for strength in supine. The p-value for group A is <0.0001 which indicates extreme significance and group B is <0.01 which indicates significance for strength in prone.

The kitchen table exercise program which is Group A showed extremely significant improvement than the Group B which was the controlled group.

XII. DISCUSSION

The The aim of the study was to find the effect of kitchen table exercise program on pain, range of motion and strength in bank workers with chronic mechanical low back pain. The subjects were selected according to the inclusion and exclusion criteria and divided into two groups with the help of chit method. Pre-test and post-test assessment was done in which Visual Analogue Scale was used for pain, goniometer for range of motion and stabilizer pressure biofeedback for strength were used. The study was conducted on 62 subjects in two groups where Group A(n=31) were given Kitchen table exercise program and Group B(n=31) was given conventional exercises for 12 weeks each.

In the recent era, the use of computers has changed the work environment drastically causing improper posture and prolonged hours of sittings in front of these computers leading to eye strain, muscle fatigue and various musculoskeletal discomforts. The factors leading to pain and discomfort were long working hours, static posture, poor office ergonomics and repetitive nature of work [(7)]. The population that was seen to be at the highest risk were bankers, computer workers, dentists and nursing facilities. The commonly observed symptoms are tenderness, aches and pain, stiffness and swelling. Typically, mechanical low back pain arises due to strain or overuse, core weakness or muscle imbalance, work environment, poor posture, poorly designed seating, incorrect bending and lifting motions causing an abnormal stress on the muscles of the back [(5)]. The abnormal stress to the spine can affect the body mechanics, trunk strength, flexibility, strength of the muscles of the pelvic arch and lower extremities [(5)].

The Kitchen Table Exercise program was designed by physiotherapist to be a self-directed exercise program. The program consists of six levels and each one of the levels have six different exercises which address the component of strength and balance. The exercise program comprises of various closed kinematic chain exercises, weight bearing exercises.

Closed kinematic chain exercises are the exercises which involve movements where the distal segment of the limb is fixed or in contact with a stable surface. This stability helps to minimize stress on the joints and surrounding tissues, making them safer and more effective, especially for individuals with joint pain. These exercises often involve multiple joints and muscle groups working together in a coordinated manner. This promotes muscle synergy, where muscles learn to work together efficiently, leading to better movement patterns and overall performance.

Closed kinematic chain exercises mimic real-life movements like sit to stand, pushing against a surface. This helps develop functional strength that translates directly into daily activities or sports performance.

According to a study conducted in 2009, proposed that closed kinematic chain exercises helps in increasing the ability to redistribute the load bearing and enhancing the capacity of joints which was effective in treating the patients with low back pain [(9)]. The results of this study align with those of the current research, reinforcing

the effectiveness of kitchen table exercise program. The kitchen table exercise program focuses on strengthening through targeted exercises that engage different muscle groups surrounding the lumbar spine which in turn improves strength and support the spine.

The kitchen table exercise program involves movements in different joints in the body. Many studies have proved that imbalance in the muscles causes the biomechanical defect of hyper-lordotic posture in the lumbosacral region, kyphosis deformity and in-co-ordination of the lumbopelvic rhythm. All these lead to low back pain causing restriction of activities of daily living. The gastrocnemius shares in knee flexion and its shortening will indirectly affect the hamstring muscle and may limit forward bending and cause low back pain due to influence on lumbopelvic rhythm. The kitchen table exercise program includes exercises like sit to stand, heel and toe raises which help in overcoming these issues.

The group B were given conventional exercises comprising of both open chain and closed chain exercises. There is abundant evidence that individuals with chronic low back pain lack proper recruitment of core muscles and exhibit core weakness [(10)]. These muscles are important for the segmental stability of lumbar spine during whole body movements. Hodges and Morris concluded, as the contraction of transverse abdominis take place intraabdominal pressure develop within the abdominal cavity by coordinated action of diaphragm, transverse abdominis which serves as pressurized balloon which will create distraction between the lumbar spine that will decrease compressive load on it. The improvement in the function will reduce pain, it will increase flexibility of lumbar spine.

XIII. CONCLUSION

This study concludes that there was a significant reduction in pain and significant increase in range of motion and strength in bank workers with chronic mechanical low back pain.

XIV. LIMITATIONS

This study was done on only bankers and can be done on other desk job workers.

XV. FUTURE SCOPE

The future studies it can be seen that the same kitchen table exercise program can be done in a reduced duration of time of the study.

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