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

Rawia, A. Ibrahim[1], Watanya, K. Atya[2]

[1]Medical-Surgical Nursing Department, Faculty of Nursing, Benha University, Qalyoubia, Egypt.
e-mail: rawia.ali@fnur.bu.edu.eg
[2]Medical-Surgical Nursing Department, Faculty of Nursing, Benha University, Qalyoubia, Egypt.
e-mail: wataneya.kaml@fnur.bu.edu.eg

Received April 5, 2023, accepted May 1, 2023, Published August 10, 2023.

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 a body mechanics training program on low back pain and disability among patients with lumbar disc prolapse.

Methods: To attain the objectives of this study, a quasi-experimental research design involving a study group and a control group was employed. 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. The study used a structured interviewing questionnaire for patients, a visual analog pain scale, and an 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, compared to 13% of the controls.

***Conclusion*:** Implementing a 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. An illustrated handbook on applying proper body techniques while engaging in everyday tasks should be available for all patients with lumber disc prolapse.

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

Citation: *Ibrahim, R. I., & Atya W. K. (2023).* Effect of body mechanics training program on low back pain and disability among patients with lumbar disc prolapse. *Evidence-Based Nursing Research*, 5*(3)*, 45-56. http://doi.org/10.47104/ebnrojs3.v5i3.302.

1. Introduction

Lumbar disc prolapse is the leading cause of disability in the world. The occurrence of a herniated disc is approximately 5 to 20 instances per 1000 adults every year, primarily affecting individuals in their thirties to fifties. This condition is more frequent among males, with a ratio of 2 males to 1 female. The estimated proportion of individuals with symptomatic herniated discs in the lower back is around 1 to 3 percent of patients *(Fjeld, 2019).*

A prolapsed disc is a spinal condition where the outer ring, called the annulus fibrosus is injured, allowing the inner nucleus pulposus, typically situated at the disc's center, to protrude or 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).*

The reason why certain individuals experience prolapsed discs while others do not, even when engaging in similar activities or lifting comparable objects, is still under investigation. Some individuals might possess a vulnerability in the outer layer of the affected disc. Different factors can initiate the displacement of the disc's inner, more pliable part through the compromised outer layer. This process might be enough to trigger a prolapse in those with disc weakness *(Mayo Clinic, 2022)*

An occupation demanding frequent lifting or prolonged sitting (especially while driving), engaging in sports that involve supporting one's body weight, smoking, carrying excess weight, and advancing in age (which increases the likelihood of a disc developing a vulnerability) all contribute to the risk of experiencing 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).*

[1]*Correspondence author: Rawia Ali Ibrahim*

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 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)).* The paramount lifestyle modification for individuals with prolapsed discs is the implementation of appropriate body mechanics to ensure spinal safety during everyday tasks. This lifestyle adjustment encompasses adopting correct postures and movements while lifting, carrying, standing, walking, and performing occupational tasks *(Ignatavicius et al., 2020).*

Education holds a significant position in one's life, guaranteeing overall well-being. It can reduce the impact of illnesses, ultimately leading to a serene life. The healthcare professional urges individuals with lower back discomfort to communicate details about the pain's position, intensity, length, qualities, spread, and any related leg weakness. Training sessions aid patients in acquiring techniques to carry out daily activities and tasks without overburdening the back *(Ali & Hamed, 2019).*

Research has investigated the impact of introducing an educational initiative focused on correct body mechanics for individuals with disc prolapse. The findings revealed that such educational programs improved patients' understanding and ability to perform daily tasks and decreased lower back pain *(Weheida et al., 2016).*

In another study carried out by Ali and Hamed (2019) that evaluated the Influence of patient education on their performance and outcomes associated with lumbar disc herniation, it was shown that the educational program achieved significant success, led to a substantial enhancement in patients' understanding, application, contentment, and overall outcomes concerning lumbar disc herniation.

2. Significance of the study

Lumbar disc prolapse is a common disease in the spine, occurring in one to two percent of the population *(Morrison & Nall, 2023).* The highest occurrence is observed within the age range of 30 to 50 years. Individuals aged between 25 and 55 years have a roughly 95 percent likelihood of experiencing herniated discs at either the L4-L5 or L5-S1 levels. Disc-related conditions account for less than five percent of 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. The census report from the previous year at Benha University Hospital indicated that 1,000 patients were admitted to the neurosurgery department due to 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 training on correct body mechanics 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: The severity of pain 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 compared to the control group post-program implementation.

4. Subjects & Methods

4.1. Research Design

The study employed a quasi-experimental research design involving both a study group and a control group in order to fulfill the study's objectives. A quasi-experimental design aims to establish a causal relationship between an independent and dependent variable. Unlike a true experimental configuration, a quasi-experiment does not involve random assignment *(Reichardt, 2019).* In the context of this study, the independent variable is the body mechanics training program, while the dependent variables encompass low back pain and disability.

4.2. Study setting

The research was conducted within the neurosurgery department and the neurosurgery outpatient clinic at Benha University Hospital in 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 selective group of individuals diagnosed with lumbar disc prolapse and under treatment at the neurosurgery department and outpatient clinic of Benha University Hospital was purposefully chosen, adhering to specific

inclusion criteria. These criteria encompassed individuals of any gender within the age range of 20 to 60 years who possessed the capacity to communicate effectively and collaborate 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 calculation utilized the Epi info (7) statistical software, relying on the previous year's enrollment data from the neurosurgery department at Benha University Hospital Census, 2021. This calculation was performed with a 90% confidence level and an acceptable margin of error of 5%. Ultimately, the total sample size was determined to be 214 individuals. Of these, 200 patients agreed to participate in the study, while 14 were excluded due to not meeting the inclusion criteria. The final count of participants was 200. All individuals who fulfilled the criteria and agreed to participate were subsequently divided into two groups of equal size through a random allocation process (referred to as the study and control groups), each comprising 100 patients.

For group allocation, a process of simple randomization was adopted: Each participant received an assigned number; these numbers were inscribed on pieces of paper, mixed extensively within a container, and then drawn one by one by the researcher until the necessary sample size was achieved. The control group received regular care at the hospital, while the study group engaged in a structured training program.

4.4. Tools of data collection

Three tools for data collection were used as follows:

4.4.1. Structured Patient Interview Questionnaire

After reviewing the related and recent literature, the researcher developed this questionnaire in Arabic *(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), 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 by *Chiarotto et al. (2019)* and used by the researcher to assess the severity of low back pain.

Scoring system

The visual analog pain scale encompassed scores between 0 and 10, where elevated scores indicated more intense pain. The scores were classified as follows:

- A score of 0 was interpreted as "absence of pain."
- Scores between 1 and 3 were labeled as "mild pain."
- Scores ranging from 4 to 6 were categorized as "moderate pain."
- Scores falling within 7 to 9 denoted "severe pain."
- A score of 10 was designated as "most extreme possible pain."

4.4.3. Oswestry Low Back Pain Disability Questionnaire

Fairbank and Pynsent (2000) developed this tool that was adopted in the current study. It was used to assess how back pain affected the patient's ability to manage everyday life and measure functional disability. It comprised ten divisions, encompassing pain severity, self-care activities like dressing and bathing, lifting, walking, sitting, standing, sleeping, sexual activity, social interactions, and travel. Each function was measured against six grades of abilities; the patients had to choose what matched their ability to function.

Scoring systems

Every section of the survey consisted of six components, where the initial item within each segment held a value of (0), the second item a value of (1), the third item a value of (2), the fourth item a value of (3), the fifth item a value of (4), and the sixth item a value of (5). The overall functional disability scores spanned from 0 to 50, with greater scores indicating more pronounced disability levels. The categorization was as follows:

- 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

Researchers crafted an instructional pamphlet concerning body mechanics training, drawing from patient needs evaluations, scholarly analysis, the researchers' expertise, and insights from specialists. The booklet, created in Arabic, featured visual aids in colorful illustrations, incorporating theoretical and hands-on components.

Administrative Framework and Ethical Considerations: This study was conducted after securing an initial endorsement from The Scientific Research and Ethics Committee of the Faculty of Nursing at Benha University (Code: Rec-MsN-P_2). Subsequently, official authorization was acquired from the dean of the faculty of nursing and the head of neurological departments at Benha University Hospital. Throughout the study, all ethical considerations were meticulously addressed. The study's objectives and intentions were communicated to all patients, with an assurance that they had the right to withdraw from the study at any point. Additional verbal consent was acquired from participants of the study. To preserve confidentiality, researchers ensured the anonymity of the subjects.

The preparatory phase encompassed an extensive review of existing literature and pertinent studies relating to the research subject, along with the acquisition of theoretical knowledge across the various facets of the study. Various resources, including textbooks, evidence-based articles, online periodicals, and journals, were utilized to construct and choose the data collection instrument for this research.

Validation of content and reliability: The tools' validity was evaluated through the assessment of a panel consisting of five experts from the Medical-Surgical Nursing Department at Benha University's Faculty of Nursing. Adjustments were made following the panel's assessment of content relevance, sentence clarity, suitability, and comprehensiveness. 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 made to the questionnaire. Therefore, the pilot study sample was included in the total study sample.

Fieldwork: Data collection spanned 12 months, commencing in February 2022 and concluding in January 2023. The study followed a sequence of four stages: Assessment, planning, implementation, and evaluation.

During the assessment phase, the research team frequented the neurosurgery department three days per week, encompassing morning and afternoon shifts from 9:00 a.m. until 3:00 p.m., 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 of prolapsed discs and proper body mechanics. Each interview lasted about 35 – 40 minutes.

Planning Phase (Development of training program): The researchers delineated objectives and priorities based on the assessment phase's insights. Subsequently, they composed a booklet in Arabic, augmented with vivid illustrations encapsulating theoretical and hands-on aspects.

The theoretical segment encompassed comprehensive details concerning disc prolapse, including its definition, causative factors, symptoms, diagnostic procedures, treatment options, potential complications, and the significance of applying body mechanics. This program involved principles applicable to standing, sitting, walking, lifting objects, reaching for higher items, and lying down while executing various everyday activities.

In the practical portion, guidelines for adopting correct body mechanics were detailed. These encompassed techniques for maintaining proper posture while standing, sitting, walking, lifting objects, reaching for higher items, and lying down during daily activities. The attending physician and specialized nurse regulated the hands-on training, which was tailored to the optimal timing and frequency of execution.

Instructional techniques comprised simplified lectures, discussions, demonstrations, and subsequent practice sessions. Educational resources such as booklets, images, and mobile videos were employed for enhanced comprehension.

Implementation phase: Solely, the study group patients within the neurosurgery department and outpatient clinics received the training program. This program's implementation took place during the patient's hospitalization. Throughout four sessions (two for theory and two for practice). Each lasting half an hour. Patients were equipped with a user-friendly booklet encompassing disease-related insights and adept body mechanics, further illustrated through images.

At the beginning of the first session, the researcher established rapport with the patient, and 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. Every session concluded with a concise content recap and sought patient input to verify their optimal comprehension.

The third and fourth sessions were dedicated to practical demonstrations and subsequent re-demonstrations. These segments centered around instructing and practicing the methods for implementing appropriate body mechanics in various contexts, such as standing, sitting, walking, lifting objects, reaching for higher items, and lying down during everyday activities. During the training sessions, motivation and reinforcement are employed to bolster learning and the motivation to engage 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 a body mechanics training program for patients with disc prolapse on low back pain and disability. Each study and control group patient was evaluated twice. 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 underwent a process of arrangement, coding, computerization, tabulation, and analysis by utilizing the statistical software known as the Statistical Package of Social Science (SPSS), specifically version 21 (SPSS Inc., Chicago, IL). Various statistical methods were employed for data analysis, including number counts, percentage distribution, the chi-square test, mean calculation, standard deviation computation, and correlation coefficient assessment. A Paired t-test was also used to compare the study's and control groups' variables. A significant level value is considered when $p<0.05$, $p<0.001$.

5. Results

Table 1 compares the study and control groups' demographics. It demonstrates 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 and 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 before and after the program application. A highly statistically significant difference was shown between the study and control groups in all items of knowledge ($P= 0.000$) after one-month post-program implementation. However, non-statistically significant differences were shown between the study and control group regarding all 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 there 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 group had 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. After one month of implementing the program, the study group displayed a significant reduction in the mean score for all parameters of the Oswestry Low Back Pain Disability Questionnaire, in contrast to the control group. Notably, there existed a statistically significant difference between the study and control groups on the overall score of the Oswestry Low Back Pain Disability Questionnaire after integrating the body mechanics training ($p=0.000$). Before the program initiation, no significant statistical variations were observed between the study and control groups across 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 application (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 the 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).

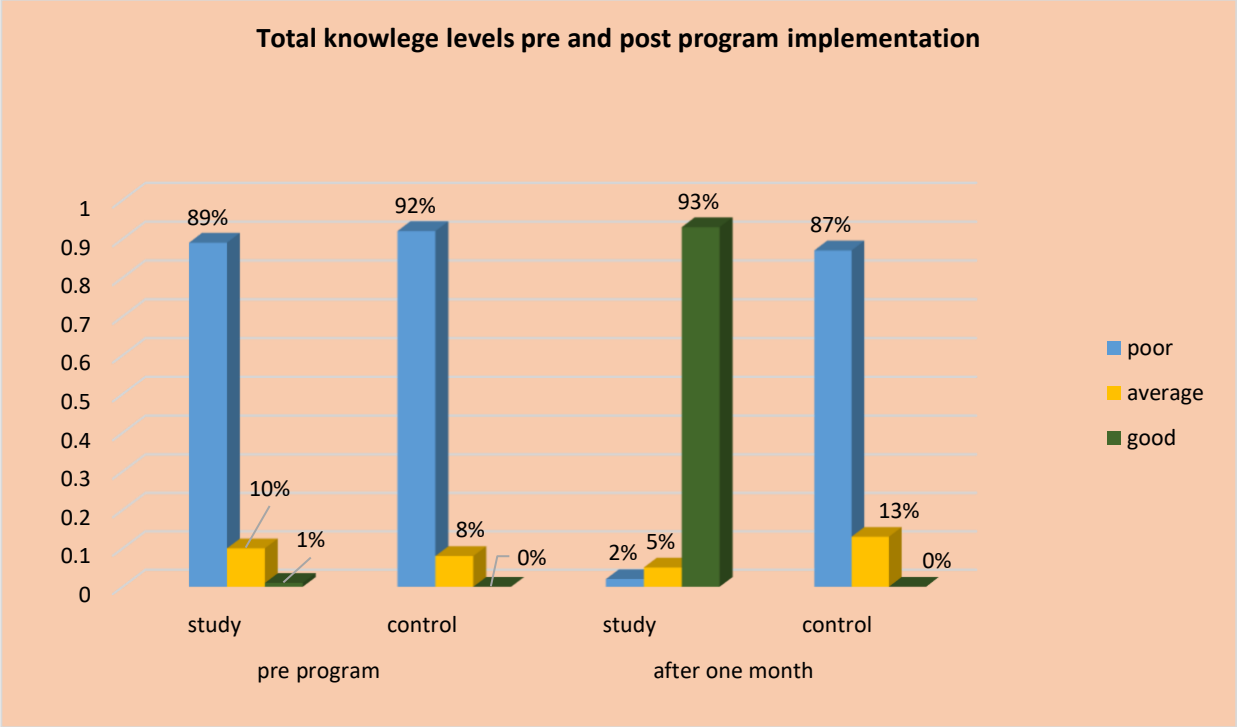

Figure (1): Percentage distribution of total level of knowledge for both study and control group pre and post-body mechanics training program implementation (n=100 study and 100 control).

Table (4): Comparison between the study and control groups' 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

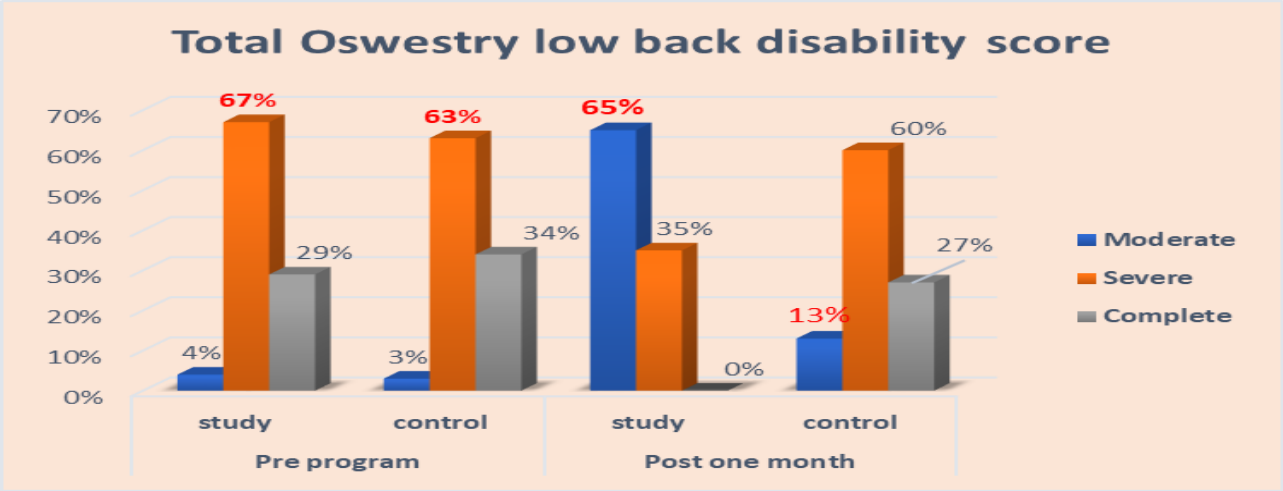

Figure (2): Percentage distribution of functional disability score between study and control group pre- and one month after implementing the body mechanics training program.

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 analog pain	0.379	0.000

6. Discussion

A disc prolapse occurs when the nucleus pulposus is displaced from its normal position between vertebrae. This condition frequently leads to back pain. Individuals with pain linked to a prolapsed disc typically remember the specific incident that triggered the pain. Unlike regular mechanical back pain, the discomfort from a prolapsed disc is often described as burning or stinging and might extend down into the lower limb. Additionally, more severe cases of disc prolapse can be accompanied by weakness or alterations in sensation *(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.

In terms of the socio-demographic attributes of the participants under investigation, the findings of this study indicate a lack of statistically significant differentiation between the two groups concerning their demographic features. This finding suggests that the two groups were relatively similar. It is worth noting that more than half of the individuals in the study group and over two-fifths of those in the control group fell within the middle-age bracket, specifically between 30 and under 50 years old. This outcome could be attributed to the natural physiological alterations in the vertebrae as individuals age. Also, this age represents the working-age population and may be related to improper use of body mechanics during performing activities.

These results are similar to *Hablass et al. (2020)* in a study that assessed the Impact of implementing an educational program for individuals who have undergone Lumbar laminectomy on their knowledge and self-care practices and indicated that over half of both the study and control group participants fell within the age bracket of 30 to 50 years. These results agree with *Ali and Hamed (2019),*

who studied the Influence of patient education on patients' performance and outcomes related to lumbar disc herniation and documented that nearly three-fourths of patients were older than forty years.

Regarding gender, the present study's findings demonstrate that nearly two-thirds of the study and control group were males. This result might be referred to assigning them to heavy workloads and heavy lifting more than women. This result aligned with *Boakye et al. (2018),* in a study aimed at assessing the neuropathic pain after decompression surgery and reported that more than half of both groups were males. On the other hand, this result disagreed with *Abd-Ella et al. (2021),* who studied the impact of a discharge plan on the contentment levels of patients who have undergone 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. According to the researcher's perspective, this outcome could be linked to most of the patients residing in rural regions. This finding was consistent with *Ebrahem et al. (2022),* in a study aimed at assessing daily life tasks among adult individuals with lumbar disc conditions. They reported that more than half of the patients under study were finishing secondary education.

Regarding the type of occupation, This study indicates that over half of the study and control groups were engaged in manual labor. This observation could potentially be elucidated by the notion that individuals involved in manual labor are more susceptible to disc prolapse due to the physical demands of strenuous 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 impact of the nursing rehabilitation program on the functional condition of discectomy patients and documented that half of the studied patients had manual work.

Concerning marital status, the present study's findings reveal that a majority of the study group and approximately seventy-five percent of the control group were married. This observation could be attributed to the fact that the age brackets of the participants align with the typical marital age range as per the societal norms in Egypt. This finding agrees with *Ahmed et al. (2020),* who conducted a study about self-care behaviors among patients recovering from lumbar disc prolapse surgery, which mentioned that more than two-thirds of the studied patients were married.

Regarding residence, the current 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 discovery could be attributed to the preference of individuals in rural regions to reside with their families rather than living independently, in contrast to those in urban areas.

This finding is in line with a study conducted by *Abd-El Mohsen et al. (2019)* about the Influence of nursing rehabilitation guidelines on the results of individuals undergoing lumbar discectomy," where the authors also noted that a significant proportion of their study participants hailed from rural areas. Additionally, *Fareed et al. (2017)* conducted a study aimed at assessing the Impact of applying superficial hot versus cold treatments on alleviating low back pain in individuals with disc prolapse, who highlighted that the occurrence of lumbar disc prolapse was more prevalent among individuals residing in rural settings.

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 the Influence of educational nursing interventions on pain and quality of life in nurses experiencing 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 most participants ranging between less than thirty to less than fifty years old, whereas most chronic diseases are not common in this age category. This finding disagrees with *Mohammed and Abo-Elfadl (2021),* whose study about the impact of an educational program for patients following surgery for a herniated cervical disc on their understanding and ability to carry out daily living activities and reported that around three-quarters of the studied patients had no chronic disease.

Regarding the cause of pain, the study's results indicate that over fifty percent of the study and control groups attributed their lower back pain primarily to lifting heavy objects. From the researcher's perspective, these activities load the spine cumulatively, increase strain on the lower back muscles, accelerate lumbar disc prolapse, and increase lower back pain.

This finding agrees with *Weahida et al. (2016),* who studied the impact of enforcing an educational program on correct body mechanics on low back pain and daily activities in individuals 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 a study about the clinical and socio-demographic profile of patients with lumbar disc disease in Riyadh, Saudi Arabia, and indicated that approximately 66% of the patients under study had no immediate family members who had been affected by lumbar disc prolapse.

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 in a study evaluating the impact of introducing a nursing care protocol on clinical outcomes in patients undergoing lumbar spine disc prolapse surgeries. It was observed that slightly over fifty percent of the control and study groups had a smoking history.

As for the study group's knowledge of disc prolapse and body mechanics, the present research findings indicate statistically significant differences between the study and control groups across all knowledge components.

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 observation aligns with the research by *Abd-Ella et al. (2021),* who noted a statistically significant enhancement in knowledge among their studied patients during the discharge planning phase. Similarly, this outcome follows *Ali and Hamed (2019),* who indicated that most patients displayed an acceptable level of knowledge immediately after the program was introduced.

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), A significant portion of the study group experienced mild pain, while most of the control group encountered moderate pain. Notably, statistically significant distinctions between the study and control groups were made after the program's implementation. This observation could be attributed to the impact of educational programs and the implementation of correct body mechanics, leading to the reinforcement of stabilizing muscles. This strengthening could result in pain reduction, improved patient mobility, and the acquisition of the capability to move while maintaining a healthy posture, thereby disrupting the cycle of pain. 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," These studies revealed noteworthy variations in pain intensity, frequency, and duration after implementing body mechanics principles, which were statistically significant. Similarly, *Weheida et al. (2016)* discovered that pain intensity in the study group notably decreased compared to the control group after education on body mechanics, specifically after two months.

Regarding functional disability, the current study showcases a significant reduction in the mean score across all variables in the study group compared to the control group. This change occurred after the program was introduced, with statistically significant differences 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 aligned with *El-said et al. (2022),* who documented 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.

Regarding the correlation among the total Owstry disability score, overall pain score, and overall knowledge score, the present study's findings demonstrate a statistically significant inverse correlation between the total Owstry disability score and the total knowledge score after the program's implementation. This finding indicates that as patients' knowledge improves, their disability score tends to decrease. Furthermore, a high positive correlation, which was statistically significant, was observed between the total visual analog pain score and the total Owstry disability score. This finding suggests that as pain intensity increases, functional disability tends to worsen. These results are consistent with a study by *Hong and Shin (2020)* aimed at assessing the correlation among pain intensity, disability, duration of exercise, computer usage duration, and depression in office workers experiencing non-specific chronic low back pain." The authors reported a significant correlation between the numeric pain rating scale and the Oswestry disability index.

7. Conclusion

Implementing a 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.

9. References

Abd-Ella, M., ELsenousy, T., Abdelatief, D., & Marzouk, S. (2021). Effect of discharge plan on satisfaction of patients with lumbar disc herniation surgery. *Egyptian Journal of Health Care*, *12*(3), 307-322. https://doi.org/10.21608/EJHC.2021.190213.

Abd Elwahhab, A., Shehata, A., & Abd Elghaffar, S. (2019). Effect of rehabilitative nursing program on functional status among patients with discectomy. *Journal of Nursing and Health Science*, *8*(6), 82-92. https://doi.org/10.9790/1959-0806118292.

Abd-El Mohsen, S. A., Ammar, S. A., &Mohammed, S. H. (2019). Effect of nursing rehabilitation guide on outcomes of patients undergoing lumbar discectomy. *Journal of Nursing and Health Science*, *8*(3), 1–11. https://doi.org/10.9790/1959-0803050111.

Ahmed, N. G., Abo El-Ata, A. B., Hendam, H. M., & Mohamed, S. A. (2020). Self-care practices of patients with lumbar disc prolapse in the postoperative period, *Port Said Scientific Journal of Nursing*, *7*(2), 78-96. https://doi.org/10.21608/PSSJN.2020.94767.

Alhowaiti, N., Mubarak, A., Alrasheed, A., Alrasheed, A., Alghamdi, J., Alboeisa, M., Alabudlwahab, M., Alkreedees, R., Awad, R., & Alshafi, R. (2018). Socio-demographic and clinical characteristics of patients with lumber disc disease in Riyadh, Saudi Arabia: A cross-sectional study. College of Medicine. *MOJ Orthop Rheumatol.*, *10*(4), 282–286. https://doi.org/10.15406/mojor.2018.10.00433.

Ali, H. A., & Hamed, S. (2019). Effect of patients' education on their performance and outcomes regarding lumbar disk herniation. *Evidence-Based Nursing Research*, *1*(2), 93–101. https://doi.org/0.47104/ebnrojs3.v1i2.54.

American Association of Neurological Surgeons, (2021). Herniated Disc. Available at https://www.aans.org/Patients/Neurosurgica-Conditions-and-Treatments/Herniated-Disc.accessed on 11/1/2023.

Arirachakaran, A., Siripaiboonkij, M., Pairuchvej, S., Setrkraising, K., Pruttikul, P., Piyasakulkaew, C., & Kongtharvonskul, J. (2018). Comparative outcomes of epidural steroids versus placebo after lumbar discectomy in lumbar disc herniation: A systematic review and meta-analysis of randomized controlled trials. *European Journal of Orthopaedic Surgery & Traumatology: Orthopedic Traumatology*, *28*(8), 1589–1599. https://doi.org/10.1007/s00590-018-2229-4.

Bell, A. (2022). Causes and treatment of a herniated disc. Medical news today. Available at https://www.medicalnewstoday.com/articles/191979. Accessed on 11/1/2023**.**

Benha University Hospital Statistical Office, (2021). A number of patients with disc prolapse**,** *Neurosurgery Department, Benha University, Egypt.*

Boakye, L. A. T., Fourman, M. S., Spina, N. T., Laudermilch, D., & Lee, J. Y. (2018). Post-decompressive neuropathy: New-onset post-laminectomy lower extremity neuropathic pain different from the preoperative complaint. *Asian Spine Journal*, *12*(6), 1043–1052. https://doi.org/10.31616/asj.2018.12.6.1043.

Chiarotto, A., Maxwell, L. J., Ostelo, R. W., Boers, M., Tugwell, P., & Terwee, C. B. (2019). Measurement properties of Visual Analogue Scale, Numeric Rating Scale, and Pain Severity Subscale of the Brief Pain Inventory in patients with low back pain: A Systematic Review. The journal of pain, *20*(3), 245–263. https://doi.org/10.1016/j.jpain.2018.07.009.

Dagar, A., Kumar, R., Kashyap, A., Prabhat, V., Lal, H., & Kumar, L. (2017). Transforaminal epidural Etanercept for the treatment of prolapsed lumbar intervertebral disc-induced sciatica. *J Clin Orthop Trauma, 8*(2), 148–52. https://doi.org/10.1016/j.jcot.2016.10.004.

Das, M., & Srimani, S. (2022). A study to assess the prevalence and reasons for readmission and health practices among patients with Prolapsed Vertebral Disc (PIVD) in a selected hospital, Kolkata, West Bengal. *International Journal of Science & Healthcare Research*, *7*(1), 111-116. https:// doi.org/10.52403/ijshr.20220119.

Dydyk, A. M., Ngnitewe Massa, R., & Mesfin, F. B. (2023). Disc Herniation. In *StatPearls*. StatPearls Publishing.

Ebrahem, A. Z. A., Farahat, N. H., & Ibrahim,W. K. (2022). Activities of daily living among adult patients with lumbar disc. *Egyptian Journal of Health Care*, *13*(2), 123-130. https://doi.org/10.21608/EJHC.2022.228548.

El-seadi, A. W., Abd Allah, A. K., El- Mahallawy, M. A., Abd El-Hay, S. A., & El-Saay, O. A. (2022). Effect of implementing a protocol of nursing care on clinical outcomes for patients undergoing lumbar spine disc prolapse surgeries. *Tanta Scientific Nursing Journ*al, *26*(3), 65-84. https://doi.org/10.21608/TSNJ.2022.255379.

Fairbank, J. C., & Pynsent, P. B. (2000). The Oswestry Disability Index. *Spine*, *25*(22), 2940–2952. https://doi.org/10.1097/00007632-200011150-00017.

Fareed, M. E., Abd-Elkader, H. E., Henidy, W. M., & Abd Elwahhab, A. S. (2017). Effect of superficial hot versus cold application on low back pain among patients with disc prolapse. *International Journal of Novel Research in Healthcare and Nursing*, *4*(3), 264 -255.

Fjeld, O. R., Grøvle, L., Helgeland, J., Småstuen, M. C., Solberg, T. K., Zwart, J. A., & Grotle, M. (2019). Complications, reoperations, readmissions, and length of hospital stay in 34,639 surgical cases of lumbar disc herniation. *The Bone & Joint Journal, 101-B*(4), 470–477. https://doi.org/10.1302/0301-620X.101B4.BJJ-2018-1184.R1

Ibrahim, R. A., & Elsaay, O. A. E. (2015). The effect of body mechanics training program for intensive care nurses in reducing low back pain. *IOSR Journal of Nursing and Health Science, 4*(5), 81-96.

Ignatavicius, D. D., Workman, L., Rebar, C. R., & Heimgartner, N. M. (2020). *Medical-surgical nursing: Concepts for interprofessional collaborative care*. Elsevier Health Sciences, India. Pp.154-155.

Hablass, A., Mahmoud, M., & Abo El-Fadl, N. (2020). Effect of applying an educational program for patients with lumbar laminectomy on their knowledge and self-care activities, Master Thesis, Faculty of Nursing, Benha University. Pp. 75.

Hemed, A., Taha, N. M., Abd-Elwahab, H., Mohamed, E. H. (2017). Effect of educational program on nurses' performance regarding body mechanics, *Zagazig Nursing Journal*, *13*(2), 21. https://doi.org/10.21608/ZNJ.2017.38595.

Hong, S., & Shin, D. (2020). Relationship between pain intensity, disability, exercise time, computer usage time, and depression in office workers with non-specific chronic low back pain. *Medical Hypotheses, 137*, 109562**.** https://doi: 10.1016/j.mehy.2020.109562.

Kang, S. (2017). The use of body mechanics principle, clinical practice fatigue, and practice satisfaction of nursing students, *Nursing Plus Open,* http://dx.doi.org/10.1016/j.npls.2017.03.001.

Mohammed, S. S., &Abo El-Fadl, N. M. (2021). Effect of educational program for patients post herniated cervical disk surgery on their knowledge and daily living activities. *International Journal of Novel Research in Healthcare and Nursing*, *8*(1), 310–328.

Morrison, M., & Nall, R. (2023). Slipped disc: Symptoms, causes, and effects. Available at http://www.healthline.com. Accessed on 15/1/2023.

Mayo Clinic, (2022). What is a herniated disk? Available at https://www.mayoclinic.org/diseasesconditions/herniated-disk/symptoms-causes/syc-20354095.

Reichardt, C. S. (2019). *Quasi experimentation. A guide to design and analysis*, Guilford Press, New York, London. P.3..https://www.guilford.com/books/Quasi Experimentation/CharlesReichardt/9781462 40204.

Sharaf, A., Syam, N., & Ahmed, R. (2020). Effects of educational nursing interventions on pain and quality of life among nurses with low back pain, *Egyptian Journal of Health Care, 11*(3),703-721.

Sharma, S.B., &Kim, J. S. (2019). A review of minimally invasive surgical techniques for the management of thoracic disc herniations. *Neurospine, 16*(1), 24-33. https://doi.org/10.14245/ns.1938014.007.

Tidy, C. (2020). Prolapsed disc. Available at https://patient.info/bones-joints-muscles/back-and-spine-pain/slipped-disc-prolapsed-disc. Accessed on 7/1/2023.

Weheida, S. M., Abd Elgaphar, S. M., & Abd Elalem, S. M. (2016). 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. *Journal of Nursing and Health Science*, *5*(6), 59-67. *https://doi.org/*10.9790/1959-0506025967.

Yelmaiza, M., Susanti, R. & Indra, S. (2021). The risk factors affecting disability level of lumbar disc herniation. *Bioscientia Medicina: Journal of Biomedicine and Translational Research, 6*(1), 1275-1280. https://doi.org/10.32539/bsm.v6i1.433.