

A RANDOMIZED CONTROL TRIAL COMPARING THE EFFECTIVENESS OF CORE MUSCLE STRENGTHENING EXERCISES AND MCKENZIE EXERCISES FOR LOW BACK PAIN IN PAKISTAN AVIATION PILOTS

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ABSTRACT:

OBJECTIVE: To determine the effectiveness of core muscle strengthening exercises and Mckenzie exercises for low back pain in pilots.

METHOD: In this RCT, 34 patients were randomly allocated into two groups namely core muscle strengthening exercises (n=17) and McKenzie exercises group(n=17). Both groups received the treatment for 4 weeks. The study was conducted in cmh Peshawar and cmh Gujranwala. The primary outcome measures were NPRS (Numerical pain rating scale) and MODI (Modified owestry disability index). The data was analyzed by spss version 20.

RESULTS: The mean age of patients enrolled in this study was 31.2 (SD±1.98). The mean weight of total patients was 84.1 (SD±6.45). The mean height of total patients was 5.31 (SD±0.39). Out of total 34 patients 4 were those who 'rarely' have low back pain complaint and 21 were those who 'sometimes' have back pain during flying and 9 were those who 'often' have back pain during flying. Pre and post data analysis of core muscle strengthening exercises was done using paired t test. It showed nonsignificant result for NPRS while showed significant results for MODI with p value ≤ 0.05 . Pre and post data analysis for McKenzie exercise group was done with paired t test. It showed significant results for NPRS and MODI with p value ≤ 0.05 . Between group analysis using independent t test showed no significant difference between two groups of core muscle strengthening exercises and McKenzie exercises for NPRS and MODI.

CONCLUSION: This study concludes that both core muscle strengthening exercises and McKenzie exercises are effective in the management of low back pain though McKenzie therapy group seemed to be more effective in reducing pain in aviation pilots with low back pain.

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Key words: Core muscle strengthening exercises, McKenzie exercises, NPRS, MODI

INTRODUCTION:

Low back pain is one of the leading causes of health care costs in developed countries(1). It affects up to 75% of adult people at some time in their lives and account for 15% of sick leaves(2). Low back pain is a common problem not only in pilots but also in people working in different professions; it is the symptoms of discomfort and pain in the area of back and buttocks.

LBP is also classified according to etiology. Mechanical or nonspecific LBP has no serious underlying pathology or nerve root compromise. Secondary LBP, is associated with underlying pathology(3)

Mechanical back pain is also called "back strain" or "musculoskeletal back pain." This diagnosis excludes anatomic sources of pain, such as disc herniation, spondylosis, etc. The causes may be multifactorial, including strain of the paraspinal muscles (the muscles along the spine), strain the ligaments of the spine, degenerative facet joint or others. Typically, mechanical pain results from bad habits, such as poor posture, poorly-designed seating and incorrect bending and lifting motions. The habits can be autonomously corrected by maintaining proper posture, adapting proper lifting and bending techniques as well as the use of ergonomic chairs to alleviate back pain. If the pain persists, the pain may not be due to mechanical pain, indicating a more serious underlying back problem(4)

There are 30 million people affected by low back pain in USA and their treatment costs about 8 billion U.S. dollar (5). It has been reported that low back pain is common to all cultures and sometimes the problem may lead to disability (6). Researchers reported in a world health organization study that low back pain was at the top of list of anatomical pain sites due to its high rate of frequency among other leading causes that were headache and joint pain. They reported a prevalence of persistence pain as 22% from all the centers of WHO and prevalence rates varying from 5% to 33% (7). Apart from general public low back pain had remained a significant problem across different occupations specially where one is prone to long hour sitting in poor posture. Musculoskeletal problem can arise due to awkward posture(8). One of these high risk professionals are aviators. Sitting postures with trunk flexion as well as asymmetrical postures such as bending and twisting in helicopters affect core stabilizing muscles as well as back extensors of spine in pilots. So core muscle strengthening exercises might be important in this population(9).

Flying officers (pilots) are supposed to work for long hours in cockpit, flying for many hours with ineffective seat padding, improper sitting, poor flight posture and constant vibration are the factors that exposed them to low back pain(5, 10, 11). Physiologically vibration forces cause a decrease in diffusion in intervertebral discs and lead to disc degeneration also vascular damage due to vascular changes may occur(12). Researchers reviewed 45 articles that were published between 1986 and 1997 and 17 selected studies findings and results of meta analysis showed that whole body vibrations were associated with high risk of low back pain,

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sciatica and intervertebral disc disorders(13). Improper sitting posture that is forward flexed lumbar and thoracic spine and unsupported upper extremity increase physiological stress and compressive forces on lumbar area specifically L3, L4, L5 so the spinal extensors are inadequately activated and become mechanically over fatigued that result in back pain over the time(14). All these factors are increased by increasing the flying hours and thus increasing the rate of back pain in population of pilots. A research was conducted to radiological examine the pilots and the result showed that there were a decrease in physiological lordosis, increase in neck muscle tone, and decrease spine mobility that indicated impaired function of ligaments and muscular structures(5)

To the author's knowledge, no concrete evidence was found for the management of low back pain in pilots working in Pakistan aviation. There is a very little practice of doing exercise by these pilots in addition to use of medicine to reduce back pain. Exercise is really beneficial for their postural faults and work related back pain and can prevent them from fear of becoming down in fitness category. Moreover, the traditional methods for the treatment of low back pain focus on conventional therapy which does not include McKenzie protocols which has been reported effective. Similarly core strengthening exercises strengthen the important static and dynamic stabilizers of spine. Therefore, this clinical trial is designed to compare the effectiveness of McKenzie protocol and conventional physical therapy including core strengthening exercises for management of low back pain in patients working as flying officers in Pakistan aviation. Authors included pilots of aircrafts named S-300C, LAMA, AH-1F, and MFI -17 in current research who were actively flying.

MATERIALS AND METHODS:

This was a randomized controlled trial which was conducted at CMH (Combined military hospital) LAHORE and GUJRANWALA. After approval from Ethical board, eligible subjects diagnosed with low back pain were engaged in this program. Study was explained to eligible subjects and informed consent was taken from subjects.

All the patients were allocated into two groups. Group A included patients who received core muscle strengthening exercises and group B included patients who received mckenzie exercises Patients in the Group A were given routine physical therapy with core abdominals strengthening exercises. Core muscle Strengthening exercises included exercises for training of transverses abdominis, external oblique, internal oblique, rectus abdominis, pelvic floor muscles, erector spinae and multifidi. Five core strengthening exercise. Supine with bilateral upper & lower lifts, Supine curl up, Quadruped with alternate upper extremity and lower extremity lifts, Horizontal side support, Prone with bilateral upper extremity and lower extremity lift Were included in this regimen. Group B included conventional physical therapy along with McKenzie exercise protocol which included Repeated movements and sustained postures, extension protocol and flexion protocol according to direction preferences of pain, 4 extension type exercises in prone and

standing and 2 flexion type in sitting and supine. These exercises were given in order to improve strength and endurance of muscles around the spine and to see the effects of improved strength and endurance on low back pain and functional activities.

All the patients were male 25 to 45 years and active duty pilots with ≥ 4 weeks of self reported low back pain. They were actively flying at least ≥ 1 hour per week during the treatment session. Patients having history of pre existing chronic low back pain prior to exposure of aircraft work environment, history of back pain due to traumatic cause and who were having medical restriction from flying duties were excluded from the research .

The sampling technique used was simple random sampling. Patients were randomly allocated into two groups either group A or group B. The sample size was calculated according to Gihan's table considering 30% improvement. The sample size came out to be 20 in each group and then 10% sample, 5 patients was added as loss to follow up. The total sample size was calculated to be 25 in each group. During the study , the required sample size could not met due to short span of time and unavailability of patients and the total patient's number was 34, 17 in each group. The study setting was same for both groups. The duration of sample collection was 4 months in which each patient was given exercises for 4 weeks, 3 sessions per week. The outcome measures used were INTENSITY OF PAIN measured through NPRS [Numerical pain rating scale from 0 (no pain) to 10 (worst pain)] and MODIFIED OWESTRY DISABILITY INDEX QUESTIONERE. This questionnaire consists of 10 items each having score of 0 to 5 and then added up. The score ranges from 0 (no disability) to 100 (maximum disability). MODI detects small and large disabilities in patients with low back pain disability.

Data was analyzed using SPSS version 20. Mean and standard deviation were calculated for numerical variables like age, weight and height. NPRS AND MODI Scores were measured on baseline and follow up. Percentage was measured for categorical variable like frequency of pain. Independent sample t test was performed to analyze the difference between two groups and for within group difference paired t test was used. Frequencies, tables, charts and graphs were used for displaying categorical data.

RESULTS:

A Total of 34 subjects male participated in the study. The mean age of the participants was 31.20. 26 years was minimum and 35 years was maximum among them.

There were 17 participants in each group. Baseline characteristics were balanced between the participants the study showed significant difference in pre and post MODI and NPRS scores when compared within groups. There was no significant difference found when compared between the groups. Thus, this study concludes that both Core muscle strengthening exercises and McKenzie exercises are effective in the management of LOW BACK PAIN.

INTRAGROUP ANALYSIS:

Core muscle strengthening group data analysis;

The intra group analysis of core muscle strengthening exercise group for pre and post intensity of pain gives non significant result with p –value 0.918. The intra group analysis for MODI yielded significant results with p value 0.002 between pre and post MODI data.

TABLE 1.

INTRA GROUP ANALYSIS OF NPRS AND MODI OF CORE MUSCLE STRENGTHENING Ex. GROUP			
Variables	Pre Mean ± S.D	Post Mean ± S.D	Sig
Intensity of Pain	5.35 ±0.70	1.29 ±0.77	0.918
MODI	17.41 ±4.45	2.47 ±2.87	0.002

MCKENZIE EXERCISES GROUP DATA:

The intra group analysis of McKenzie exercises group for NPRS yielded significant result with p value 0.001 between pre and post intensity of pain data. The comparison of pre MODI AND post MODI data gave significant results with p value 0.0004.

TABLE 2.

INTRA GROUP ANALYSIS OF NPRS and MODI OF MACKENZIE EXERCISE GROUP						
Variables		Pre Mean ± S.D		Post Mean ± S.D		Sig
Intensity of Pain		5.53 ±1.01		1.53 ±0.87		0.0001
MODI		19.76 ±5.99		2.82 ±2.74		0.0004

INTER GROUP ANALYSIS:

Post intensity of pain:

The between group analysis showed that there was a non significant difference between two groups having p value of 0.412.

Post MODI:

The inter group analysis of core muscle strengthening exercise and Mckenzie exercises showed that there is non significant difference between two groups having p value of 0.717.

TABLE 3.

INDEPENDENT T TEST OF GROUP A AND GROUP B			
Variables	Core Muscle Strengthening Exercises	McKenzie Exercise	Sig
	± S.D	± S.D	
Post intensity of Pain	1.29 ±0.77	1.53 ±0.87	0.412
Post MODI	2.47 ±2.87	2.82 ±2.74	0.717

DISCUSSION:

The present study was undertaken to evaluate the effectiveness of Core muscle strengthening exercises and McKenzie exercises for low back pain in pilots; and to compare which of the techniques is better in reducing pain and disability.

The study showed significant difference in pre and post MODI and NPRS scores when compared within groups.

There was no significant difference found when compared between the groups. Thus, this study concludes that both Core muscle strengthening exercises and McKenzie exercises are effective in the management of LOW BACK PAIN .

Low back pain is a very common problem now a days. It affects a number of different professionals. Pilots are also affecting from this due to their working conditions all over the world and in some cases it becomes a serious illness if not treated properly. There are various factors that are responsible for low back pain in pilot population and many researchers in different countries were done to evaluate them. No previous study on Pakistan aviation pilots and their back pain was found. Although many foreign researchers compared different physical therapy regimens for treatment of low back pain and also found causative factors in their aviation community.

A Research was conducted and found a relationship between age , flying hours, and muscle endurance with low back pain in pilots (12). **Truszczynsk A. et al.** conducted a research on 112 pilots aged 25-56 yrs , actively flying and 70% of them reported pain in different parts of spine, these researchers found that uncomfortable posture and unsupported lumbar spine provoked pain. They concluded that elimination of risk factors and specific physical exercises with the adjustment of pilot seats could reduce the pain. Authors further suggested that isometric and isotonic training of paravertebral and deep abdominal muscles could be included to reduce low back pain in pilots(5) Pelham and colleagues researched on protocol proprioceptive neuromuscular facilitation by stretching and focused on muscles of hips legs and chest. They introduced the aviator-athlete concept and suggested that a sport specific type approach might be at value. This concept is currently in search by Canadian Forces(14).

Limitations of study :

1. Sample size is small

2. Assessment of Pain and disability is subjective.
3. Patient can not undergo long term exercises due to their posting and working environment.

CONCLUSION:

The present study concludes that CORE MUSCLE STRENGTHENING EXERCISES AND MCKENZIE EXERCISES both are effective in the management of the low back pain pilots as there was no significant difference found between the two groups. The study also concludes that there is a need of further study to investigate the short and long-term effects of each and to compare the treatments in a larger sample size and for longer treatment duration.

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