Effect of Body Mechanics Training Program on Low Back Pain and Disability among Patients with Lumbar Disc Prolapse

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ABSTRACT

Context: Lumbar disc prolapse is one of the most common spinal pathologies, which can be associated with debilitating pain and neurological dysfunction. Evidence suggests that patients with disc prolapse and low back pain must be taught proper body mechanics to move safely and with the least strain possible on their back.

Aim: Evaluate the effect of body mechanics training program on low back pain and disability among patients with lumbar disc prolapse.

Methods: A quasi-experimental research design (study and control group) was utilized to achieve the aim of this study. This study was conducted in the neurosurgery department and neurosurgery outpatient clinic at Benha University Hospital on a purposive sample of patients diagnosed with lumbar disc prolapse. Three tools for data collection were used; a Structured interviewing questionnaire for patients; a visual analog pain scale, and Oswestry low back pain disability questionnaire.

Results: Showed that the total mean knowledge score for the study and control group was 33.500±3.862 and 8.140±6.402, respectively, after one-month post-program implementation, with a statistically significant difference between both groups. Also, 75% of the study group had mild pain, and 58% of the control group had moderate pain post-program implementation, with statistically significant differences between the study and control group post-program, where p=0.000. Regarding functional disability scores among study and control groups pre and one month after program implementation. It shows that (67% and 63%) of the study and control groups had severe disability pre-program implementation. In contrast, post-program implementation, 65% of the study group had moderate disability, while 13% of the control group had moderate disability.

***Conclusion*:** Implementing body mechanics training program for patients with lumbar disc prolapse improved knowledge, reduced pain severity, and reduced disability among the study group compared to the control group. A simplified colored booklet about using body mechanics when performing activities of daily living should be available for all patients with lumber disc prolapse.

Keywords: Body mechanics, disability, low back pain, lumbar disc prolapse, and training program

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1. Introduction

Lumbar disc prolapse is the leading cause of disability in the world. The incidence of a herniated disc is about 5 to 20 cases per 1000 adults annually and is most common in people in their third to the fifth decade of life, with a male-to-female ratio of 2:1. The estimated prevalence of symptomatic herniated disc of the lumbar spine is about 1-3 percent of patients *(Fjeld, 2019).*

A prolapsed disc is a condition affecting the spine in which the annulus fibrosus is damaged, enabling the nucleus pulposus, normally located within the center of the disc, to herniate *(Morrison & Nall, 2023*). Prolapsed discs are sometimes known as slipping or herniated discs. In the lower back, more often than any other portion of the spine, that can compress the spinal cord or nerves, producing discomfort and spinal cord dysfunction. It can occur with back strain or injury, frequently through improper lifting and twisting *(Dydyk et al., 2023).*

It is still being determined why some people have prolapsed discs and others do not, even when they perform the same tasks or lift the same objects. Some people may have a weakness in the outer part of the affected disc. Various things may trigger the inner softer part of the disc to squeeze out through the weakened outer part of the disc. This process might be enough to trigger a prolapse in those with disc weakness *(Mayo Clinic, 2022)*

A job that requires a lot of lifting or sitting (especially driving), weight-bearing sports, smoking, being overweight, and being older (a disc is more prone to develop a weakness) are all risk factors for prolapsed discs *(Tidy, 2020; Yelmaiza et al., 2021).* Most prolapse discs occur in the lower back but can also occur in the neck. Signs and symptoms of a herniated disc can include arm or leg pain that is frequently described as sharp or burning, radiating numbness or tingling in the body part served by the affected nerves, and muscle weakening. These signs and symptoms depend on where the disc is located and whether it is pressing on nearby nerves. The capacity to lift or hold objects may be affected *(Bell, 2022; Das & Srimani, 2022).*

There are two treatment options for prolapsed discs: Medical or surgical, depending on the severity of the condition and the patient's age. Most people with prolapse discs are offered "conservative" treatment, which does not involve

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surgery *(Ignatavicius, 2020).* This treatment mainly involves exercise, relaxation, positioning, painkillers or local anesthetics, and manual and physical therapy. Changing one's lifestyle and using proper body mechanics can speed the recovery from a herniated disc *(American Association of Neurological Surgeons, 2021)*

Body mechanics is a term used to describe the transitions from one position to another during daily activities. It covers how to support bodies as one sits, stands, lifts, carries, bends, and sleeps. Poor body mechanics frequently causes back problems. So, learning the principles of appropriate body mechanics is crucial for reducing lower back pain *(Kang,2017).* Applying proper body mechanics to keep the spine safe during routine activities is the most important lifestyle change for patients with prolapsed discs. This lifestyle includes using proper positions and movements while lifting, carrying, standing, walking, and performing work duties *(Ignatavicius et al., 2020).*

Education plays a major role in life to ensure a healthy life. It can minimize the burden of disease, leading to a peaceful life. The nurse encourages the patient with low back pain to describe the location, severity, duration, characteristics, radiation of pain, and associated weakness in the legs. The training sessions help patients learn to move and do routine activities without putting extra strain on the back *(Ali & Hamed, 2019).*

Studies have examined the effect of implementing an educational program about proper body mechanics on low back pain and activities of daily living among patients with disc prolapse and concluded that educational programs about the utilization of proper body mechanics for patients with disc prolapse had shown beneficial improvement of knowledge and activities of daily living and reduction of low back pain *(Weheida et al., 2016).*

Another research conducted by *Ali and Hamed (2019)* to evaluate the effect of patients' education on their performance and outcomes regarding lumbar disk herniation revealed that the educational program was effective and resulted in a significant improvement in patient knowledge, practice, satisfaction, and outcomes regarding lumbar disk herniation.

2. Significance of the study

Lumbar disc prolapse is a common disease in the spine area, occurring in 1%-2% of the population *(Morrison & Nall, 2023).* The prevalence is most significant among 30-50-year-olds. The patients between 25-55 years old have an approximately 95 percent chance of herniated discs occurring either at L4 - L5 or L5 - S1. Disc disease is the underlying etiology in less than five percent of patients with back pain *(Dydyk et al., 2023).* Radicular pain is one of the most common and disabling symptoms, leading to sensory and motor deficits and incapacitating the person *(Dagar et al., 2017; Arirachakaran et al., 2018).* Due to limited national statistical data in Egypt, the prevalence rate of lumber disc herniation is still underestimated. Benha university hospital documented that the previous year's census report of admission in the neurosurgery department was 1000 patients suffering from disc prolapse. *(Benha University Hospital Statistical Office, 2021).*

Evidence suggests that patients with disc prolapse and low back pain must be taught proper body mechanics in order to move safely and with the least strain possible on their back; so, this study was conducted to investigate the effect of body mechanics training programs on low back pain and disability among patients with lumbar disc prolapse in order to help them manage their daily activities, improve their functional ability, reduce their pain and lessen their disability.

3. Aim of the study

This study aimed to evaluate the effect of body mechanics training programs on low back pain and disability among patients with lumbar disc prolapse.

3.1. Research hypotheses

- H1: The knowledge level of the study group will be significantly improved post-program implementation compared to the control group.
- H2: Pain severity will be significantly decreased for the study group post-program implementation compared to the control group.
- H3: Oswestry's low back disability score will be significantly lower in the study group patients than in the control group post-program implementation.

4. Subjects & Methods

4.1. Research Design

A quasi-experimental research design (study and control group) was utilized to achieve the aim of the study. A quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. However, unlike a true experiment, a quasi-experiment does not rely on random assignment *(Reichardt, 2019).* The independent variable in the current study is the body mechanics training program, while the dependent variables are low back pain and disability.

4.2. Study setting

This study was conducted in the neurosurgery department and neurosurgery outpatient clinic at Benha University Hospital, Qalyoubia, Egypt. The neurosurgery department located on the second floor of the surgical building contains three rooms, including 20 beds which serve patients with spine and neurological conditions from around the governorate of Qalyoubia. It offers medical and surgical care for patients free of charge.

4.3. Subjects

A purposive sample of patients diagnosed with lumbar disc prolapse was admitted to the neurosurgery department and outpatient clinic at Benha University Hospital based on the inclusion criteria. The inclusion criteria were as follows: Adult male and female patients aged between 20 to 60 years old, able to communicate and cooperate with the researcher.

Exclusion criteria: Patients with mental or physical handicapped, patients with osteoporosis, rheumatoid arthritis, or fracture, and previous lumbar surgery were excluded.

The sample size was estimated using the Epi info (7) statistical program based on the previous year's census report of admission in the neurosurgery department from Benha University Hospital Census, 2021, at a 90% confidence level and an acceptable margin of error of 5%. The total sample size was 214. Two hundred patients consented to participate in the study. Fourteen were excluded from the study because they did not meet the inclusion criteria. The final sample size was (200) patients who met the inclusion criteria and agreed to participate. They were divided randomly into two equal groups (study and control), each containing 100 patients.

The participants were assigned to the study and the control group by using simple randomization as follows: Each participant was given a number, and the numbers were written on slips of paper, put in a container, mixed thoroughly, and then pulled out one at a time until the necessary sample was assigned. The number was drawn out of the container by the researcher. The control group received routine hospital care, while the study group participated in a planned training program.

4.4. Tools of data collection

Three tools for data collection were used as a following:

4.4.1. Structured Patient Interview Questionnaire

The researcher developed this questionnaire in Arabic after reviewing the related and recent literature *(Weheida et al., 2016; Ibrahim & Elsaay, 2015)*. It involved three parts as following:

Part I is concerned with assessing the patient's socio-demographic characteristics, such as age, gender, level of education, nature of work, marital status, residence, and living conditions.

Part II assesses body mass index (BMI), presence of chronic diseases, cause of pain, duration of pain, family history of disc prolapses, and smoking.

Part III concerns assessing patients' knowledge of prolapsed discs and proper body mechanics. It contains two sections:

- Section 1: Patients' Knowledge about prolapse disc. It consists of ten multiple choice questions such as definition (one question), causes (3 questions), signs and symptoms (one question), diagnosis (one question), treatment (2 questions), and complications (2 questions),
- Section 2: Patients' knowledge about proper body mechanics. It consists of 28 questions (true & false and multiple-choice questions) related to definition (one question), purpose (one question), and principles of proper body mechanics (one question),) and proper position during sitting (four questions), standing (three questions), sleeping (three questions), and pulling or lifting objects (15 questions).

Scoring system for knowledge questionnaire: The right answers were given one score, and the wrong answer was given zero. These scores were summed-up and converted into a percent score. Total knowledge scores were 38 degrees equal (100%)**,** categorized as follows:

- Poor knowledge <50% (<19 degree).
- Average knowledge 50-70% (19-26 degrees).
- Good knowledge >70% (>26 degrees).

4.4.2. Visual Analog Pain Scale

It was adopted from *Chiarotto et al. (2019)* and used by the researcher to assess the severity of low back pain.

Scoring system: The total scores of the visual analog pain scale ranged from (0-10); the higher scores reflect the worst pain. It was categorized as the following:

- 0 was considered "no pain."
- 1-3 was considered "mild pain."
- 4-6 was considered "moderate pain."
- 7-9 was considered "severe pain."
- 10 were considered "worse pain possible."

4.4.3. Oswestry Low Back Pain Disability Questionnaire

It was adopted from *Fairbank and Pynsent (2000).* It was used to assess how back pain affected the patient's ability to manage everyday life and measure functional disability. It included ten sections, including pain intensity, personal care such as (dressing, bathing), lifting, walking, sitting, standing, sleeping, sex, social life, and traveling. Each function was measured against six grades of abilities; the patients had to choose what matched their ability to function.

Scoring systems

Each section of the questionnaire contained six items, the first item in each section scored (0), the second item scored (1), the third item scored (2), the fourth item scored (3), the fifth item scored (4), the sixth item scored (5). The total scores of functional disabilities ranged from 0-50; the higher scores reflect the higher disability level. It was categorized as the following:

- A score of 0-4 considered there is no disability,
- A score of 5-14 considered there are mild disability,
- A score of 15-24 considered there are moderate disability,
- A score of 25-34 considered there is a severe disability and
- A score of 35-50 is considered completely disabled.

4.5. Procedures

A booklet regarding body mechanics training was developed by researchers based on patients' needs assessment, literature review, researchers' experience, and experts' opinions. The researchers designed a booklet in Arabic with illustrations in the form of colored pictures involving theoretical and practical parts.

Administrative design and ethical consideration: This study was conducted after primary approval was obtained from The Scientific Research and Ethics Committee of the Faculty of Nursing, Benha University(Code: Rec-MsN-P_2). Then, official permission was obtained from the dean of the faculty of nursing and the director of neurological departments at Benha University Hospital. All ethical issues were taken into consideration during the study. The objectives and aim of the study were explained to all patients, and they were informed that they could withdraw from the study at any time. Additional verbal consent was obtained from patients participating in the study. Researchers maintained subject anonymity and confidentiality.

The preparatory phase included reviewing the available literature and different studies related to the research problem and theoretical knowledge of the various aspects of the study, using textbooks, evidence-based articles, internet periodicals, and journals to develop and select the data collection instrument of this study.

Content validity and reliability: Validity for tools was tested by a jury of five experts from the Medical-Surgical Nursing Department, Faculty of Nursing, Benha University. The modification was done according to the panel's judgment on the contents, clarity of sentences, appropriateness, and completeness. The reliability of the proposed tool was tested by the Cronbach alpha test (0.097) for the structured interview questionnaire. The visual analog scale was 0.926, and the Oswestry questionnaire was 0.857. They were tested for their reliability value in one of the Egyptian studies *(El-seadi et al., 2022*), but they were not tested in the current study.

A pilot study was carried out on 10% of patients (20 patients) representing the study sample to test the feasibility and clarity of the tools used and the estimation of time needed to fill in the tools. No modifications were done to the questionnaire. Therefore, the pilot study sample was included in the total study sample.

Fieldwork: The process of data collection extended over 12 months from the beginning of February 2022 to the end of January 2023. The study was carried out through four phases: Assessment, planning, implementation, and evaluation.

Assessment Phase: The researchers visited the neurosurgery department three days weekly (morning and afternoon) from 9:00 am until 3:00 pm to collect the data using previous tools. Each patient (control and study group) was individually interviewed to collect demographic data and medical history). Then the researchers assessed the patients' knowledge about prolapsed discs and proper body mechanics. Each interview lasted about 35 – 40 minutes.

Planning Phase (Training program development): Based on the findings of the assessment phase, goals and priorities were formulated, and the researchers designed a booklet. It was written in Arabic with illustrations in colored pictures involving theoretical and practical parts.

The theoretical part included information about the definition of prolapse disc, its causes, symptoms, diagnosis, treatments, complications, and definition, the purpose of applying body mechanics and its principles during standing, sitting, walking, picking up an object, reaching for a higher object and lying down while performing all activities of daily living.

The practical part included techniques of applying proper body mechanics such as standing, sitting, walking, picking up an object, reaching for a higher object, and lying down while performing all activities of daily living.

The treating physician and nurse specialist arranged the practical training concerning the timing and quantity of performing techniques.

Teaching methods included a lecture of simplified instruction followed by discussion and demonstration and re-demonstration for practice training. Media for teaching and training included booklets, pictures, and videos through mobile.

Implementation phase: The training program was provided for study group patients only in the neurosurgery department and outpatient clinics. The training program was implemented for patients in terms of theoretical and practical parts during their hospitalization hours.

Four sessions were carried out (two for theory and two for practice), each lasting 30 minutes. As the program started, each patient obtained a copy of a simplified booklet that included information about the disease and proper body mechanics with some illustration pictures.

In the first sessions, the researcher established rapport with the patient, then the theoretical background was explained, including the definition of prolapse disk, its causes, signs and symptoms, investigation, complications, and treatment modalities using a brochure, PowerPoint presentation in lab top, and booklet.

The second session involved the definition, purpose, and principle of proper body mechanics and proper position during sitting, standing, sleeping, pulling, or lifting objects. Each session ended with a content summary and patient feedback to ensure they got the maximum benefit.

The third and fourth sessions involved demonstration and return demonstration about the techniques of applying proper body mechanics such as standing, sitting, walking, picking up an object, reaching for a higher object, and lying down while performing all activities of daily living, motivation, and reinforcement during training sessions are used in order to enhance learning and motivation for sharing in the study.

Control group: The patients in the control group received routine hospital care only during the data collection. However, after the researchers finished data collection, they distributed a booklet to every patient in the control group.

The evaluation phase includes evaluating the effect of implementing body mechanics training program for patients with disc prolapse on low back pain and disability. Each patient in the study and control group was evaluated two times: The first evaluation was pre-program implementation using the same pretested tools. The second evaluation was done by pointing out the same tool after the first month of the proper body mechanics training program.

4.6. Data Analysis

The collected data were organized, coded, computerized, tabulated, and analyzed using the statistical package for social science (SPSS), version (21). (SPSS Inc., Chicago, IL). Data analysis was accomplished using the number, percentage distribution, chi-square test, mean, standard deviation, and correlation coefficient; a Paired t-test was used to compare the study and control group variables. A significant level value is considered when $p<0.05$, $p <0.001$.

5. Results

Table 1 compares the study and control groups regarding their demographic data. It shows that 57% and 45%) of the study and control groups were in middle age

between 30-<50 years, with mean ages of 40.08±10.38 & 39.69±10.45, respectively, while 70% and 64% of the study and control groups were males. Regarding educational level, the highest frequency (38% and 33%, respectively) was for secondary education. The nature of work reveals that 58% and 59%, respectively, of the study and control groups had manual work, and 84% and 71% were married. Regarding residence, 65% and 69% of them live in rural areas, and most of them live with their families, with a non-statistically significant difference between both groups at the beginning of the study.

Table 2 compares the study and control groups' medical data. It reveals that 51% and 50% of the study and control groups were overweight, with a mean body mass index of 25.12±3.51 and 24.80±4.05, respectively. Moreover, 84% and 88% of the study and control groups did not suffer from chronic diseases. Regarding the cause of pain, 53% and 60% of the study and control group reported that lifting heavy objects was the cause, and 65% and 58% had pain from six months to less than one year. Most of them (93% & 90%) reported no family history of disc prolapse, and the highest percentages (70% and 75%) of both groups were not smokers, with non-statistically significant differences between both groups regarding their medical history.

Table 3 compares knowledge about disc prolapse and body mechanics between study and control groups pre- and post-program implementation. It shows highly statistically significant differences between the study and control groups in all items of knowledge (P= 0.000) after one-month post-program implementation. But there were no statistically significant differences between the study and control group in all items of knowledge pre-program implementation, whereas (P>0.05)

Figure 1 demonstrates the percentage distribution of the total level of knowledge for both the study and control group pre- and post-program implementation. It displays that 89% and 92% of the study and control groups had poor knowledge before program implementation. In contrast, 93% of the study group had good knowledge after one month of program implementation, and it was zero percentage for the controls.

Table 4 compares the study and control groups' pain severity pre- and post-program. It reveals that 57% and 50% of the study and control groups had severe pain pre-program implementation, with a non-statistically significant difference between both groups before body mechanics training. In contrast, 75% of the study group had mild pain post-program implementation. In comparison, only 9% of the control have mild pain, and 58% of the control group had moderate pain, with highly statistically significant differences between the study and control group post-program, where p=0.000.

Table 5 compares study and control groups related to their functional disability pre- and post-program implementation. There was a marked decrease in the mean score for all variables of the Oswestry Low Back Pain Disability Questionnaire for the study group after one month of program implementation compared to a control group, with a highly statistically significant difference between the study and control group regarding total score of Oswestry Low Back Pain Disability Questionnaire post implementation of body mechanics training (at p=0.000). While pre-program, there were no statistically significant differences between the study and control groups in all variables (P>0.05).

Figure 2 demonstrates functional disability scores among the study and control groups pre and one month after program implementation. It shows that 67% and 63% of the study and control groups had severe disability pre-program implementation. In contrast, in post-program implementation, 65% of the study group had moderate disability, while 13% of the control group had moderate disability.

Table 6 illustrates the correlation between functional disability score, total knowledge, and total pain score post-program implementation for the study. It shows a negative statistically significant correlation between the total knowledge score and Total Owsetery disability score at p<0.05. Also, a positive, high, statistically significant correlation existed between total visual analog pain and total Oswestry disability score at p=0.000.

Table (1): Comparison between the study and control groups' demographic characteristics.

Demographic characteristics	Study group n= 100		Control group N= 100		X^2	P value
	No.	%	No.	%		
Age						
<30 years	32	32	39	39	3.028	0.220
30-< 50 years	57	57	45	45		
50years	11	11	16	16		
Mean±SD	40.080±10.388		39.690±10.453		t=0.265	0.792
Gender						
Male	70	70	64	64	0.814	0.367
Female	30	30	36	36		
Education level						
Can not read and write	14	14	12	12	1.098	0.895
Read and write	20	20	22	22		
Preparatory	18	18	20	20		
Secondary	38	38	33	33		
University	10	10	13	13		
Nature of work						
Do not work	22	22	17	17	1.01300	0.603
Manual work	58	58	59	59		
Employee	20	20	24	24		
Marital status						
Single	10	10	17	17	5.397	0.145
Married	84	84	71	71		
Divorced	1	1	4	4		
Widow	5	5	8	8		
Residence						
Rural	65	65	69	69	0.362	0.547
Urban	35	35	31	31		
Living						
Live alone	7	7	9	9	0.272	0.602
Live with family	93	93	91	91		

Table (2): Comparison between the study and control groups' medical data.

Medical data	Study group N= 100		Control group N= 100		X^2	P value
	No.	%	No.	%		
BMI						
Underweight	2	2	0	0	2.140	0.544
Normal weight	40	40	47	47		
Overweight	51	51	50	50		
Obese	7	7	3	3		
Mean±SD	25.12±3.519		24.80±4.052		t=0.598	P=0.155
Chronic disease						
Yes	16	16	12	12	0.664	0.415
No	84	84	88	88		
If yes (study=16, control =12)						
DM	7	43.75	5	41.7	1.799	0.409
Hypertension	7	43.75	7	58.3		
Cardiac	2	12.50	0	0		
Causes of pain						
Falls	9	9	5	5	3.591	0.309
Lifting heavy objects	53	53	60	60		
Car Accident	2	2	0	0		
Incorrect movement	36	36	35	35		
Duration of pain						
3-6 month	27	27	31	31	1.148	0.563
6 months -<1 year	65	65	58	58		
one year	8	8	11	11		
Family history of disc prolapse						
Yes	7	7	10	10	0.579	0.447
No	93	93	90	90		
Smoking						
Yes	30	30	25	25	0.627	0.428
No	70	70	75	75		

Table (3): Comparison between study and control groups' knowledge about disc prolapse and body mechanics pre and post-program implementation (n =100 study & 100 control).

Variables	Pre-program		Post-program		t_1	P_1	t_2	P_2
	Study	Control	Study	Control				
Knowledge related to disc prolapse	1.88±1.78	1.56±1.81	9.36±1.25	2.00±1.86	1.257	0.210	2.781	0.000
General knowledge related to body mechanics	0.58±0.82	0.58±0.69	2.58±0.72	0.68±0.72	-0.186	0.853	18.227	0.000
Knowledge related to the correct position during setting	0.83±0.77	0.65±0.82	3.29±0.87	0.78±0.90	1.590	0.113	19.884	0.000
Knowledge related to the correct position during standing	0.67±0.73	0.67±0.75	3.68±0.58	0.81±0.78	0.00	1.00	19.075	0.000
Knowledge related to the correct position during sleep	0.49±0.65	0.57±0.59	2.36±0.93	0.69±0.64	-0.904	0.367	14.778	0.000
Knowledge related to the safe handling and lifting of objects	2.87±2.97	2.26±2.60	13.21±2.15	3.00±2.86	1.544	0.124	28.500	0.000
Total knowledge	7.32±6.42	6.51±6.02	33.50±3.86	8.14±6.40	0.919	0.359	33.916	0.000

t_1 (P_1): p-value for comparing between the study group and control group) pre-program.
t_2 (P_2): p-value for comparing the study and control groups post-program (after one month).

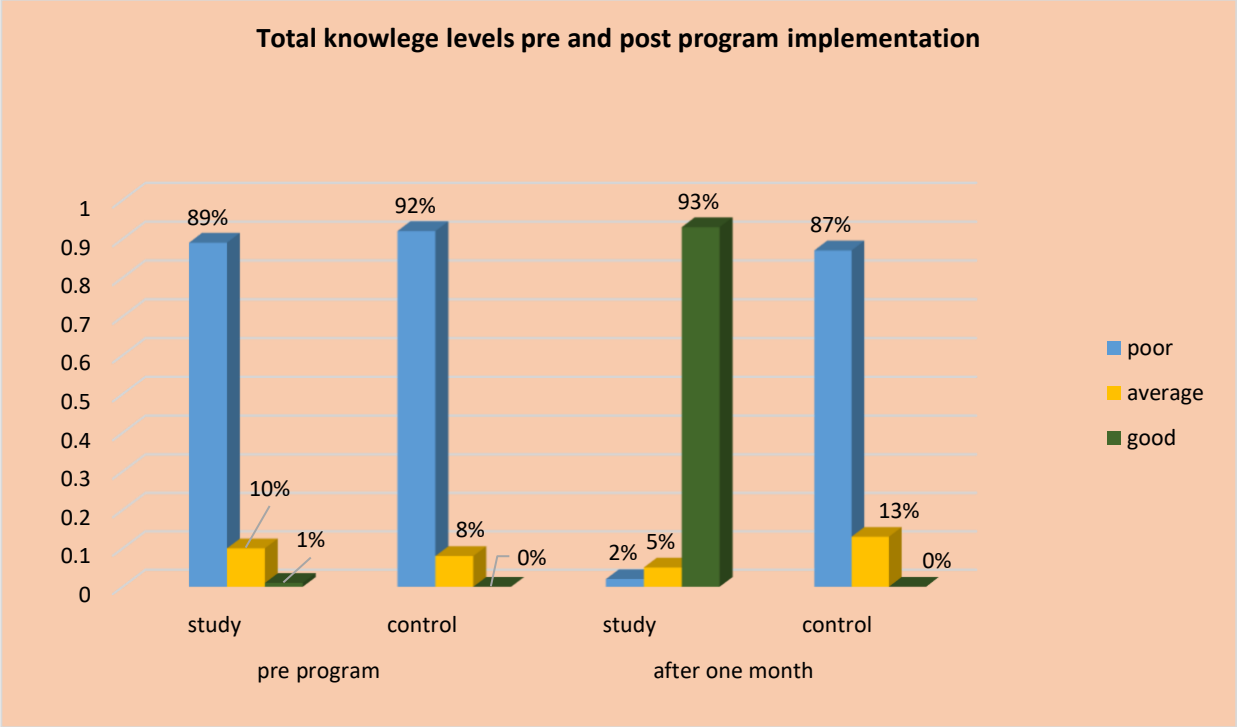

Figure (1): Percentage distribution of total level of knowledge for both study and control group pre and post-body mechanics training program implementation (n=100 study and 100 control).

Table (4): Comparison between the study and control group regarding their pain severity pre- and post-body mechanics training program (n =100 study & 100 control).

Pain severity	Pre-program				Post-program				X^2_1	(p_1) value	X^2_2	(p_2) value
	Study		Control		Study		Control					
	No	%	No	%	No	%	No	%				
Mild pain	4	4	5	5	75	75	9	9				
Moderate pain	24	24	26	26	22	22	58	58	1.120	0.772	89.290	0.000
Severe pain	57	57	50	50	3	3	26	26				
Worse pain	15	15	19	19	0	0	7	7				
Mean±SD	7.080±2.023		7.713±2.199		2.9200±1.390		5.770±1.932		T1=-0.169	0.866	T2=-11.972	0.000

X^2_1 (P_1): p-value for comparing the study group and control group pre-program.
X^2_2 (P_2): p-value for comparing the study and control groups post-program (after one month).

Table (5) Comparison between study and control groups' functional disability pre- and post-body mechanics training program implementation (n =100 study & 100 control).

Variables	Pre-program		Post-program		t_1	P_1	t_2	P_2
	Study	Control	Study	Control				
Pain intensity	3.170±0.75	3.15±0.85	1.89±0.63	2.00±.186	0.17	0.86	-10.84	0.000
Personal care	3.12±0.71	3.21±0.67	2.94±.070	3.14±0.06	-0.91	0.36	-2.15	0.033
Lifting	3.47±0.80	3.36±1.05	2.98±.079	3.24±1.00	0.85	0.41	-2.03	0.044
Walking	3.06±0.74	3.21±0.74	2.81±.072	3.07±.071	-1.42	0.15	-2.56	0.011
Sitting	3.12±0.64	3.01±0.61	2.86±0.69	3.07±0.65	1.24	0.21	-2.19	0.029
Standing	3.36±0.73	3.45±0.74	2.96±0.68	3.31±0.76	-0.86	0.38	-3.56	0.000
Sleeping	3.12±0.74	3.26±0.74	2.60±0.66	3.28±0.77	-1.32	0.15	-6.62	0.000
Social life	3.29±0.78	3.46±0.79	2.85±0.75	3.29±0.71	-1.61	0.10	-4.26	0.000
Traveling	3.22±0.79	3.37±0.84	2.76±0.74	3.27±0.70	-0.28	0.20	-4.67	0.000
Employment/homemaking	3.49±0.84	3.37±1.01	3.03±0.77	3.28±0.97	0.91	0.36	-2.01	0.046
Total Oswestry low back disability score	32.41±3.69	32.85±3.97	27.68±0.32	31.90±3.64	-0.81	0.418	-8.63	0.000

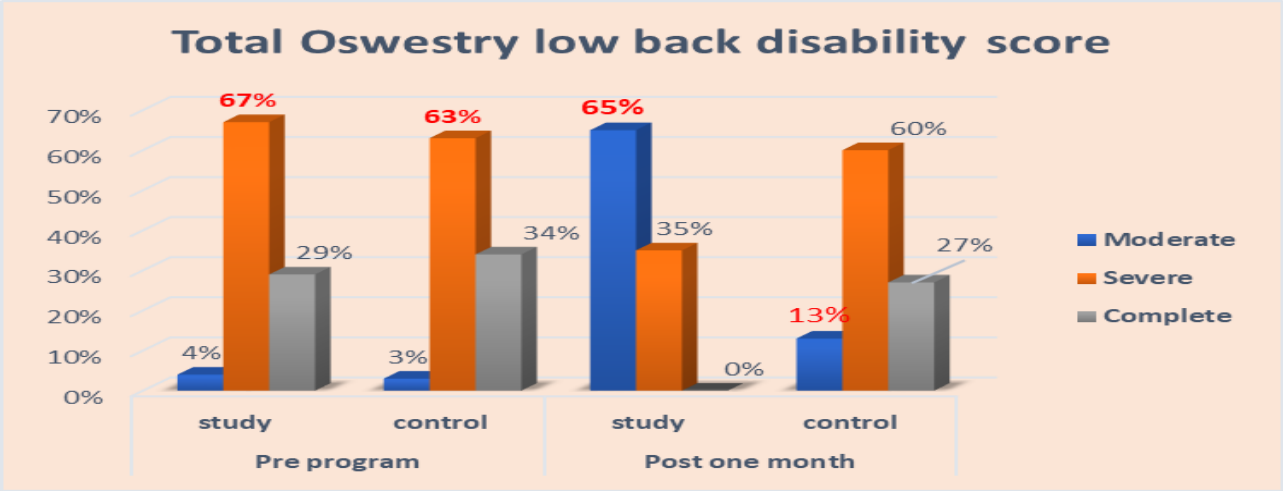

Figure (2): Percentage distribution of functional disability score between study and control group pre and one month after implementing the body mechanics training program.

Table 6) Correlation between total disability, total knowledge, and total pain score after implementing the body mechanics training program for a study group (n =100 study & 100 control).

Variables	Total Owstery disability score	
	R	P
Total knowledge score	-0.242	0.015
Total visual analogue pain	0.379	0.000

6. Discussion

Disc prolapsed when a nucleus pulposus was displaced from intervertebral space. It is a common cause of back pain. Patients experiencing pain associated with a prolapsed disc when often recall the initiating event that caused the pain. Unlike mechanical back pain, prolapsed disc pain is often burning or stinging and may radiate into the lower extremity. Furthermore, weakness or sensation changes can be associated with more severe cases *(Sharma & Kim, 2019).* This study aimed to evaluate the effect of body mechanics training programs on low back pain and disability among patients with lumbar disc prolapse.

Regarding the socio-demographic characteristics of the studied patients, the current study result reveals no statistical significance difference between the two groups regarding their demographic characteristics, which indicates that the two groups were nearly homogenous. It shows that more than half of the studied patients and more than two-fifth of the control group their ages were at middle age between 30-<50 years old. This result may be related to the physiological changes in vertebrae with aging. Also, this age represents the working-age population and may be related to improper use of body mechanics during performing activities.

These results agreed with *Hablass et al. (2020)* in their study entitled "Effect of applying an educational program for patients with Lumbar laminectomy on their knowledge and self-care activities," who reported that more than half of the study and control group patients were in the age of 30-50 years old. Also, these results were in the same line with *Ali and Hamed (2019),* who studied the "Effect of patients' education on their performance and outcomes regarding lumbar disk Herniation" and documented that nearly three-fourths of patients are older than 40 years old.

Regarding gender, the results of the present study reveal that nearly two-thirds of the study and control group were

males. This finding might be due to assigning them to heavy workloads and heavy lifting more than women. This result was supported by *Boakye et al. (2018),* in the study entitled "Post-decompressive neuropathy: New-onset post-laminectomy lower extremity neuropathic pain different from the preoperative complaint," who reported that more than half of both groups were males. On the other hand, this result was in contrast with *Abd-Ella et al. (2021),* who studied the " Effect of discharge plan on the satisfaction of patients with lumbar disc herniation surgery," which stated that more than half of the study sample were females.

Concerning educational level, the current study illustrates that more than one-third of the study group and one-third of the control group had secondary education. From the researcher's point of view, this result may be attributed to most of the patients living in rural areas. This result was consistent with *Ebrahem et al. (2022),* in the study entitled "Activities of daily living among adult patients with lumbar disc," who reported that more than half of the patients under study were finishing secondary education.

Concerning to nature of work, the present study shows that more than half of the study and control group had manual work. This result may be explained by the fact that manual workers were more prone to disc prolapse due to heavy manual tasks which demand more carrying, lifting, and persistent bending that might be accompanied by poor knowledge regarding appropriate body mechanics, as revealed by this study that most of the study sample had poor knowledge regarding disc prolapse and body mechanics at pretest. This result agrees with *Abd Elwahhab et al. (2019)* study on the "Effect of the rehabilitative nursing program on functional status among patients with discectomy" and documented that half of the studied patients had manual work.

Regarding marital status, the current study elicits that most of the study group and nearly three-fourths of the control group were married; it might be explained that the age categories of the study subjects were within the marital age according to the Egyptian social culture. This finding agrees with *Ahmed et al. (2020),* who conducted a study about "Self-care practices of patients with lumbar disc prolapse in the postoperative period," which mentioned that more than two-thirds of the studied patients were married.

Regarding residence, the present study indicates that more than two-thirds of the study and control group live in rural areas, most of which live with their families. This finding might be because people in rural areas prefer to live with their families than live alone, as reverse to people in urban areas.

This finding agrees with a study done by *Abd-El Mohsen et al. (2019)* entitled ″Effect of nursing rehabilitation guide on outcomes of patients undergoing lumbar discectomy″ who reported that most of the studied patients were from rural areas. Furthermore, a study done by *Fareed et al. (2017)* entitled ″Effect of superficial hot versus cold application on low back pain among patients with disc prolapse″ reported that the incidence of lumbar disc prolapse was more common in people from rural areas.

The medical history of the study and control group reveals body mass index for study and control groups that half of the study and control group were overweight. From the researcher's point of view, the result of the current study could be due to the increased load on the spine caused by being overweight, which decreases the strength of the back muscles that protect the lumbar spine. This result agrees with *Sharaf et al. (2020),* who studied "Effects of educational nursing interventions on pain and quality of life among nurses with low back pain," which denoted that most studied nurses were overweight or obese.

Concerning chronic disease, this study reveals that most of both groups did not suffer from chronic diseases. This finding may be due to the age of the majority of participants ranging between less than thirty to less than fifty years old, whereas most chronic diseases are not common in this ng category of age. This finding disagrees with *Mohammed and Abo-Elfadl (2021),* whose study about the "Effect of educational program for patients post herniated cervical disk surgery on their knowledge and daily living activities" reported that around three-quarters of the studied patients had no chronic disease.

Regarding the cause of pain, the study finding denotes that more than half of the study and control group reported that lifting heavy objects was the main cause of low back pain. From the researcher's point of view, these activities act as a cumulative load on the spine, increase strain on the muscles of the lower back, accelerate lumbar disc prolapse, and increase low back pain.

This finding agrees with *Weahida et al. (2016)* in their study entitled "The Effect of Implementing an educational program about proper body mechanics on low back pain and Activities of daily living among Patients with disc Prolapse," who documented that the most factors aggravating low back pain were lifting heavy objects.

Concerning family history, this study reveals that most of the study and control group reported no family history of disc prolapse; from the researcher's point of view, more than half of the studied patients had manual work, considered the main cause of developing disc prolapse. This result was supported by *Alhowaiti et al. (2018)* in their study entitled "Socio-demographic and clinical characteristics of patients with lumber disc disease in Riyadh, Saudi Arabia" and documented that about two-thirds of their patients had no first-degree relative affected by lumber disc disease.

Concerning smoking history, this study reveals that about two-thirds of the study and control groups were not smokers; this result may be due to more than half of patients in both groups being educated in addition to the effect of educational methods about the danger of smoking, this finding disagreed with *El-seadi et al. (2022),* who studied the effect of implementing a protocol of nursing care on clinical outcomes for patients undergoing lumbar spine disc prolapse surgeries" who reported that, approximately more than half of the control and study groups had a smoking history.

Regarding knowledge about disc prolapse and body mechanics, the results of the present study show statistically significant differences between the study and control groups in all items of knowledge. It was attributed to the

effectiveness of theoretical sessions designed in the training program, the clear demonstration, and the illustrative handout. This finding supports the first research hypothesis.

This finding is consistent with *Abd-Ella et al. (2021),* who found a highly statistically significant improvement among patients under study throughout the discharge planning phases regarding their knowledge. Also, this result agreed with Ali *and Hamed (2019),* who reported that most patients had a satisfactory level of knowledge immediately post-program implementation.

Regarding the severity of pain pre- and post-program, this study reveals that more than half of the study and half of the control group had severe pain pre-program implementation. In contrast, post-program implementation (after one month), most of the study group had mild pain. More than half of the control group had moderate pain, with statistically significant differences between the study and the control group post-program. This finding may be because of the educational programs and utilization of proper body mechanics on stabilizing muscles which become stronger so that pain is reduced, and the patient exercises better and gets the ability to move correctly and save a healthy posture, so the pain cycle breaks. This finding supports the second research hypothesis.

The result of the present study is congruent with *Hemed et al. (2017)* study "Effect of educational program on nurses' performance regarding body mechanics," which reported statistically significant differences concerning intensity, frequency, and duration of pain after using body mechanics principles.

Also, in the same context, *Weheida et al. (2016)* found that pain intensity among the study group was significantly decreased than the control group post-education (after two months) post utilizing body mechanics.

Concerning functional disability, the current study shows a marked decrease in the mean score for all variables among the study group compared to the controls after one month of program implementation, with a statistically significant difference between the study and control groups. This finding may be attributed to significant improvement in knowledge about disc prolapse and the utilization of proper body mechanics among study group post-education due to the effect of an educational program that facilitates sitting, standing, walking, sleeping, and social life. This finding supports the third research hypothesis.

These results were in the same line with *El-seadi et al. (2022),* who reported a non-statistically significant difference regarding levels of Oswestry Disability Index (ODI) in the 2nd and 3rd-week post-routine hospital care in the control group compared to the study group.

Concerning the correlation between total Owstery disability score, total pain score, and total knowledge score, the current study findings show a statistically significant negative correlation between total Owstery disability score and total knowledge score post-program implementation, which means that when patients' knowledge improves, disability score decrease. Also, there was a positive high, statistically significant correlation between the total visual analog pain score and total Owstery disability score, which indicated that patients' functional disability decreases with worsening of pain intensity. These results align with a study by *Hong and Shin (2020)* entitled "Relationship between pain intensity, disability, exercise time, computer usage time and depression in office workers with non-specific chronic low back pain." They reported a correlation between the Oswestry disability index and the numeric pain rating scale.

7. Conclusion

Implementing body mechanics training program for patients with lumbar disc prolapse improved knowledge, reduced pain severity, and reduced disability among the study group compared to the control group.

8. Recommendations

- All patients with lumbar disc prolapse should participate in a carefully supervised body mechanics training program about applying proper body mechanics for reducing low back pain and disability.
- A simplified colored booklet about using proper body mechanics when performing activities of daily living should be available for all patients with lumber disc prolapse.
- Similar studies should be replicated on a large sample size in different geographic areas in Egypt to generalize the findings.

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