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The Effect of Breathing Exercises on Reducing Low Back Pain and Physical Disability

Seham Kamal Mohamed[1], Furat Hussein Mahmoud[2], and Baghdad Hussein Mahmoud [3]

[1]*Lecturer in Medical Surgical Nursing, Faculty of Nursing, Cairo University,*
[2-3]*Assist. Profs in Medical Surgical Nursing, Faculty of Nursing, Helwan University, Cairo, Egypt.*

Abstract: Chronic low back pain (LBP) is one of the most frequent musculoskeletal conditions causing physical disability. Breathing exercises offer a holistic approach to pain management, addressing both pain and physical disability, and potentially enhancing overall well-being. **Aim:** To assess the effect of practicing breathing exercises on reducing LBP and physical disability. **Design:** a quasi-experimental research. **Setting:** In the outpatient clinic at "Eldemerdash Hospital" affiliated to "Ain Shams university hospital" Cairo, Egypt. **Subjects:** A sample of (50) adult individuals with LBP were randomized equally into study and control categories**. Tools:** Three tools were adopted to collect data include: I Patients' structured interview questionnaire, II visual analogue scale (VAS) and III Oswestry disability index (ODI). **Results:** total score of study category pre breathing exercise had a highly considerable correlation with overall score of post and 1 month follow up breathing exercise (P= 0.00,.002**).**So the breathing exercises has positive impact on reducing LBP and physical disability. **Conclusion:** Considering its safety and cost effectiveness the breathing exercises could play a crucial role in decreasing LBP and physical disability. **Recommendations:** Encourage patients with LBP to perform deep breathing exercises and lose weight to decrease pain. More researches to investigate psychological impact of LBP. Apply the breathing exercises as a complementary therapy for LBP as long as medical treatment.

Key words: *Breathing exercises, Low Back pain, physical disability*

Introduction:

In the past, LBP was considered a symptom rather than an illness. The location of the discomfort defined it. LBP was defined as pain between the buttock creases and the lower rib borders. According to reports, 23% of people have LBP, with women experiencing this condition more frequently than men. Adolescents and adults have comparable incidence rates of LBP **(Hirotaetal, 2023).**LBP negatively impacted mental health, work capacity, and personal income, which negatively impacted patients' quality of life and placed a significant financial strain on families and society. It was discovered that the national economic burden of LBP in the UK was comparable to that of expensive illnesses including cancer, autoimmune disease, and cardiovascular disease.(**Knezevicetal, 2021).**

The LBP was classified as acute if it lasted less than 12 weeks and as chronic if it lasted more than 12 weeks. Local, radiating, and transferred pain are common forms of back pain. A particular region of the lower back has local pain. This kind of back discomfort is the most prevalent. Muscle sprains and strains, joint arthritis, and minor disk injuries are typically the cause. The discomfort can occasionally be intense and

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sporadic or it can be persistent and painful. When an injury is the reason, sudden discomfort may be experienced. Positional changes can either exacerbate or alleviate local pain. Touching the lower back may cause pain. Muscle spasms could happen**(Chou,2021).**

Pain that radiates down the leg from the lower back is known as radiating pain. The pain may be severe and powerful, or it may be a dull aching. Usually it only affects the back or side of the leg, and it can go all the way to the foot or only to the knee. Radiating pain is usually a sign of a nerve root being compressed by conditions including spinal stenosis, osteoarthritis, sciatica, or a ruptured disk. The pain may be triggered by straining, sneezing, coughing, or leaning over while maintaining a straight posture (**Zo¨etal, 2020)**.

The location of referred pain differs from the pain's real source. For instance, some heart attack victims have pain in their left arm. It might be challenging to determine the precise location of lower back pain that is referred from internal organs because it is often deep and agonizing. Unlike discomfort from a musculoskeletal condition, it usually does not get worse with movement.LBP is caused by GIT disruptions as well**(Chou, 2021)**.High body mass index (BMI), smoking, longer workdays, and low job satisfaction are risk factors for LBP, according to numerous research that looked into the risk factors for LBP among hospital employees.(**Cefalì et al, 2025**)

Although lumbar spondylosis is frequently linked to LBP, there are other mechanical causes as well, such as sprains, strains, intervertebral disc degeneration, radiculopathy, sciatica, a traumatic injury, spondylolisthesis, spinal stenosis, scoliosis, infections, tumors, caudaequina syndrome, abdominal aortic aneurysms, ruptured herniated discs, kidney stones, inflammatory bowel disease (IBD), inflammatory diseases of the joints, osteoporosis, endometriosis, and fibromyalgia.The causes of LBP can be categorized into three categories. Personal characteristics including age, BMI, exercise, alcohol intake as well as smoking. Anxiety, depression, somatization, stress, dissatisfaction with work, poor body perception, as well as low self-esteem are all psychosocial variables. Physical occupational variables, activities such as repetitive movement, strenuous lifting, unfavorable body positions, and vibration belong to the third category. ((**Cefalì et al, 2025**)

Breathing exercises therapy can be considered one of a complementary and alternative therapy (CAT). Breathing exercises are used as complementary therapies alongside conventional medical treatments. Breathing exercises like deep breathing, diaphragmatic breathing, yogic breathing, or Buteyko breathing can be used to complement other treatments for conditions like LBP, helping to manage symptoms and improve disability. However, some people may choose to use breathing exercises as their primary treatment for certain conditions, making them an alternative therapy. Breathing exercises therapy having a crucial role in treating LBP. Patients with LBP were more likely to experience tiredness in their respiratory muscles; when respiratory muscle function declines, back muscle oxygenation and blood volume would also drop.

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According to certain research, the degree of LBP decreased and the strength of the respiratory muscles rose.**(Hartvigsen, 2018)**.

Deep breathing exercise can help relax muscles in the back and surrounding areas, reducing tension and stiffness that contribute to pain.Deep breathing exercises can also help lower stress levels, which can be a significant contributor to muscle tension and pain, including LBP(Center for Spine & Orthopedics).It's common to see inefficient breathing patterns in people suffering from back pain. Diaphragmatic breathing, a key component of breathing exercises for LBP, emerges as a powerfully in the battle against LBP. Research indicates that diaphragmatic breathing engages the parasympathetic nervous system, promoting relaxation and reducing stress – a key player in the manifestation and exacerbation of pain**(Jiao, 2023)**.

Disability has been defined by the "World Health Organization" (WHO) as any limitation or lack of ability to do an action within the range considered normal for a human being. Pain-related disability in LBP focuses on reduction in capacity of performance and alteration of activity performance in daily living (**Wang, 2019)**. So the objective of this work is to evaluate the effect of breathing exercises on reducing LBP and Physical disability.

Significance of the study:

Globally, LBP is the primary cause of disability. Globally, 619 million people suffered with LBP in 2020, and it is predicted that by 2050, there will be 843 million instances, mostly due to population growth and aging**(Global burden disease, 2021).**LBP affects around 70% to 80% of people, impacting daily life and overall well-being. Traditional treatment approaches often focus on symptom relief; however, addressing the root causes is crucial for long-term management .In 2016, it was found that LBP was the main reason of disability in the whole year globally, impacting 57.6 million people. In recent years, research has shown benefits in addressing causes of LBP when practicing diaphragmatic breathing(**Fern´andez-Rodríguez et al, 2022).**

According to estimates, adults between the ages of 20 and 59 are 19.6% more likely to have LBP than those between the ages of 30 and 60, with the prevalence of LBP rising linearly between these two age groups. Today, there is an 84% prevalence of LBP worldwide. One of the most common and expensive musculoskeletal conditions, LBP has grown to be a significant public health concern in the modern era**(Pozarek,2023).**The frequency of LBP was 53.2% in Egypt. Compared to male patients (38.3%), it was higher among female patients (62.8%)**(Alyx& Edoardo,2021).**People employ breathing exercises, which primarily include abdominal breathing, to manage their breathing rate in accordance with specific rhythms. It is easy to use and can greatly alleviate symptoms **(Jiao,2023).**

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Aim:

The objective of the current research was to evaluate the impact of breathing exercises on reducing LBP and Physical disability through:

1-Assess the level of LBP

2-Assess the level of physical disability caused by LBP

3- Implement breathing exercises for patients.

4- Evaluate the impact of practicing breathing exercises on reducing LBP and physical disability

Hypotheses:

The research hypotheses that were proposed to fulfill the objective of the research include:

- The total mean score of visual analogue scale will be lower in participants of the study group than those in the control group.
- The total mean score of Oswestry disability index will be lower in participants of the study group than those in the control group.

Subjects and methods:

Design: A quasi-experimental research.

Setting: In the outpatient clinic at "Eldemerdash Hospital" affiliated to "Ain Shams University Hospital," Cairo, Egypt.

Subjects: A purposive sample of (50) adult subjects with LBP and were randomly categorized equally into study and control groups.

The inclusion criteria were:

1- Individuals who have LBP for >3 months.

2- Aged between 20 and 60 years.

3- Agree to participate in the research

The exclusion criteria:

Subjects with diabetes, pre-existing joint illness, prior surgery in the back and patients with psychiatric problems.

Data collection tools: Three tools were adopted for data collection include: I Patients' structured interview questionnaire which includes patient personal characteristics. II visual analogue scale (VAS) and III Oswestry disability index (ODI). Pre, post& follow up after 1 month from practicing breathing exercises.

The first tool: Patients' structured interview questionnaire: It included two section: **1**: **Patients' personal information** age, gender, education, marital status and occupation.

2: Patients Medical History: It used to assess **general** patient condition which includes previous medical history, presence of chronic disease, smoking and length of time of having LBP.

Scoring system: yes and no answers scored one and zero, respectively.

The second tool: VAS is an instrument used for pain evaluation**.**

The third tool: ODI consists of 10 questions evaluating pain intensity, self-care, lifting, walking, sitting, standing, sleep disturbance, sexual life, social life, travel and so on. Each question was scored as follows: 0 for the first answer, 1 for the second one, etc. Summing the total for all questions and rate them on the scale at right (The higher the score, the worse the pain).

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Operational Design:

It included preparatory phase, validation and reliability of the modified tool, pilot study, and field work.

A-Preparatory Phase:

It comprised rereading present and previous obtainable literature of various articles, periodicals, and magazines to establish data collection tools.

B- Validity and Reliability

Validity:

Face and content validity means that the tool that measures what is proposed to be measured **(Middleton, 2023)**. It was showed to test the tool for suitability, application, improvement, and authorization through five experts, from the Medical-Surgical and critical nursing staff at the Faculty of Nursing, Helwan University. The experts were from several academic professions (professors and assistant professors). They were asked about their thoughts on the scoring system, consistency, and tool format layout.

Testing reliability:

It is the extent to which the instruments being used measure what should be measured consistently, under the same conditions, and with the same participants **(Middleton, 2023)**. It is evaluated by using Cronbach's alpha test which revealed high internal consistency (Cronbach's $\alpha = 0.891$& 0.821) for VAS and ODI, respectively, with 95% confidence interval (CI) and P-value was deemed significant at the level of $P \leq 0.05$.

C-Pilot Study:

Five patients, representing 10% of the sample population, participated in a pilot study to assess the tools' effectiveness, dependability, clarity, and application. The tools were then modified in light of the findings of the pilot study. Pilot study participants were not removed from the whole sample because no changes were made to the research's instruments.

D-Field work:

After receiving the permission to perform the study; the researchers were introduced themselves to the patients and explained the purpose of the research. The written consent was received from the patients. The data collection was covered for a period of six months from the beginning of August 2024and to the end of January 2025. The researchers were present in the research settings 3 days/week from 9.00 a.m. to 1.00 p.m. The structured survey took about 25 minutes to be filled. Post-test and follow up after one month was performed at the end of the breathing exercises practicing.

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The breathing Exercises were done in four phases:

Assessment:

After explaining the purpose of the study and conducting one-on-one interviews with each participant, the researchers requested their involvement. In order to examine the patient's condition, gather personal information, and gauge their symptoms, they met with the subjects and had them complete a questionnaire. The information gathered at this stage served as the foundation for the pre-test breathing exercises.

Planning:

Based on the findings of the evaluation phase, the researchers described the breathing exercises after determining the patient's health and symptoms. It was intended to improve physical handicap and lessen the subjects' back pain.

Implementation:

The practicing of breathing exercises explained in simple Arabic language to be suitable for subject's understanding**.** Deep breathing exercises (the researcher take full deep breath from the nose and hold it for at least 10 seconds then release breath slowly from mouth) were performed first by the researchers and asked the subject to do it to assert the accuracy of doing the exercises; the session for theoretical and application part took almost 30 minutes. The training exercises were took six months given in mean for three days /week.

Evaluation phase:

A posttest utilizing the same format as the pretest tools was used to evaluate the evaluation four weeks later, and a follow-up was conducted four weeks later. After the trial was over, the researchers gave the control group an explanation of the exercises and gave them the option to use them or not.

Administrative Design

The present work was carried out after receiving approval from the ethics committee from the Faculty of Nursing, Helwan University, after the aim of the study were explained clearly. An official letter obtained from the dean of Faculty of Nursing, Helwan University and from the head of the department. The study was approved by the ethical committee of Faculty of Nursing, Helwan University by (N0.42) by date 13-7-2024.

Ethical considerations:

- The researchers explained the objectives and the purpose of the research to the candidates who agreed to participate in this work.
- The subjects were informed that participation wasn’t obligatory and that they have the right to withdraw at any time.
- The data was collected solely for research purposes, and following data processing, it was burnt.

Statistical analysis:

The SPSS program was used for data analysis. Normality of the datawas checked prior to any calculations. Continuous variables were expressed in mean ±standard deviation (SD), while categorical ones were represented in frequency (%). Comparison of categorical data was done using the chi-square test Significance was set at $p<0.05$.

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Results

Table (1): Personal characteristics of the two categories(n=50)

Personal data	Groups				X2	p
	Study(n=25)		Control(n=25)			
	No.	%	No.	%		
Age					**0.05**	**0.819**
20-30 year	4	16.0	3	12.0		
31-40 year	9	**36.0**	10	**40.0**		
41-50 year	7	28.0	7	28.0		
51-60 year	5	20.0	5	20.0		
Gender					0.15	0.695
Male	14	**56.0**	12	**48.0**		
Female	11	44.0	13	52.0		
Education					0.40	0.527
Don't read and write	4	16.0	6	24.0		
Read & Write	7	28.0	7	**28.0**		
Diploma	9	**36.0**	7	28.0		
University education	5	20.0	5	20.0		
Marital status					0.04	0.847
Single	12	48.0	11	44.0		
Married	13	**52.0**	14	56.0		
Occupation					0.29	0.593
Manual work	8	32.0	6	24.0		
Employee	8	**32.0**	8	**32.0**		
House wife	6	24.0	7	28.0		
Retired	3	12.0	4	16.0		

Table (1) Shows that there is no considerable variation between the personal characteristics of both categories. There were 36% patients in the age group 31-40 in the study subjects versus 40% in the controls. Also there was 56% males and 48% females in the study and control categories respectively. While there was 36% had diploma in the study individuals versus 28% in the controls and 52% and 56%of the patients were married, respectively. Finally 32% of the individuals were employee in each category.

Table (2): Medical data of both categories(n=50).

Medical data	Groups				X2	p
	Study		Control			
	No.	%	No.	%		
Medical history					0.05	0.819
Osteoarthritis	9	36.0	10	40.0		
Lumbar disc	16	**64.0**	15	**60.0**		
Chronic disease					0.03	0.866
Hypertension	18	**72.0**	17	**68.0**		
Renal	7	28.0	8	32.0		
Smoking					0.05	0.819
Yes	10	**40.0**	9	**36.0**		
No	15	60.0	16	64.0		
Duration of low back pain					0.25	0.617
less than 1 Year	5	20.0	5	20.0		
1-5 years	7	**28.0**	9	**36.0**		

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6-10 years	7	28.0	7	28.0		
More than 10 years	6	24.0	4	16.0		

Table (2) displays no significant variance was between the medical data of the study and control groups. There were 64% of the studied patients with lumbar disc in the study subjects versus 60% in the controls. Also there were 72% hypertensive patients and 68% in the study and control categories respectively, while there were 40% smokers in the study individuals versus 36% in the control group. Finally 28% of the studied patients had 1-5 years duration of LBP in study group versus 36% in control group.

Table (3): Differences between disability index ofboth categories pre and post breathing exercise(n=50).

Items	Pre				Post				t	p
	Study		Control		Study		Control			
	mean	sd	mean	sd	mean	sd	mean	sd		
Pain Intensity	3.48	1.05	2.80	1.26	1.84	0.75	2.80	1.26	3.586	0.001*
Personal Care	2.88	1.27	2.36	1.04	1.88	0.78	2.36	1.04	2.022	0.048*
Lifting	2.36	1.04	2.72	1.37	1.12	1.01	2.72	1.37	5.149	0.000*
Walking	2.48	1.00	3.40	1.04	1.08	0.81	3.40	1.04	9.640	0.000*
Sitting	2.40	1.22	2.76	1.33	1.52	0.51	2.76	1.33	4.768	0.000*
Standing	2.64	1.38	3.12	1.01	1.52	0.51	3.12	1.01	7.745	0.000*
Sleeping	2.84	1.28	2.96	0.79	1.44	0.51	2.96	0.79	8.854	0.000*
Sex life	2.64	1.08	1.96	0.81	1.60	0.71	1.96	0.81	1.831	0.072
Social life	2.36	1.04	2.44	1.04	0.48	0.51	2.44	1.04	9.268	0.000*
Travelling	2.72	0.79	2.36	1.08	0.88	0.67	2.36	1.08	6.378	0.000*
Total	26.80	9.86	27.42	10.15	13.36	5.00	27.42	10.15	6.806	0.000*

*significant at p-value<0.05

Table (3) reveals the considerable difference between the mean scores of the study and control groups post the breathing exercise for all items. The post total disability index of the study group was 13.3 versus 27.4 in the controls. Also the mean of pain intensity was 1.8 in the study versus 2.8 in the control categories while the mean score of lifting was 1.1 in the study versus 2.7 in the control categories. The travelling index mean score was 0.88 in the study cases versus 2.3 in the controls. The table showed that all disability indices in the study subjects were markedly lower than the controls.**Table (4):** Differences between VAS scale of both categories pre and post breathing exercise(n=50).

VAS scale	**Pre**				**Post**				X2	p
	Study		**Control**		**Study**		**Control**			
	No.	%	No.	%	No.	%	No.	%		
Mild	5	20.0	6	24.0	15	60.0	6	24.0	11.1	0.001*
Moderate	8	32.0	9	36.0	10	40.0	9	36.0		
Severe	12	48.0	10	40.0	0	0.0	10	40.0		

*significant at p-value<0.05

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Table (4) illustrates the marked variation between the VAS scale of the study and control groups post the breathing exercise .In the study category no patients of the studied patients had severe pain versus 40% in the control category while in the study one 60% had mild pain versus only 24% in the control group.

Table (5): Correlation between disability index and VAS score

Items	VAS	
	R	P
Pain Intensity	0.88	0.00*
Personal Care	0.86	0.00*
Lifting	0.88	0.00*
Walking	0.92	0.00*
Sitting	0.82	0.00*
Standing	0.78	0.00*
Sleeping	0.86	0.00*
Sex life	0.66	0.00*
Social life	0.88	0.00*
Travelling	0.52	0.00*
Total	0.92	0.00*

*significant at p-value<0.05

Table (5) shows that there was a marked positive direct correlation between VAS score and all disability indices. The highest correlation is between VAS and walking(r=0.92) and the lowest correlation is between VAS and travelling(r=0.52).

Table (6): Correlation between Total disability index and personal and medical data

Personal and medical data	Total disability index	
	R	p
Age	0.92	0.00*
Education	0.95	0.00*
Smoking	0.88	0.00*
Duration of low back pain	0.22	0.28
	F	p
Gender	10.1	0.004*
Occupation	64.6	0.00*
Medical history	8.1	0.00*
Chronic disease	25.2	0.00*

*significant at p-value<0.05

Table (6) represents the considerable positive direct relation between total disability index and age, education and smoking. Also there is a remarkable relation between Total disability index and gender, occupation, medical history and chronic disease.

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Table (7): Correlation between VAS scale and personal and medical data

Personal and medical data	**VAS scale**	
	R	**P**
Age	0.85	0.00*
Education	0.88	0.00*
Smoking	0.82	0.00*
Duration of low back pain	0.33	0.10
	F	P
Gender	13.9	0.001*
Occupation	21.1	0.00*
Medical history	12.4	0.00*
Chronic disease	11.5	0.00*

*significant at p-value<0.05

Table (7) displays that there is a marked positive direct correlation between VAS scale and age, education and smoking. Also there is a significant relation between VAS scale and gender, occupation, medical history and chronic disease.

Discussion

Clinically, LBP is described as pain, stiffness, or muscle tension that is situated above the inferior gluteal folds and below the costal border, with or without leg pain. Having LBP for longer than 12 weeks is considered chronic. It affects its victims physically and psychologically, causes pain and functional impairment, and has become the world's leading cause of disability in recent years. It has also put an enormous financial burden on economies worldwide because of the high cost of medical care and widespread absenteeism from work across all socioeconomic sectors. (**Journal of sport rehabilitation, 2024)**

The findings of the current work revealed no considerable difference was between the personal data of the study and control groups. There were greater than one third of the subjects in the study and controls in the age group of 31-40. In relation to gender, greater than half of the cases in the study category were males. Regarding educational level, greater than one third of the studied patients was diploma. In relation to marital status, greater than half of the cases in the study and control groups were married .In relation to occupation, about one third of the participants were employee.

This may contradicted with **(Eca et al, 2024)**who mentioned that the majority of research individuals were female, with an average age of 47 years .Also**(Haiting et al,2024)**showed that risk factors for chronic LBP include female gender, older age and being over-weight.

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Regarding medical history the this study displayed that, there is no marked variation between the medical data of the study and control groups. About two thirds of the participants in the study cases had lumber disc. This result contradict with **Doualla et al, (2019)** who mentioned that, 41% of subjects had non-specific chronic LBP, 56% chronic LBP with radiculopathy /stenosis, and 3% had chronic LBP from a specific spinal cause. Also about three quarters of the study group participants had hypertension. In relation to smoking about one third of the study participants were smokers; regarding the length of time having LBP, more than one quarter of them had duration of LBP from 1-5 years**.**

The findings of our work showed that marked improvements in functional outcomes detected by ODI scores, among LBP cases. The ODI of the study and control categories pre and post breathing exercise. the current study showed that, there was a statistical difference between the mean scores of the study and control groups post the breathing exercise for all items. The post total disability index of the study group was 13.3 versus 27.4 in the control group. Also the pain intensity was 1.8 in the study versus 2.8 in the controls while the mean score of lifting was 1.1 in the study versus 2.7 in the control category. The travelling index mean score was 0.88 in the study cases versus 2.3 in the controls. The study findings showed that all disability indices in the study cases were potentially lower than the controls(p= 0.000).

Such findings come in line with **Majediet al.(2020)** who revealed that ODI scores of LBP cases were potentially lower than those in the controls [ODI: MD = −2.46, I^2 = 20%, p = 0.28]. A study by **Jiang et al. (2024)**also supported our study findings and revealed a potential impact of breathing exercises on the ODI score (SMD =-0.74, P< 0.00001).

Zhai et al. (2024)showed that an effect size SMD = −0.79, (P < .00001), indicating that ODI and the mobility function of individuals with LBP could be improved by breathing exercises. Also **Carter et al, (2022**) mentioned that, after breathing exercises the patient reported that he has been able to tolerate prolonged sitting, standing, walking, and running greater than 30 minutes without pain. This outcomes comes in the same line with our findings.

Our research findings suggest marked difference between the VAS scale of the study and control groups post the breathing exercise (p=0.00).In the study group 0% patients had severe pain versus 40% in the controls. This finding comes in accordance with **Jiang et al. (2024)** who revealed that the meta-analysis findings showed a remarkable influence of breathing exercises on VAS score (SMD =-0.84, P< 0.0001) also concluded that breathing exercises can decrease pain, assist people with lumbar disabilities, and improve pulmonary function, and could be considered as a potential alternative treatment for CLBP.

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Another study by **Majediet al.(2020**) concluded that breathing exercises have a positive effect on alleviating LBP, and the VAS scores of LBP cases were considerably lower than those in the controls(VAS: MD = − 0.50, I 2 = 76%, p = 0.0009). **(Mikkonen et al, 2023)**pointed out that Post-intervention, VAS markedly decreased and pain reduced in the study category ($p< 0.01$) which support our study findings in post intervention study group ($p= 0.001$). Furthermore, breathing exercise stabilizes intra-abdominal pressure, reduces compressive forces on lumbar spine and supports spinal alignment, resulting in a reduction in pain.

Lastly, the study group's notable decreases in VAS scores pave the way for the connection between pain management and functional gains. Patients can participate more actively in functional tasks when pain intensity is reduced because it lessens the inhibiting effects of pain on everyday activities. This serves as the foundation for the discussion that follows about how pain management improves functional outcomes as indicated by ODI scores.

Regarding ODI and VAS score our findings showed a marked positive direct correlation between VAS score and all disability indices ($p=0.00$). The highest correlation is between VAS and walking($r=0.92$) and the lowest correlation is between VAS and travelling($r=0.52$). Such findings come in line with **(Mikkonenet al, 2023)**who demonstrated significant reduction in ODI score in patients with chronic LBP. The greatest decrease in ODI scores was seen in the experimental group; this decrease is directly related to the gains in muscle strength and pain alleviation noted in this investigation.

The current findings also come in harmony with **Jiang et al, (2024)**and **Majediet al.(2020**) who reported that breathing exercises have a positive influence on alleviating LBP and improved ODI scores. The current study findings also on the line with **O'Neil, (2024)** who emphasized that incorporating respiratory training into exercise therapy is important, and there is strong evidence that it helps doctors make better decisions when treating patients with LBP.

Better ODI results were probably a result of subjects being able to carry out activities of daily living with less difficulty due to the notable decrease in pain intensity, as indicated by VAS scores. In order to stabilize the spine during functional motions, breathing exercises improve intra-abdominal pressure (IAP) and respiratory efficiency. Additionally, pro prioception and neuromuscular coordination may be indirectly enhanced by breathing exercises, improving movement control and lowering functional impairment. **(Mikkonenet al, 2023).**

The present findings revealed a markedly positive direct relation between total disability index and VAS score with age, education and smoking ($p=0.00$). Also there is a significant relation between total disability index and VAS score with gender

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(p=0.004), occupation, medical history and chronic disease (p=0.00). Our study findings were in the same line with **Mikkonenet al,2023)** who addressed that potential gender-related differences in functional recovery should be considered. According to available research, men may gain more from muscular hypertrophy and strength-oriented interventions, while women may exhibit more flexibility and postural control, which may have a good impact on pain and ODI improvements.

Existing research indicates that gender-related variations in pain perception and muscle function may have affected individual reactions to the therapies, even if the gender distribution was not equal among groups because of the limited sample size. The sensitivity of pain receptors and the capacity to build muscle strength, for example, may be impacted by hormonal and anatomical changes, which could account for part of the diversity in VAS results. However, current research indicates that while females may have more balanced neuromuscular control, males may have greater muscle growth as a result of higher testosterone levels.

In relation to correlation between total disability score and age it was believed that the older the age the greater the functional disability as there is a significant positive direct correlation between total disability index and age. Regarding positive direct correlation between total disability index and education; from the researchers' point of view it may be related to the increased awareness about the importance of breathing exercise in relieving pain and subsequently improved functional ability of the study group.

Also the significant positive direct correlation between total disability index and smoking the literature support that smoking affect functional ability of lungs and also affect the ventilation ability. Study group subjects have shown significant relation between total disability index and occupation, medical history and chronic disease (p=0.00),it may be related to the type of work if the work or occupation need more physical force would lead to increased physical disability. It was observed that presence of chronic diseases as a contributing factor that increase morbidity leading to increased pain and functional disability then subsequently increased VAS and ODI scores.

Conclusion

Considering its safety and cost effectiveness the breathing exercises could play a substantial role in decreasing LBP and physical disability.

Recommendations:

1- Encourage patients with LBP to do deep breathing exercises and lose weight to decrease pain.
2- Pay more attention to the importance of psychological therapy for improving LBP beside its physical symptoms.
3- Don't replace LBP medical therapy and apply the breathing exercises as a complementary therapy.

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