Prevalence of Diaphragm Dysfunction in Relation to Breathing Pattern in Non Specific Low Back Pain

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Abstract

Background: Low Back pain is commonly seen clinical condition which is encountered in day to day practice of Physiotherapy. There is lack of studies correlating the relationship between the diaphragm and low back pain.

Purpose: The aim of the study was to observe the diaphragm dysfunction with relation to the breathing pattern in individuals with low back pain.

Material and Method: The materials used in this study is Pen, pencil and the data collection sheet. An observational study was carried out using a cross sectional study design. The study was carried in Karad city, Maharashtra, India. 80 Participants with low back pain [37:M;43:F] has been participated in the study. The diaphragm weakness and breathing pattern were evaluated at rest as well as after motor task with the help of Manual Assessment of Respiratory Motion and pulmonary Function Test.

Result: Observational findings of this study demonstrates partial weakness and altered breathing pattern in patients with low back pain.

Conclusion: Partial diaphragm weakness and an altered breathing pattern was found in individuals with low back pain.

Keywords: Diaphragm weakness, Breathing pattern, Low back pain, Motor task.

Introduction

Low back pain is one of the very commonest problem in the general population affecting almost 70-80% of the people¹. Both the genders are affected but Women being the most affected than men²,⁴. Low back pain is the pain which lies between the 12th rib and the inferior gluteal folds which may or may not radiate to the legs³. Back pain may occur due to degeneration of the spine, jobs that require repetitive lifting of heavy weights, jobs that require prolonged sitting as well as standing and mechanical stress over the intervertebral disc³. Other than mechanical causes Back pain may be a feature of the extra spinal disease like the Genito-Urinary or Gynaecological conditions¹.

Age: Usually back pain is uncommon in children, but if it is present it may be because of some Organic Disease. In adolescents age group the traumatic back pain and the postural back pain may be the common cause¹,⁴. In adult age group there may be various cause such as ankylosing spondylitis, disc prolapse⁴. In elderly there may be various causes such as degenerative arthritis and osteoporosis⁴.

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Sex: Women who had several pregnancies are mostly affected\(^4\). Poor Muscle Tone due to lack of Exercises are the contributory factors in these women\(^1,4\). Due to Obesity during the Pregnancy women may develop Mechanical Back Pain\(^4\).

Occupation :- The occupation may give us the clues of the risk factors which are responsible for back pain. People with sedentary jobs are most likely to be prone for back pain that the people whose work includes various activities \(^4\).

Usually Low back pain can be classified into three; Acute, Subacute, Chronic. Patients with Low back pain may present with decrease in the Muscle Strength and decrease in the Postural Control \(^1,2\).

The recent evidences suggested that the diaphragm is not only the main muscle of respiration but also contribute biomechanically in the maintenance of the trunk stability as well as in regulating the intra-abdominal pressure \(^1,2\). Diaphragm plays a role as a trunk stabilizer as well as helps in respiration\(^1,2\). It was found that when the diaphragm gets activated by the Phrenic Nerve there was an increase in the intra-abdominal pressure which subsequently enhanced the Spinal Stiffness\(^1,2\). The Transverse Abdominis, the Pelvic Floor Muscle and the Multifidus along with Diaphragm help in the Stabilization of the Trunk\(^5\).

It was found due to delay in the contraction of Transverse Abdominis there was an inefficient muscular stabilization, kinematics of diaphragm was impaired as well as the kinematics of pelvic floor muscle was impaired and there was change in the respiratory pattern when the patient was asked to perform any motor control tasks\(^5\). And thus the alteration in the Kinematics of the Trunk Stabilizer may be the responsible factor for Low Back Pain\(^5\).

**Method**

An observational study was carried out using a cross sectional study design. The study was conducted in the city of Karad, Maharashtra. The samples were chosen using the simple random sampling method. The participants in this study are both males and females suffering with nonspecific low back pain. Subjects are selected as per inclusion and exclusion criteria. Study were conducted using a sample size of 80 patients with nonspecific low back pain (n= 4pq/L\(^2\)) for a period of 6 months. The materials used in this study includes data collection sheet and consent form.

Statistical Analysis Used: Statistical analysis of the recorded data was done by using the software SPSS version20

![Figure 1: Participants](image)

**Interpretation:** Individuals with low back pain, 52% seen in females and 28% seen in males.
**Figure 2: Diaphragm Dysfunction**

**Interpretation:**

10 male individuals with partial weakness were found while 27 individuals were found to be normal.

14 female individuals with partial weakness were found while 29 individuals were found to be normal.

**Figure 3: Breathing Pattern**

**Interpretation:**

20% of male individuals were found to be normal while 14% males were found to have breath hold.

18% females individuals were found to be normal while 24% females were found to have breath hold.
Results

The result showed that there was partial weakness in the diaphragm along with a significant breath hold while performing a motor task in individuals with non specific low back pain.

Discussion

This research aimed to study the diaphragm dysfunction with relation to the breathing pattern in individuals with non specific low back pain. Biomechanically diaphragm is a main muscle for respiration as well as a trunk stabilizer. Evidence suggests that a lack in the spinal control can sometimes contribute to low back pain as the spine becomes vulnerable to loading during any motor task such as lifting, picking up the weights.

The objective of this study is to find out dysfunction of diaphragm along with the breathing pattern in individuals with chronic low back pain.

This study was done in six months of duration with sample size of 80 (43-females; 37-males) and age group between 20 and 40 years. The individuals participated in the study were diagnosed with low back pain lasting for past 6 months or more. The individuals with any underlying respiratory problems were not allowed for the participation. The subjects were taken from Karad city. Consent form was taken from the subjects. The procedure was carried out by assessing the strength of the diaphragm by measuring the Vital Capacity. The breathing pattern of the subjects were assessed at rest as well as while performing the motor task.

Diaphragm weakness in subjects with Low Back Pain can contribute in a reduced Spinal Control.

One main reason is an Increase in the Intra-abdominal pressure which results in a relative stiffness. Increased Intra-abdominal pressure suggests to unload the spine by the trunk muscle activation. When the postural control and the respiration demand gets increased the co-ordination of both gets complicated.

Due to the alteration in the activity of Transversus Abdominis and the diaphragm the subjects with Low back pain often reported altered postural control.

There is continuous Fluctuation effect falling on the Intradiskal pressure.

The respiration induced Intradiskal pressure changes can play a big role in the nutrition and thus in the mechanical behavior of the Intervertebral disk.

The greater diaphragm weakness in the low back pain individuals can contribute in a decrease in the spinal control in such a population and this is via a response evoked by the inspiratory muscles metaboreflex activation- this may impair the function of the muscles that is the muscles involved in spinal control.

Figure:1 shows that out of 80 individuals 52% of Women has a non-specific low back pain, and 48% of Men has non-specific low back pain.

Figure: 2 shows that out of 37 male individuals 10 individuals had a partial weakness of diaphragm while the other 27 were found to be normal.

Out of 43 female individuals 14 individuals had a partial weakness of diaphragm while the other 29 were found to be normal.

Figure:3 shows that 20% male individuals were found to be normal at rest as well as while performing the motor task.

But around 14% of the male individuals had breath hold while performing the motor task.

On the other hand 18% female individuals were found to be normal at rest as well as while performing the motor task.

But around 24% of the females had breath hold while performing the motor task.

Conclusion

On the basis of the result of the study, it was concluded that there is a partial weakness in the diaphragm and a significant breath hold while performing a motor task in individuals with non specific low back pain.

Conflict of Interest: There was no conflict of interest.

Source of Funding: This study was self funded

Ethical Clearance: Ethical clearance was taken from institutional committee of Krishna Institute of Medical Sciences, Deemed to be University, Karad.
References


2. Roussel N, Et Al, Shawn Thistle; Altered Breathing Pattern in Chronic Low Back Pain Patients. European Spine Journal;18(7): 1066-1073

