

Case Report

Role of Diaphragmatic Breathing Exercise in the Rehabilitation of Chronic Low Back Ache

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ABSTRACT

A 55-year-old male patient who has undergone physiotherapy sessions on and off for about 6 months has been admitted to the hospital for the recurrence of back pain along with it he has slight breathing issues while performing day-to-day activities, especially in forward bending activity and has been treated with pain killers and muscle relaxants during the medication periods. The patient is feeling better again, but his symptoms continue to worsen. Later, he was referred to a pulmonologist for additional evaluation after presenting with decreased diaphragm excursion, which was causing a disordered breathing pattern. He was treated with medication and referred to additional rehabilitation for low back pain management after a thorough physical examination that also included checking the patient's core and deep breathing muscles Activities of Daily Living (ADL) activities.

KEYWORDS: Chronic low back ache, diaphragm excursion and lumbar mobility, diaphragmatic breathing exercise

INTRODUCTION

The chronicity of the pain has been poorly understood and has led to moderate to poor outcomes in the management of pain, many physiotherapeutic approaches have been used in treating low back pain, including electrotherapeutic modalities, manual therapy, and manipulative therapy; however, there is only moderate evidence regarding these therapies and have targeted core muscles in stabilizing the spine (transverse abdominis, multifidus, etc).^[1] Considering the available research on the treatment of low back pain only two of these therapies, spinal manipulation therapy and electrotherapy can be advised in the clinical environment since they offer adjuvant short-term improvement in pain and function based on the moderate evidence that is currently available.

The deep muscles of respiration have often been neglected in rehabilitation settings, where primarily the target is on core stabilization and other manual therapy techniques have been widely used^[2] the main disadvantage of these techniques is patients would again

report the recurrence of pain, to date with the existing literature this is one of the first reports of diaphragmatic breathing exercise in the rehabilitation of chronic low back ache.

CASE REPORT

A 55-year-old male patient who is suffering from chronic low back aches and difficulty in breathing during forward bending has visited a local hospital for the treatment of low back pain and breathing issues and his past history revealed that he is a known smoker and daily travels around 70 km on the bike for his marketing job. He has been informed that earlier he has undergone regular physiotherapy sessions for the management of pain and recently he has reported difficulty in breathing during forward bending activities associated with low back pain he has been treated for breathlessness with a pulmonologist

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Figure 1: Pre assessment of Diaphragmatic Excursion



Figure 2: Post Assessment of Diaphragm E

Table 1: Preassessment of outcomes (baseline)

Parameter	Range
Diaphragm excursion (cm)	2.2–2.9
Lumbar flexion (°)	0–40
Lumbar extension (°)	0–10
Side flexion (right) (°)	0–15
Side flexion (left) (°)	0–15

Table 2: Post Assessment of outcomes at regular intervals

Parameter	Postintervention	Month 1	Month 2	Month 3
Diaphragm excursion (cm)	3.9–4.1	4.0–4.2	3.8–4.2	3.9–4.2
Lumbar flexion (°)	0–40	0–45	0–40	0–40
Lumbar extension (°)	0–10	0–12	0–11	0–12
Side flexion (right) (°)	0–15	0–18	0–18	0–17
Side flexion (left) (°)	0–15	0–16	0–17	0–16

who provided a slight relief to the patient; however, the symptoms tend to remain the same for which he has undergone clinical examination which showed that there is a slight decrease in diaphragm excursion (2.2–2.9 cm) [Figure 1] which resulted in disordered breathing pattern [Table 1] and has been referred to further rehabilitation for the management of pain.

Therapeutic intervention

The patient has undergone diaphragmatic breathing exercises along with other core stabilization exercises; the exercises were performed five times/week for 4 weeks and followed up to 3 months [Table 2]. The postintervention the outcomes of diaphragm excursion and lumbar mobility were recorded.

As it is a breathing exercise, the patient has been performed without any risks and complications and it is well tolerated.

DISCUSSION

The case report has documented the finding of diaphragmatic breathing exercises in the rehabilitation of chronic low back aches. Our main finding of this case report is that when diaphragmatic breathing exercise is added to the regular traditional method in treating chronic low back aches has shown promising results five times/week for 4 weeks which has been followed up to 3 months. Although this one report enhanced diaphragm excursion and lumbar mobility to a higher extent, we cannot generalize the findings of this report because diaphragmatic breathing exercise is rarely investigated in the rehabilitation of low back pain.

The increase in diaphragm excursion and lumbar mobility might be due to various reasons, as the patient himself had earlier sessions of regular exercises for low back ache and adding diaphragmatic breathing exercise has a lot of impact on postural control. The postural function of the diaphragm, understood as trunk stabilization and postural trunk control during repetitive movements, is inextricably linked with its breathing function. There is also a general consensus that an increase of intra-abdominal pressure (IAP) stabilizes the spine Figure 2 Post Assessment of Diaphragmatic Excursion. The diaphragm cannot move the trunk voluntarily, but its contraction contributes to trunk (spinal) stability through an increase of pressure in the abdominal cavity. This dual function of the diaphragm (ventilation and posture) is performed simultaneously.^[3-5]

During the regular performance of this diaphragmatic breathing exercise, there is a rapid change in the kinematics of breathing. The diaphragm can achieve its respiration function from a lowered position to ensure sufficient IAP that is produced when required for a postural task.^[6]

There is an individual ability to control the postural function of the diaphragm. Individuals with a limited capability to contract their diaphragm for the stabilization of the body may have a higher likelihood of the development of back pain. Insufficient and uncoordinated diaphragm activation in people with weak body stabilizing function of the diaphragm may lead to overloading of spinal segments.^[7,8]

In another study, Vostatek *et al.* demonstrated that individuals with low back pain move their diaphragms about half less, compared to healthy individuals. Similarly, a study performed by Janssens *et al.*, in 2013 also found that individuals with low back pain exhibited significant diaphragm fatigue after inspiratory muscle loading. The authors suggest that fatigability of the diaphragm may be a potential underlying mechanism in the etiology of recurrent nonspecific low back pain.^[9,10]

In the clinical setting by incorporating diaphragmatic breathing exercises, clinically, we have found a greater result in improving diaphragm excursion and lumbar mobility in individuals with chronic low back aches; however, we cannot generalize it in the rehabilitation settings.

In conclusion, there is a variety of treatments with good controlled trials have been there for the rehabilitation of low back aches. As per the knowledge and the literature survey, this is the first case report which has investigated the role of diaphragmatic breathing exercises in the rehabilitation of chronic low back aches and as a part of it, we need to further include the component of diaphragm training in the rehabilitation of low back ache and as a recommendation it should be used as an integral part in rehabilitation and clinical settings.

Ethical approval

The study has been approved and verified by the Ethical Committee Padmashree Institute of Physiotherapy Vide Ref: PIP/EC/DBE/04–20/03–23 dated February 05, 2023, and found to be ethically satisfactory.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in

the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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