

# Effects of Educational Nursing Interventions on Pain, and Quality of Life among Nurses with Low Back Pain.

Amany Youssef Sharaf<sup>1</sup>, Narges Mohammed Syam<sup>2</sup>, Rasha Fathy Ahmed<sup>3</sup>

1Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt.

2,3Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt.

Corresponding Author : Rasha Fathy Ahmed

Email/ rasha.fathy@alexu.edu.eg

## Abstract

Low back pain negatively impacts nurses' quality of life. Educational interventions have minimal side effects compared to other interventions that can decrease nurses' pain intensity and improve their quality of life. **Aim of the study:** To identify the effects of educational nursing interventions on pain and quality of life among nurses with low back pain. **Setting:** This study was conducted at medical and surgical units of Alexandria Main University Hospital, Egypt. **Subjects:** The study subjects comprised a convenience sample of 50 nurses with low back pain. **Tools:** Three tools were used: **Tool (I) Nurses' Knowledge Structured Interview schedule:** to assess nurses' educational needs related to Low Back Pain. **Tool (II) Nurses' Pain Numeric Rating Scale:** to assess nurses' levels of low back pain. **Tool (III): The World Health Organization Quality of Life-brief (WHOQOL-BREF) questionnaire.** to assess QOL of the participants. **Results:** The mean age of the studied nurses was  $40.94 \pm 9.50$  years. The majority of them were either overweight or obese with a mean body mass index ( $28.25 \pm 3.54$ ). High statistically significant difference was detected in nurses' LBP levels between pre and post application of the educational nursing interventions, with mean percent reduction in LBP levels post interventions ( $46.0 \pm 21.31$ ). High statistically significant differences were detected between nurses' overall QOL at pre, and post application of the educational nursing interventions, with mean percent improvement score in overall QOL ( $19.49 \pm 13.76$ ). **Conclusion:** Significant positive effects on pain reduction, and QOL improvement among the studied nurses post interventions were detected. Statistically significant associations between body mass index and both of mean percent reduction of pain levels, and mean percent improvement of QOL post interventions. **Recommendations:** Other studies to examine other effects of the educational nursing interventions in a longer duration to find out long-term effects, on nurses with LBP, are recommended.

**Keywords:** Nursing Interventions, Low Back Pain, Nurses, Quality of Life.

## Introduction

Low back pain (LBP) is a nonspecific condition of acute or chronic pain, muscle tension or stiffness in or adjacent to the lumbar region localized below the costal margin and above the inferior gluteal folds, with or without pain radiating into the legs (Tosunoz & Oztunc, 2020; Vrbanić, 2011). Low back pain (LBP) is one of the most prevalent health problems worldwide. It impacts 85%–90% of people in both developed and developing countries (Zanoli, Strömqvist, Jönsson, Padua, & Romanini, 2002). It is the most cause of activity limitation, the 5<sup>th</sup> most frequent cause of hospitalization, and the 3<sup>rd</sup> most common cause of surgery in the USA (Tantawy, Kamel, Abdelbasset, & Nambi,

2020). Also, LBP is a rising cause of direct and indirect costs for the social systems in many industrialized countries (Zanoli et al., 2002). In addition, LBP has economic consequences because of increased costs, decreased productivity, frequent sick leave, as well as inability to perform the assigned tasks (Fawzy, & El-Deen, 2019).

Nursing is one of the most risky occupations for back injuries and it has the highest incidence of LBP in the USA as it is reported that 63%–86% of nursing professionals suffer from LBP in their lifetime (Fawzy, & El-Deen, 2019; Vrbanić, 2011). Low back pain is particularly challenging among nursing professionals in terms of morbidity absenteeism, and decreased

productivity. **Fawzy and El-Deen, (2019)** reported that LBP was six times more prevalent among nurses when compared with other professions. Also, **Macfarlane et al., (1997) and Sharafkhani et al., (2015)** reported that 18% of the nursing staff quit their jobs because of back pain.

The etiology of LBP among nurses is usually multifactorial; because of the nature of the nursing profession that mixes both physical, and psychological demanding tasks. Physical tasks incorporate manual handling/ lifting of patients, inappropriate body postures, squatting, bending, prolonged standing, while psychological tasks include dealing with crises, mental fatigue, anxiety and depression (**Asadi et al., 2016; Khorsandi et al., 2014 & Stubbs et al., 2016**). Poor working conditions as unplanned work, improper workplace design, shortage of lifting aids/ transport equipment, hard physical work, and low nurse to patient ratio have been implicated as causative factors of LBP in nurses in developing countries (**Asadi et al., 2016; Khorsandi et al., 2014**).

The American Nurses Association (ANA) 2016, reported that nurses are prone to LBP which has a major impact on the efficiency of the nursing profession (**Neethu et al., 2020; Semachew et al., 2018**). Nurses are one of the few professional groups who have to work in shifts which disturb a nurse's health and performance because of disruption of the circadian rhythm. This may result in sleep disorders, fatigue, and impaired work performance and safety awareness (**Felstead & Angrave, 2005**). Other impacts of LBP include loss of physical function, loss of muscle tone, weight gain, constant or episodic pain or increase in the level of pain; loss of social functioning (**Al-Mutairi, 2019**).

Quality of life (QOL) has become a major issue for nurses as they are an efficient and effective part of any health care system (**Macfarlane et al., 1997**). LBP is one of the main concerns, which negatively impacts nurses' quality of life (QOL) domains from primarily self-care activities to advance and complex social connections, work, and leisure activities (**Ovayolu, Ovayolu, Genc & Col-Araz, 2014**). Limited studies have examined quality of life for nurses. They have been

generally ignored when addressing low back pain (**Tavafian, Jamshidi, Mohammad & Montazeri, 2007; Zahra, Sheha & Elsayed, 2020**).

However, low back pain can be managed using anti-inflammatory medications, physiotherapy, surgery and educational nursing interventions (**Patil et al., 2018**). Nurses' education is a part of the rehabilitation process for nurses having low back pain (**Shariat et al., 2018**). In the last decade, an educational nursing intervention has been addressed as the first management of choice, as it can alleviate LBP effectively (**Hurwitz et al., 2005; Synnott et al., 2016**) In addition, clinical trials revealed that effective educational interventions that combine exercise therapy, can maximize nurses' quality of life, and reduce the incidence of work-related LBP among nurses. Education consists of basic information about the vertebral column, low back pain, risk factors modification, like body posture during work, sitting, moving patients, and joint protection (**Khorsandi et al., 2013; Shaheed et al., 2016**). Regular exercise, body weight control and maintaining correct posture can also decrease pain intensity and improve quality of life of nurses with LBP (**Miyamoto et al., 2019 ; Van Hoof et al., 2018**).

Exercise is currently recommended as an effective pain control measure that can be used by nurses in their daily practice (**Miyamoto et al., 2019**). It is considered as an effective therapy for increasing muscles mass, which is attained through improvement of blood flow to muscles that reduces stiffed joints, since exercise results in the mechanical stretching of the tendons, intramuscular connective tissue and other passive skeletal structures. Also progressive exercises program, strengthen the abdominal and spinal muscles which are effective in reducing the pain in individuals with LBP (**Semachew et al., 2018**).

### Significance of the study

Nurses in developing countries have a higher incidence of work-related low back pain due to poor working conditions. In Egypt, low back pain affects 60% of the population and nurses have been reported the highest levels of LBP in all occupational groups, as they reported 79.3% (**El-sol, Ahmed & Ahmed,**

2018; Ibrahim & Elsaay, 2015). Educational nursing interventions related to prevention of LBP, and practicing stretching exercises are two nursing interventions which have minimal side effects compared to other interventions that can decrease nurses' pain intensity and improve their quality of life (El-sol et al., 2018; Genç, Kahraman & Göz, 2016). So far, very limited studies have examined the effects of educational interventions on pain intensity, and quality of life among nurses with LBP in Egypt (Zahra et al., 2020). Therefore, the aim of the current study was to assess the effects of educational nursing interventions on pain intensity, and quality of life among nurses with low back pain.

#### Operational definitions:

- Educational nursing interventions are health education aspects related to low back pain and practicing exercise instructions.
- Low Back Pain: back pain between the lowest ribs and the pelvis that lasting at least 24 hrs with a pain intensity of 3 or more on a 0-10 numeric pain rating scale.

#### Aim of the study

To identify the effects of educational nursing interventions on pain and quality of life among nurses with low back pain.

#### Hypotheses:

- Nurses with low back pain who receive educational nursing interventions exhibit lower levels of pain.
- Nurses with low back pain who receive educational nursing interventions exhibit improvement in quality of life domains.

#### Material and Methods

**Research Design:** A quasi experimental design pre-post interventions study was used.

**Setting:** This study was conducted at medical and surgical units of Alexandria Main University Hospital, Alexandria University, Egypt.

**Subjects:** The study subjects comprised a convenience sample of 50 nurses with low back pain who recruited in this study.

The Epi info 7 program was used to estimate sample size according to the following parameters:

- Population size= 120 nurses in 2020
- Expected frequency =50%.
- Maximum margin of error= 10%.
- Confidence coefficient =95%.
- Estimated sample size = 50 nurses.

**Inclusion criteria:** Participants were included if they met the following inclusion criteria:

- Age: 20- 60 years old
- Clinical diagnosis of Low back pain
- Recovered from a previous episode of non-specific LBP (between the 12th rib and buttock crease) within the last month.

**Exclusion criteria:** Participants were excluded if they had any of the following:

- Uncontrolled hypertension
- Severe osteoarthritic pain
- Loss of limb.
- Previous spinal surgery.
- Sciatica, ankylosing spondylitis, or vertebral fracture.

**Tools:** Three tools were used in the study to collect the necessary data:

**Tool (I) Nurses' Knowledge Structured Interview schedule:** This tool was developed by the researchers based on the review of relevant literature (Maciel, Jennings, Jones, & Natour, 2009; de Campos, 2017 & Stochkendahl et al., 2018) to assess nurses' educational needs related to LBP, and to develop the health education booklet accordingly: It included two parts:

**Part 1: Nurses' socio-demographic data sheet:** It included age, sex, level of education, occupation, area of residence, marital status, and years of experience.

**Part 2: Nurses' knowledge assessment sheet.** This part incorporates three sections of

open, and/or closed ended questions pertaining to: general anatomy of the spinal column, definitions of acute and chronic low back pain, causes, signs and symptoms, diagnostic procedures, management, and physical activity for nurses with low back pain.

Questions were prepared in accordance with the training program content and the responses to the above-mentioned questions were noted as being: “correct/complete”, “correct incomplete”, and “don't know/wrong answer” using the following scoring system:

- Two scores= correct/complete answer
- One score = correct incomplete answer (equal to at least half of the true answer).
- Zero = do not know /wrong answer

#### Scoring system

- Total scores of <60% were considered unsatisfactory level of knowledge.
- Total scores of  $\geq 60\%$  were considered satisfactory level of knowledge.

#### Tool II: Nurses' Pain Numeric Rating Scale:

This scale was adopted from **McCaffery (2012)** to assess nurses' levels of low back pain. The score ranged from 0-10 corresponding to degree of pain in the lower back. A score of zero indicated no pain, a score of 1 up to 3 indicated mild pain, 4 up to 6 indicated moderate pain, 7 up to 9 denotes severe pain, and a score of 10 indicated worst possible pain.

#### Tool III: The World Health Organization Quality of Life-brief (WHOQOL-BREF) questionnaire.

This tool was adapted from **World Health Organization (WHO, 2017)** to assess QOL of the participants. The scale provides a measure of an individual's perception of QOL on four domains (21 items): (1) physical health (six items), (2) psychological, and sexual health (seven items), (3) social relationships (four items), and (4) financial health (four items). The domain scores are scaled in a positive direction (i.e., higher scores denote higher QOL).

**WHOQOL-BREF Scoring system:** Each item has five levels of respondent's responses: Very poor is coded as 1, poor is coded as 2, neither poor nor good is coded as 3, good is

coded as 4, very good is coded as 5. Total score is ranged from 21 to 105. Total score converted into percent score as: scores of less than 50% were considered as poor quality of life, scores from 50% to less than 75% were considered as Fair quality of life, and scores from 75% or more were considered as Good quality of life.

#### Method:

- Approval from the Ethical Research Committee of the Faculty of Nursing, Alexandria University was obtained.
- Official permissions to carry out the study from the identified setting authorities were obtained, after explaining the purpose of the study.
- Medical diagnosis and eligibility for the exercise interventions were approved by neurosurgery consultant.
- Tools were developed, adopted, and /or adapted by the researchers after extensive review of related literature and translated into Arabic language by the researchers.
- Content and construct validity of the tools were ascertained by a jury of three experts in the field of Medical Surgical Nursing, Faculty of Nursing, Alexandria University, and two experts in the field of Orthopedic Surgery academic staff, Faculty of Medicine, Alexandria University. The necessary modifications were introduced accordingly.
- Reliability of the tools (I & III) was established by using Cronbach's Alpha Coefficient Test (0.930 & 0.850 respectively) which indicated that the tools were reliable.
- A Pilot study was conducted on 10% of subjects fulfilling subject's inclusion criteria. Those subjects were not included in the study sample, to test feasibility and applicability of the tools and modifications were introduced accordingly.
- **Ethical considerations:** at the initial interview, each nurse was informed about the purpose and benefits of the study, and a written consent for participation has been obtained. Confidentiality of the collected data and privacy of the participants were assured. Nurses' voluntary participation and

right to withdraw from the study at any time, were considered.

#### Technique for data collection:

- After securing the administrative approval, data collection was started and continued for a period of six months.
- The researchers introduced themselves to the selected subjects. Informed written consents were obtained.

#### The study was carried out on four phases:

**I. Assessment phase (pretest):** the subjects of 50 nurses were interviewed individually during break hours, to collect socio-demographic data using tool I part 1. Initial assessment of the study participants' knowledge was done using tool I part 2. Also, assessment of nurse's level of back pain using tool II, and assessment of nurse's QOL using tool III were carried out to collect base line data before application of the educational nursing interventions.

#### II. Planning phase:

- A health education unit, including the educational nursing interventions and the exercises interventions, was designed by the researchers based on assessment phase and recent review of literature, to help nurses with low back pain to improve their knowledge about low back pain's definition, causes, signs and symptoms, diagnostic procedures, management, physical activity, and maneuvers to prevent or alleviate pain (Maciel et al., 2009; de Campos, 2017 & Stochkendahl et al., 2018).
- Two sessions were designed for every nurse to cover knowledge related to LBP, and practice of the exercises program.
- An illustrated colored Arabic booklet was developed by the researchers and was distributed to every nurse.

#### III. Implementation phase:

The developed nursing interventions were conducted and implemented individually to participants, using demonstration and re-demonstration of the colored booklet.

a) **Health education** items were covered into two teaching sessions, provided individually for participants.

- Each session lasted 30 to 45 minutes.
- During the first teaching session, information about LBP definition, etiologies, signs and symptoms, diagnostic procedures, and management were provided. In the second session, physical activity, and maneuvers to prevent or alleviate pain were covered, through demonstration, and practice. The study participants were asked to repeat the exercises until gaining the skills.
- Written Arabic booklet was provided as a reminder, together with references about physical activities & exercises.

b) **LBP exercise interventions** :(Dunn, 2018; wikiHow Staff, 2020; Irvine, 2017 & Malone, 2020)

- The studied nurses practiced LBP exercises twice/day (10 minutes each). Each exercise was repeated 5 times. Practice of LBP exercises were continued for four weeks.
- LBP exercises consisted of the following:
  1. Starting the exercises within bed activities using "Log Rolling" technique bend knees and roll moving shoulders and hips at the same time as a log.
    - Turning from a supine position to a lateral position.
    - Turning from a lateral position on one side to a lateral position on the other side.
    - Turning from a supine position to a sitting position in bed.
  2. Isometric exercises of Quadriceps, Hamstrings, Gluteal, and Abdominal muscles.
  3. Range of motion exercises for Hip, Knee, Ankle, and Toes joints.
  4. Stretching exercises as: Gluteal stretch, Pelvic tilt, Quadruped arm/leg stretch, Cat and camel position, and Partial curl.

5. Application of proper body mechanics of activities of daily livings (sleeping, sitting, standing, walking, clothes wearing, lifting objects, self-care activities, and home care activities).
  - Implementation of the educational nursing interventions were carried out under the supervision of specialist's staff of neurosurgery and physical therapist.
- Subjects were given logs to record their practice times and potential adverse events.
- Phone contact was maintained between the researcher and the study participants to ensure adherence and answer arising quires.

#### IV. Evaluation phase:

- Nurses were evaluated twice: pre nursing interventions implementation and post implementation using tool I part 2, tool II, and tool III.
- Comparisons were carried out at pre and post interventions to identify the effects of the educational nursing interventions on pain levels, and quality of life of the studied nurses.

#### Statistical analysis of the data

- After data were collected, they were coded and transferred into specially designed formats, so be suitable for computer feeding. Verification processes were carried out to avoid any errors during data entry.
- The suitable statistical program was utilized (IBM SPSS software package version 20.0) (Armonk, NY: IBM Corp) for both data presentation and statistical analysis of results.
- Qualitative data were described using number and percent and Quantitative data were described using range (minimum and maximum), mean and standard deviation.
- Significance of the obtained results was judged at the 5% level.
- Comparisons between data pre and post implementation of the educational nursing

interventions were carried out using these tests :

1. **Chi-square test** for categorical variables, to compare between different groups.
2. **McNemar and Marginal Homogeneity Test** used to analyze the significance between the different stages.
3. **Student t-test** for normally distributed quantitative variables, to compare between two studied.
4. **F-test (ANOVA)** for normally distributed quantitative variables, to compare between more than two groups.
5. **Paired t-test** for normally distributed quantitative variables, to compare between two periods.

#### Results

**Table (1)** shows socio-demographic, and clinical characteristics of the studied nurses (n = 50). The mean age of the studied nurses was  $40.94 \pm 9.50$  years. Nearly half of the studied nurses (48%) were overweight compared to 34% who were obese with a mean body mass index ( $28.25 \pm 3.54$ ). Additionally, about two thirds of the studied nurses (66%) were diploma graduates and suffered from low back pain for more than one year. The majority of the studied nurses were married and had 10 to 20 years of experience (84%, 92% respectively). Lumbar spondylosis was the main cause of low back pain in more than two fifth of the studied nurses (44%).

**Table 1:** Frequency distribution of the studied nurses according to their socio demographic, and clinical characteristics (n = 50)

Socio-demographic data	No.	%
<b>Age</b>		
20 - <30	4	8.0
30 - <40	19	38.0
40 - <50	19	38.0
50-60	8	16.0
Mean $\pm$ SD.	40.94 $\pm$ 9.50	
<b>Body Mass Index</b>		
Normal	9	18.0
Overweight	24	48.0
Obese	17	34.0
Mean $\pm$ SD.	28.25 $\pm$ 3.54	
<b>Education</b>		
Diploma	33	66.0
Associate degree	4	8.0
Bachelors	11	22.0
Master degree	2	4.0
<b>Marital status</b>		
Single	4	8.0
Married	42	84.0
Divorced	0	0.0
Widow	4	8.0
<b>Years of experience</b>		
<1 year	0	0.0
1 – 5 year	0	0.0
5 – 10 years	4	8.0
10 – 20 years	46	92.0
<b>Duration of LBP</b>		
Less than 3 months	2	4.0
3months to 1 year	15	30.0
More than 1year	33	66.0
<b>Causes of LBP</b>		
Nonspecific muscle spasm	18	36.0
Lumbar spondylosis	22	44.0
Intervertebral disc prolapse	10	20.0

**Table (2)** displays differences in the studied nurses' overall knowledge regarding LBP at pre and post application of the educational nursing interventions (n = 50). High statistically significant differences were found between nurses' overall knowledge pre and post interventions, as ( $\chi^2=40.024$ ,  $P<0.001^*$ ). Additionally, the majority of the studied nurses (84%) had an unsatisfactory level of overall knowledge pre interventions, and (100%) achieved satisfactory level post interventions, with a mean percent improvement in their overall knowledge ( $127.3 \pm 71.74$ ).

**Table (2):** Differences in the studied nurses’ overall knowledge regarding LBP at pre and post application of the educational nursing interventions (n = 50)

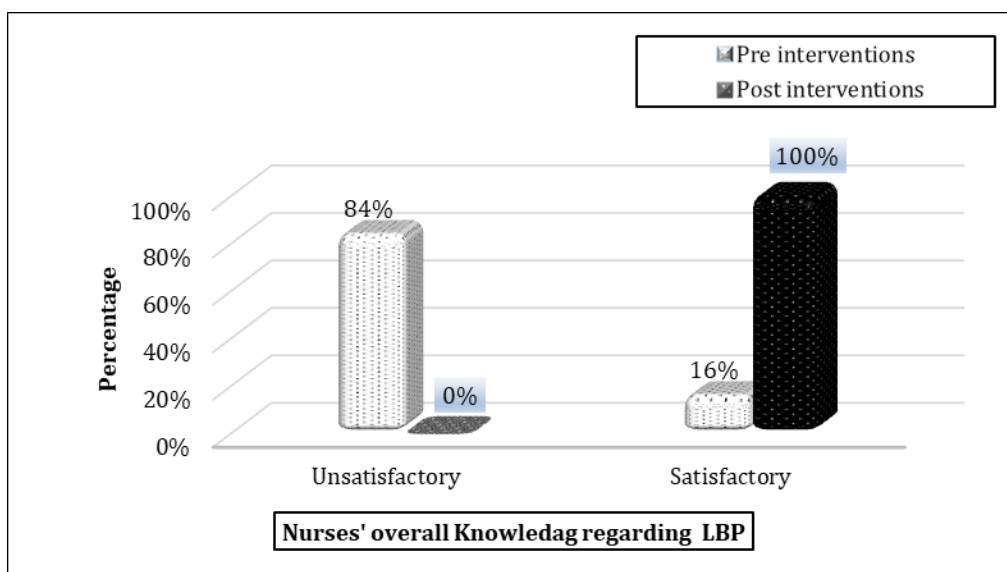
Nurses’ overall knowledge about LBP	Pre interventions		Post interventions		Test of Sig.	P	
	No.	%	No.	%			
<60% Unsatisfactory	42	84.0	0	0.0	$\chi^2 = 40.024^*$	McN <0.001*	
≥60% Satisfactory	8	16.0	50	100.0			
<b>Total score</b>					t= 22.315*	<0.001*	
Min. – Max.	7.0 – 17.0		20.0 – 26.0				
Mean ± SD.	11.62 ± 3.13		24.34 ± 1.67				
<b>% score</b>							
Min. – Max.	26.92 – 65.38		76.92 – 100.0				
Mean ± SD.	44.69 ± 12.04		93.62 ± 6.44				
<b>Mean percent Improvement</b>	127.3 ± 71.74						

$\chi^2$ : Chi square test

McN: McNemar test

t: Paired t-test

\*: Statistically significant at p ≤ 0.05



**Figure (1):** Frequency distribution of the studied nurses according to their overall level of knowledge at pre, and post application of the educational nursing interventions (n=50)

**Table (3)** reveals differences in the studied nurses’ low back pain levels pre and post application of the educational nursing interventions (n = 50). The table represents that the majority of nurses were allocated between moderate to severe LBP pre interventions (40%, 44% respectively), whereas the majority of them had mild LBP post interventions (78%). High statistical significant differences were detected in nurses’ LBP severity levels pre and post application of the nursing interventions (MH=85.500, P<0.001), with mean percent reduction in LBP levels post interventions (46.0 ± 21.31).

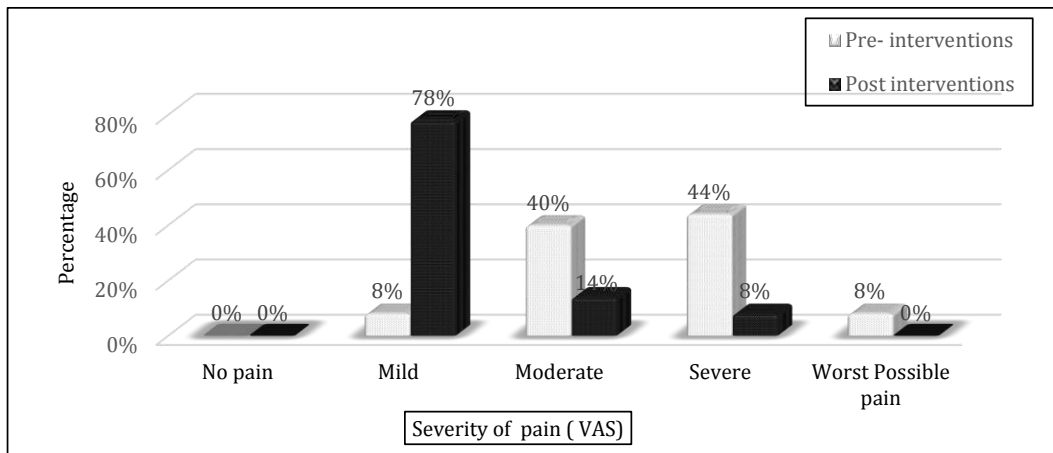


**Table (3):** Differences in the studied nurses' low back pain levels pre and post application of the educational nursing interventions (n = 50)

levels of pain (VAS)	Pre interventions		Post interventions		MH	p
	No.	%	No.	%		
No pain	0	0.0	0	0.0	85.500*	<0.001*
Mild	4	8.0	39	78.0		
Moderate	20	40.0	7	14.0		
Severe	22	44.0	4	8.0		
Worst Possible pain	4	8.0	0	0.0		
<b>Overall mean percent reduction of pain level score</b>	46.0 ± 21.31					

MH: Marginal Homogeneity Test

\*: Statistically significant at  $p \leq 0.05$



**Figure (2):** Differences in the studied nurses' low back pain levels pre and post application of the educational nursing interventions (n = 50)

**Table (4)** shows overall percent score of the studied nurses according to their quality of life domains pre and post application of the educational nursing interventions. The table displays that the majority of the studied nurses had poor QOL related to physical, psychological, and financial domains pre interventions (76%, 68%, 70% respectively), whereas the majority of them (88% and 80%, 78% respectively) had fair QOL post interventions. As regards the social domain, 58% of the studied nurses achieved improvement in their QOL, as they shifted from fair QOL pre interventions to good QOL post interventions, and these results were statistically significant different (MH= 52.50,  $P < 0.001$ ). High statistical significant differences were detected between nurses' overall QOL at pre, and post application of the nursing interventions ( $\chi^2 = 31.030^*$ , McN  $< 0.001^*$ ), with a mean percent improvement score in overall QOL ( $19.49 \pm 13.76$ ).

**Table (4):** Overall percent score of the studied nurses' quality of life domains pre and post application of the educational nursing interventions (n = 50)

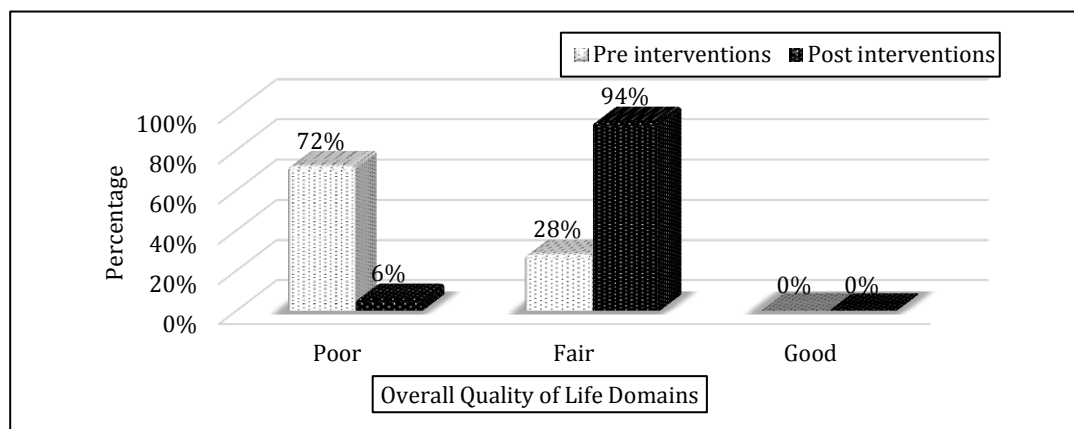
WHOQOL-BREF scale (%)	Pre		Post		Test of Sig.	p
	No.	%	No.	%		
<b>Physical domain</b>						
<50% Poor	38	76.0	4	8.0	MH 56.0*	<0.001*
50% - <75% Fair	12	24.0	44	88.0		
≥75% Good	0	0.0	2	4.0		
<b>Total score</b>	16.62 ± 2.41		20.40 ± 1.92		t= 9.772*	<0.001*
<b>% score</b>	44.25 ± 10.03		60.0 ± 7.99			
<b>% Improvement</b>	24.88 ± 19.51					
<b>Psychological domain</b>						
<50% Poor	34	68.0	10	20.0	$\chi^2$ = 16.531*	McN <0.001*
50% - <75% Fair	16	32.0	40	80.0		
≥75% Good	0	0.0	0	0.0		
<b>Total score</b>	19.82 ± 2.49		21.36 ± 2.17		t= 3.297*	0.002*
<b>% score</b>	45.79 ± 8.89		51.29 ± 7.76			
<b>% Improvement</b>	9.43 ± 17.37					
<b>Social domain</b>						
<50% Poor	11	22.0	3	6.0	MH 52.50*	<0.001*
50% - <75% Fair	29	58.0	18	36.0		
≥75% Good	10	20.0	29	58.0		
<b>Total score</b>	13.0 ± 2.97		15.48 ± 1.97		t= 5.498*	<0.001*
<b>% score</b>	56.25 ± 18.56		71.75 ± 12.32			
<b>% Improvement</b>	32.59 ± 71.14					
<b>Financial domain</b>						
<50% Poor	35	70.0	7	14.0	MH 63.0*	<0.001*
50% - <75% Fair	11	22.0	39	78.0		
≥75% Good	4	8.0	4	8.0		
<b>Total score</b>	10.26 ± 2.81		13.52 ± 2.13		t= 6.236*	<0.001*
<b>% score</b>	39.13 ± 17.58		59.50 ± 13.32			
<b>% Improvement</b>	51.02 ± 54.19					
<b>overall quality of life</b>						
<50% Poor	36	72.0	3	6.0	$\chi^2$ = 31.030*	McN <0.001*
50% - <75% Fair	14	28.0	47	94.0		
≥75% Good	0	0.0	0	0.0		
<b>Total score</b>	59.70 ± 5.53		70.76 ± 5.02		t= 11.565*	<0.001*
<b>% score</b>	46.07 ± 6.58		59.24 ± 5.97			
<b>Overall % Improvement</b>	19.49 ± 13.76					

$\chi^2$ : Chi square test  
t: Paired t-test

McN: McNemar test

MH: Marginal Homogeneity Test

\*: Statistically significant at  $p \leq 0.05$

**Figure (3):** Overall percent score of the studied nurses' quality of life domains pre and post application of the educational nursing interventions (n = 50)

**Table (5)** displays relationships between socio-demographic characteristics of the studied nurses, and their overall mean percent reduction of pain score levels post interventions. The table shows that there is a statistically significant association between body mass index and overall mean percent reduction score of nurses' level of pain post interventions, as nurses with normal body weight achieved higher percentages of pain reduction ( $F= 4.060^*$ ,  $0.024^*$ ). Also, there is a statistical significant association between duration of low back pain and the overall mean percent reduction of nurses' pain score levels post interventions, where nurses who suffered from the low back pain for more than one year showed the highest percent reduction of pain levels ( $F= 6.243^*$ ,  $P = 0.004^*$ ). However, no statistically significant differences are detected between nurses' age, education level, marital status, years of experience, or causes of low back pain and percent of reduction in their pain levels post interventions.

**Table (5):** Relationships between socio-demographic characteristics of the studied nurses, and their overall mean percent reduction of pain score levels post application of the educational nursing interventions (n = 50)

Socio-demographic characteristics	Percent reduction score of nurses' levels of pain post interventions (Mean $\pm$ SD).	Test of sig.	p
<b>Age</b>			
20 - <30	58.33 $\pm$ 9.62	F= 1.880	0.146
30 - <40	43.86 $\pm$ 25.59		
40 - <50	50.88 $\pm$ 15.69		
50-60	33.33 $\pm$ 21.82		
<b>Body Mass Index</b>			
Normal	59.26 $\pm$ 8.78	F= 4.060*	0.024*
Overweight	47.92 $\pm$ 13.96		
Obese	36.27 $\pm$ 29.45		
<b>Education level</b>			
Diploma	46.46 $\pm$ 22.15	F= 0.170	0.916
Associate degree	50.0 $\pm$ 19.25		
Bachelors	42.42 $\pm$ 22.81		
Master degree	50.0 $\pm$ 0.0		
<b>Marital status</b>			
Single	41.67 $\pm$ 9.62	F= 2.427	0.099
Married	48.41 $\pm$ 20.60		
Widow	25.0 $\pm$ 28.87		
<b>Years of experience</b>			
5 – 10 years	58.33 $\pm$ 9.62	t= 1.212	0.231
10 – 20 years	44.93 $\pm$ 21.76		
<b>Duration of LBP</b>			
Less than 3 months	0.0 – 0.0	F= 6.243*	0.004*
3months to 1 year	44.44 $\pm$ 22.42		
More than 1year	49.49 $\pm$ 18.15		
<b>Causes of LBP</b>			
Nonspecific muscle spasm	48.15 $\pm$ 20.52	F= 0.567	0.571
Lumbar spondylosis	42.42 $\pm$ 22.84		
Intervertebral disc prolapse	50.0 $\pm$ 20.03		

t: Student t-test

F: F for ANOVA test

\*: Statistically significant at  $p \leq 0.05$

**Table (6)** displays relationships between socio-demographic characteristics of the studied nurses, and their quality of life's mean percent improvement score post application of the educational nursing interventions. The table elicits that there is a statistical significant association between body mass index and mean percent improvement scores of the studied nurses' QOL post

interventions, where nurses with normal weight achieved higher improvement scores of QOL post interventions ( $F=3.801^*,0.029^*$ ). However, no statistically significant differences were detected between nurses' age, education level, marital status, years of experience, duration, or causes of low back pain and mean percent improvement scores of the studied nurses' QOL post interventions.

**Table (6):** Relationships between socio-demographic characteristics of the studied nurses, and their quality of life's mean percent improvement scores post application of the educational nursing interventions (n = 50)

Socio-demographic characteristics	% improvement score of the studied nurses' QOL post interventions (Mean $\pm$ SD).	Test of sig.	p
<b>Age</b>			
20 - <30	28.89 $\pm$ 8.81	F= 2.379	0.082
30 - <40	22.71 $\pm$ 17.48		
40 - <50	13.55 $\pm$ 10.39		
50-60	21.24 $\pm$ 7.11		
<b>Body Mass Index</b>			
Normal	28.03 $\pm$ 23.59	F= 3.801*	0.029*
Overweight	20.52 $\pm$ 9.03		
Obese	13.51 $\pm$ 10.17		
<b>Education level</b>			
Diploma	20.23 $\pm$ 15.16	F=1.440	0.243
Associate degree	29.52 $\pm$ 8.08		
Bachelors	15.41 $\pm$ 15.41		
Master degree	9.68 $\pm$ 0.0		
<b>Marital status</b>			
Single	21.95 $\pm$ 0.73	F= 0.071	0.932
Married	19.22 $\pm$ 15.01		
Widow	19.86 $\pm$ 1.03		
<b>Years of experience</b>			
5 – 10 years	28.89 $\pm$ 8.81	t=1.440	0.156
10 – 20 years	18.67 $\pm$ 13.87		
<b>Duration of LBP</b>			
Less than 3 months	18.97 $\pm$ 0.00	F=0.640	0.532
3months to 1 year	22.86 $\pm$ 17.84		
More than 1year	17.99 $\pm$ 11.95		
<b>Causes of LBP</b>			
Nonspecific muscle spasm	19.48 $\pm$ 11.74	F= 0.005	0.995
Lumbar spondylosis	19.66 $\pm$ 16.72		
Intervertebral disc prolapse	19.13 $\pm$ 10.84		

t: Student t-test

F: F for ANOVA test

\*: Statistically significant at  $p \leq 0.05$

## Discussion

Low back Pain (LBP) is a distressing problem among nurses that affects negatively their quality of life. This raises the urge to develop educational nursing interventions, which have minimal side effects compared to other interventions that can decrease nurses' pain intensity and improve their quality of life (Bejia et al., 2005; Mitchell et al., 2018 & Vieira et al., 2016). In this regard, Zahra et al. (2020) reported that nurses' health

education about LBP significantly decreased pain and improved their QOL.

Therefore, the present study aimed to identify the effects of educational nursing interventions on pain intensity and quality of life among nurses with low back pain. The mean age of the current study nurses' participants was (40.94  $\pm$  9.50) years. This could be related to the nature of the nursing profession that mixes both physical demands; as patient lifting, shortage of the staff, and psychological demands; as stress, and work

burnout. In this context, The American Nurses Association (ANA) reported that nurses over 40 years old are more liable to develop LBP because of their work burden (**Zahra et al., 2020**). Similarly, **Azizpour et al. (2017)** found that LBP is most prevalent in nurses over 40 years old. This could be related to the fact that with aging, the power of the body (mental and physical) decreases. On the contrary, **Asadi et al. (2016)** found that LBP was more prevalent in younger nurses than those in the middle age. They interpreted these findings as younger nurses were more involved in manual work, less knowledgeable about the proper techniques of body mechanics, and also had more problems related to job stress than older nurses who were involved in organizational and managerial roles.

Other socio-demographic characteristics of the current studied nurses revealed increased severity of low back pain among married nurses. This could be related to the fact that LBP is more common among married nurses due to specific physical conditions in women as; lower pain threshold, physical changes due to monthly menstruation, pregnancy, labor and delivery children as well as home responsibilities that could be attributed to such disorders. **Freimann et al. (2013)** findings were in the same line with our findings, as the majority of their studied nurses were married.

As regards level of education, the present study showed that the majority of the studied nurses were diploma graduates. These findings may be attributed to the higher workload on diploma nurses than bachelor holders. Similar findings were reported by **Hamid et al. (2011)**. Also, **Mousa et al. (2015)** found a higher prevalence of LBP among diploma nurses compared to those with higher educational levels, as they delegate more physical care to others.

The findings of the present study revealed that the majority of the studied nurses were either overweight or obese. Also, **Omran et al. (2014)** found that nurses' obesity was significantly associated with their suffering from LBP. On the same line, **Shieh et al. (2016)** found that obesity was a major cause of LBP among their nurses, as it decreases the abdominal and back muscles strength and

increases the level of lumbar lordosis. These findings were supported by **Bin Homaid (2016)** who found that about half of their studied nurses with LBP were obese. In this regard, **Schloss-macher and Amaral (2012)** reported that low back pain was more common in obese nurses when compared with respondents of normal and underweight.

The present study results revealed that the majority of the studied nurses had 10 to 20 years of experience. In this context, **Zahra et al. (2020)** suggested that longer working hours may be associated with higher LBP prevalence. Also, **Taghinejad et al. (2016)** found that the total years of nurses' experience were related to LBP prevalence among nurses, as nurses with longer years of experience reported higher prevalence of LBP. Nevertheless, **Saremi, and Khayati (2016)** reported that the majority of their nurses who had five years of experience, suffered more from LBP.

The findings of this study showed that the majority of the studied nurses suffered from low back pain for more than one year, and lumbar spondylosis was the main cause of low back pain among nearly half of the sample. These findings were supported by **Dawson et al. (2011)** who found that nurses who suffered from low back pain for more than one year had lumbar spondylosis which is the principal cause of LBP. In this regard, **Berthelette et al. (2012)** reported that patient-lifting devices, safe patient handling, transfer technique should be available in health care settings to prevent LBP.

As regards nurses' knowledge related to LBP, the present study showed that the majority of the studied nurses had an unsatisfactory level of overall knowledge pre interventions, while all nurses had satisfactory level of overall knowledge post interventions, and these results were highly significant. These findings were consistent with **Wong et al. (2010)** who found that the majority of their nurses' knowledge had improved significantly after providing an educational program related to low back pain. In this context, **Karahan & Bayraktar (2013)** found that educational interventions among nurses with low back pain, had significantly improved their knowledge and behaviors. Interestingly, **Nilsen et al.**

(2008) reported that knowledge improvement does not necessarily imply that a change in daily subject habits or posture has occurred, as the behavior models suggest that only knowledge is not sufficient to induce changes in behaviors that are habits.

The present study has been developed to help participants better manage pain, which is evident by the current findings. The applied nursing interventions significantly decreased pain experienced by the studied nurses, as the majority of them were allocated between moderate to severe LBP pre interventions, whereas the majority of them had mild LBP post interventions. This comes in line with the results in a study by **Branney & Newell (2009)** who found that their studied nurses presented an average low pain level after implementation of nursing teaching program that incorporates both health education and practicing exercise interventions. Similarly, **Shariat et al. (2019)** findings showed that the combination of both health education, and exercise therapy significantly decreased the pain intensity in their subjects with LBP compared to the control group.

On studying the associations between socio-demographic characteristics of the studied nurses, and their overall mean percent reduction of pain score levels post interventions, a statistical significant association between body mass index and the overall mean percent reduction score of nurses' level of pain score post interventions was detected, as nurses with normal body weight achieved higher percentage of pain reduction. These findings are in agreement with **Mousa et al. (2015)**, and **Heutink et al. (2013)** who noted a similar association between obesity and low back pain, as obese nurses achieved lowest levels of pain reduction post educational interventions. In congruent, **Ahdhi et al. (2016)** findings showed that there was no association between BMI and low back pain in their participants.

Also, the present study results showed a statistically significant association between duration of low back pain and the overall mean percent reduction score of nurses' level of pain post interventions, where nurses suffering from the low back pain for more than one year

showed the highest percent reduction of pain levels. Similar findings were reported by **Mousa et al. (2015)** who found positive correlations between nurses' duration of LBP, and pain scores.

However, the present study results showed no statistically significant relationships between nurses' age, education level, marital status, years of experience, and percent of reduction of pain score levels post interventions. These results are in congruent with **Mousa et al. (2015)** who found positive correlations between age, education, marital status, experience, and percent of reduction of pain levels among nurses post interventions.

**Tosounoz & Oztunc (2020)** reported that LBP affected nurses' quality of life adversely in many ways and was associated with poorer quality of life. One of the main findings revealed by the current study is the positive effects of the applied educational nursing interventions on QOL domains of the studied nurses, as significant differences were detected in physical, psychological, social and financial domains post interventions, with a mean percent improvement score in overall QOL items post interventions ( $19.49 \pm 13.76$ ). Similar findings were reported by many authors, as they found significant improvement in their studied nurses' QOL domains after application of nursing educational programs (**Berthelette et al., 2012; Heutink et al., 2013**). These findings were consistent with **Carugno et al. (2018)**, who studied QOL among nurses with LBP, and found that their participants showed significant improvements in all QOL; physical, psychological, social, and financial domains post application of educational nursing interventions that mixed both health education and practicing exercises. However, the current study findings differ from those findings of **Oslan et al. (2016)** and **Yip (2011)**, who found no statistical significant differences in nurses' QOL domains post educational interventions.

Furthermore, the present study findings revealed a statistically significant association between body mass index and mean percent improvement scores of the studied nurses' QOL post interventions, where nurses with normal weight achieved higher improvement

scores of QOL post interventions. Similar findings were reported by **Menzel et al. (2017)**, and **Valet et al. (2009)**.

### Limitations of the Study:

This study was conducted on nurses working at a single setting which is considered a limitation for generalizability of the findings.

### Conclusion

This study provides preliminary evidence for the use of the educational nursing interventions to improve pain and QOL among nurses with LBP. The findings indicated that the study hypotheses are accepted. The educational nursing interventions had significant positive effects on pain reduction, and QOL improvement among the studied nurses. The present study highlighted statistical significant associations between body mass index, and both of mean percent reduction of pain scores levels, and mean percent improvement of QOL of the studied nurses post interventions.

### Recommendations

Based on the results of the present study, the following recommendations are suggested:

- Further studies, to examine long lasting effects of educational nursing interventions, in other clinical setting, to find out long-term effects, on nurses with LBP and large sample are recommended.
- Raise awareness among nurses and health policy makers of the need for early diagnosis, proper treatment and recovery policies to alleviate the burden associated with chronic LBP.
- A proper no weight lifting policy should be considered. Hospitals should be well equipped with all necessary lifting equipment.
- Health care managers should formulate a clear methodological approach for maximizing the issue of QOL among nurses.
- The adjoining teaching manual is a significant guide for healthcare managers to

include specific educational programs to decrease LBP incidence among nurses.

### Acknowledgement

The authors would like to express the deepest appreciation and sincere gratitude to the studied nurses for their support throughout this study.

### References

- Ahdhi, G. S., Subramanian, R., Saya, G. K., & Yamuna, T. V. (2016)**. Prevalence of low back pain and its relation to quality of life and disability among women in rural area of Puducherry, India. *Indian Journal of Pain*, 30(2), 111.
- Al-Mutairi, M. D. (2019)**. Quality of Life among Nurses with Low Back Pain: A Review. *Open Journal of Nursing*, 9(11), 1138-1142.
- Asadi, P., MONSEF, K. V., ZIA, Z. S. M., & Zohrevandi, B. (2016)**. The prevalence of low back pain among nurses working in Poursina hospital in Rasht, Iran.
- Azizpour, Y., Delpisheh, A., Montazeri, Z., & Sayehmiri, K. (2017)**. Prevalence of low back pain in Iranian nurses: a systematic review and meta-analysis. *BMC nursing*, 16(1), 1-10.
- Bejia, I., Younes, M., Jamila, H. B., Khalfallah, T., Salem, K. B., Touzi, M., Bergaoui, N. (2005)**. Prevalence and factors associated to low back pain among hospital staff. *Joint bone spine*, 72(3), 254-259.
- Berthelette, D., Leduc, N., Bilodeau, H., Durand, M.-J., & Faye, C. (2012)**. Evaluation of the implementation fidelity of an ergonomic training program designed to prevent back pain. *Applied Ergonomics*, 43, 239-245.
- Bin Homaid M, Abdelmoety D, Alshareef W, Alghamdi A, Alhozali F, Alfahmi N, et al. (2016)**. Prevalence and risk factors of low back pain among operation room staff at a tertiary care center, Makkah. Saudi Arabia:a cross-sectional study *Ann Occup Environ Med*; 28:1.

- Branney, J., & Newell, D. (2009).** Back pain and associated healthcare seeking behaviour in nurses: A survey. *Clinical Chiropractic*, 12(4), 130-143.
- Carugno T, O Sullivan PB, Burnett AF, Straker L, Rudd C. (2018).** Low back pain characteristics from undergraduate student to working nurse in Australia: A cross-sectional survey. *International Journal of Nursing Studies*, 45(11): 1636-1644.
- Dawson AP, Schluter PJ, Hodges PW, Stewart S, Turner C. (2011).** Fear of movement, passive coping, manual handling, and severe or radiating pain increase the likelihood of sick leave due to low back pain. *PAIN* 152(7): 1517-1524.
- De Campos, T. F. (2017).** Low back pain and sciatica in over 16s: assessment and management NICE Guideline [NG59]. *J Physiother*, 63(2), 120.
- Dunn S., (2018).** How Do I Get Out of Bed with Back Pain? Log Roll Technique for Back Pain. Available at: <https://therapyandpilates.com/how-do-i-get-out-of-bed-with-back-pain-log-roll-technique-for-back-pain>.
- El-sol, A. E. S., Ahmed, R. G., & Ahmed, R. M. (2018).** Effect of Multidimensional Interventions on Back Pain Reduction among Intensive Care Unit Nurses. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* e- ISSN: 2320-1959.p- ISSN: 2320-1940 Volume 7, Issue 2 Ver. IV, PP 09-28 [www.iosrjournals.org](http://www.iosrjournals.org)
- Fawzy, N., & El-Deen, D. S. (2019).** Effect of jaw relaxation technique on low back pain and selected vital signs among nursing staff: a randomized controlled trial. *The Malaysian Journal of Nursing (MJN)*, 10(4), 88-99.
- Felstead, I., & Angrave, P. (2005).** Implementing moving and handling in higher education. *Nursing standard*, 19(33), 46-51.
- Freimann, T., Coggon, D., Merisalu, E., Animägi, L., & Pääsuke, M. (2013).** Risk factors for musculoskeletal pain amongst nurses in Estonia: a cross-sectional study. *BMC musculoskeletal disorders*, 14(1), 1-7.
- Geç, A., Kahraman, T., & Göz, E. (2016).** The prevalence differences of musculoskeletal problems and related physical workload among hospital staff. *Journal of back and musculoskeletal rehabilitation*, 29(3), 541-547.
- Hamid SN, Ali Akbar H, Zahra B, Mohammad Ali S, Nasim B, et al. (2011)** Relationship between backache and psychological and psychosocial job factors among the nurses. *International Journal of Nursing and Midwifery* 3(7): 86-91.
- Heutink M, Post WM, Overdulve C, et al. (2013).** Which Pain Coping Strate[1]gies and Cognitions Are Associated with Outcomes of a Cognitive Behavioral Intervention for Neuropathic Pain after Spinal Cord Injury? *Top Spinal Cord InjRehabil*. Fall; 19(4): 330-340. PMID:24244098 <http://dx.doi.org/10.1310/sci1904-330>
- Hurwitz, E. L., Morgenstern, H., & Chiao, C. (2005).** Effects of recreational physical activity and back exercises on low back pain and psychological distress: findings from the UCLA Low Back Pain Study. *American Journal of Public Health*, 95(10), 1817-1824.
- Ibrahim, R., & Elsaay, O. E. 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.
- Irvine P., (2017).** Beat lower back pain with exercise. Complete chiropractic, family health care. Available at: <https://www.completechiropractic.co.uk/beat-lower-back-pain-exercise/>.
- Karahan, A., & Bayraktar, N. (2013).** Effectiveness of an education program to prevent nurses' low back pain: an



- interventional study in turkey. *Workplace health & safety*, 61(2), 73-78.
- Khorsandi, M., Sharafkhani, N., Shamsi, M., & Ranjbaran, M. (2013).** Knowledge, self-efficacy, and practice among nurses for prevention of chronic low back pain in Arak, Iran, in 2014. *Journal of Occupational Health and Epidemiology*, 2(4), 157-164.
- Macfarlane, G. J., Thomas, E., Papageorgiou, A. C., Croft, P. R., Jayson, M. I., & Silman, A. J. (1997).** Employment and physical work activities as predictors of future low back pain. *Spine*, 22(10), 1143-1149.
- Maciel, S. C., Jennings, F., Jones, A., & Natour, J. (2009).** The development and validation of a low back pain knowledge questionnaire-LKQ. *Clinics*, 64(12), 1167-1175.
- Malone A., (2020).** Stretch and Strengthen Your Way Out of Lower Back Pain. Available at: <https://www.iowaclinic.com/physical-therapy/stretch-and-strengthen-your-way-out-of-lower-back-pain/>
- McCaffery, M. (1994).** Pain: Clinical manual for nursing practice. Available at: <https://pubmed.ncbi.nlm.nih.gov/27527475/>. Retrieved on Sep 2012.
- Menzel NN, Brooks SM, Bernard TE, Nelson A. (2014).** The physical work workload of nursing personnel: association with musculoskeletal discomfort. *International Journal of Nursing Studies*, 41(8): 859-867.
- Mitchell T, O'Sullivan PB, Burnett AF, Straker L, Rudd C (2018)** Low back pain characteristics from undergraduate student to working nurse in Australia: A cross-sectional survey. *International Journal of Nursing Studies* 45(11): 1636-1644.
- Miyamoto, G. C., Lin, C. W. C., Cabral, C. M. N., van Dongen, J. M., & van Tulder, M. W. (2019).** Cost-effectiveness of exercise therapy in the treatment of non-specific neck pain and low back pain: a systematic review with meta-analysis. *British journal of sports medicine*, 53(3), 172-181.
- Moussa, M. M. M., El-Ezaby, H. H., & El-Mowafy, R. I. (2015).** Low back pain and coping strategies' among nurses in Port Said City, Egypt. *Journal of Nursing Education and Practice*, 5(7), 55-62.
- Neethu, C. L., Kumar, R., Soman, S. K., & Manivannan, S. (2020).** Effects of ergonomic education and exercise training program on low back pain among nurses.
- Nilsen P, Bourne M, Verplanken B. (2008).** Accounting for the role of habit in behavioral strategies for injury prevention. *Int J Inj Contr Saf Promot* 15(1):33-40
- Olsen JC, Ogarek JL, Goldenberg EJ, Sulo S. (2016).** Impact of a chronic pain protocol on emergency department utilization. *Bird SB, ed. Acad Emerg Med*, 23(4):424-432. doi: 10.1111/acem.12942.
- Omran, S., Al Qadire, M., Ali, N. A., & Al Hayek, M. F. (2014).** Knowledge and attitudes about pain management: a comparison of oncology and non-oncology Jordanian nurses. *Nurs Health*, 2(4), 73-80.
- Ovayolu, O., Ovayolu, N., Genc, M., & Col-Araz, N. (2014).** Frequency and severity of low back pain in nurses working in intensive care units and influential factors. *Pakistan journal of medical sciences*, 30(1), 70.
- Patil, N. J., Nagaratna, R., Tekur, P., Manohar, P. V., Bhargav, H., & Patil, D. (2018).** A randomized trial comparing effect of Yoga and exercises on quality of life in among nursing population with chronic low back pain. *International journal of yoga*, 11(3), 208.
- Saremi M, Khayati F. (2016).** Evaluation of incidence of low back pain and its relationship with ergonomic risk level of

- wards among nurses. *J Mod Rehabil.* 9(4):68–77.
- Schlossmacher R, Amaral F. (2012).** Low back injuries related to nursing professionals working conditions: a systematic review. *Work.* 41(Suppl 1): 5737-8. PMID:22317669
- Semachew, A., Workineh, Y., Ayalew, E., & Animaw, W. (2018).** Low back pain among nurses working in a clinical settings of Africa: A systematic review and meta-analysis of a 19 years of studies. *BioRxiv*, 507053.
- Shaheed, C. A., Maher, C. G., Williams, K. A., Day, R., & McLachlan, A. J. (2016).** Efficacy, tolerability, and dose-dependent effects of opioid analgesics for low back pain: a systematic review and meta-analysis. *JAMA internal medicine*, 176(7), 958-968.
- Sharafkhani, N., Khorsandi, M., Shamsi, M., & Ranjbaran, M. (2016).** The effect of an educational intervention program on the adoption of low back pain preventive behaviors in nurses: an application of the health belief model. *Global spine journal*, 6(1), 29-34.
- Shariat, A., Alizadeh, R., Moradi, V., Afsharnia, E., Hakakzadeh, A., Ansari, N. N., ... & Shaw, I. (2019).** The impact of modified exercise and relaxation therapy on chronic lower back pain in office workers: a randomized clinical trial. *Journal of exercise rehabilitation*, 15(5), 703.
- Shariat, A., Cleland, J. A., Danaee, M., Kargarfard, M., Sangelaji, B., & Tamrin, S. B. M. (2018).** Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial. *Brazilian journal of physical therapy*, 22(2), 144-153.
- Shieh, S. H., Sung, F. C., Su, C. H., Tsai, Y., & Hsieh, V. C. R. (2016).** Increased low back pain risk in nurses with high workload for patient care: A questionnaire survey. *Taiwanese Journal of Obstetrics and Gynecology*, 55(4), 525-529.
- Stochkendahl, M. J., Kjaer, P., Hartvigsen, J., Kongsted, A., Aaboe, J., Andersen, M., Vaagholt, M. (2018).** National Clinical Guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy. *European Spine Journal*, 27(1), 60-75.
- Stubbs, B., Koyanagi, A., Thompson, T., Veronese, N., Carvalho, A. F., Solomi, M., Vancampfort, D. (2016).** The epidemiology of back pain and its relationship with depression, psychosis, anxiety, sleep disturbances, and stress sensitivity: data from 43 low-and middle-income countries. *General hospital psychiatry*, 43, 63-70.
- Synnott, A., O'Keefe, M., Bunzli, S., Dankaerts, W., O'Sullivan, P., Robinson, K., O'Sullivan, K. (2016).** Physiotherapists report improved understanding of and attitude toward the cognitive, psychological and social dimensions of chronic low back pain after cognitive functional therapy training: a qualitative study. *Journal of physiotherapy*, 62(4), 215-221.
- Taghinejad H, Azadi A, Suhrabi Z, Sayedinia M. (2016).** Musculoskeletal Disorders and Their Related Risk Factors Among Iranian Nurses. *Biotech Health Sci.*;3(1):e34473. doi: 10.17795/bhs-34473.
- Tantawy, S. A., Kamel, D. M., Abdelbaset, W. K., & Nambi, G. (2020).** A randomized controlled trial investigating the impact of interferential therapy on pain, range of motion and quality of life in patients with chronic non-specific low back pain. *Archives of the Balkan Medical Union*, 55(1), 47-54.
- Tavafian, S. S., Jamshidi, A., Mohammad, K., & Montazeri, A. (2007).** Low back pain education and short term quality of life: a randomized trial. *BMC musculoskeletal disorders*, 8(1), 1-6.
- Tosunoz, I. K., & Oztunc, G. (2020).** Effects of Low Back Pain on Functional

- Disability Level and Quality of Life in Nurses Working in a University Hospital. *International Journal of Caring Sciences*, 13(3), 2131.
- Valet, M., Gundel, H., Sprenger, T., Sorg, C., Muhlau, M., Zimmer, C., et al. (2009).** Patients with Pain Disorder Show Gray-Matter Loss in Pain-Processing Structures: A Voxel-Based Morphometric Study. *Psychosomatic Medicine*, 71, 49-56. <https://doi.org/10.1097/PSY.0b013e31818d1e02>.
- Van Hoof, W., O'Sullivan, K., O'Keeffe, M., Verschueren, S., O'Sullivan, P., & Dankaerts, W. (2018).** The efficacy of interventions for low back pain in nurses: a systematic review. *International journal of nursing studies*, 77, 222-231.
- Vieira ER, Kumar S, Coury HJCG, Narayan Y (2016)** Low back problems and possible improvements in nursing jobs. *Journal of Advanced Nursing* 55(1): 79-89.
- Vrbanić T. S. (2011).** Krizobolja--od definicije do dijagnoze [Low back pain--from definition to diagnosis]. *Reumatizam*, 58(2), 105–107.
- WikiHow Staff, (2020).** How to Do Log Roll. Available at: [https:// www. wikihow. com/ Do-a-Log-Roll](https://www.wikihow.com/Do-a-Log-Roll).
- Wong TS, Teo N, Kyaw MO. (2010).** Prevalence and risk factors associated with low back pain among health care providers in District Hospital. *Malaysian Orthopedic Journal* 4(2): 23-29.
- World Health Organization. (1996).** WHOQOL-BREF: introduction, administration, scoring and generic version of the assessment: field trial version, December 1996 (No. WHOQOL -BREF). World Health Organization. Available at: <https:// apps. who. int/ iris/ handle/ 10665/ 63529>. Retrieved on: 12/1/2017.
- Yip Y. (2011).** A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. *Journal of advanced nursing*, 36(6), 794–804. <https:// doi. org/ 10. 1046/ j. 1365- 2648.2001.02037.x>
- Zahra, N. A., Sheha, E. A. A. E., & Elsayed, H. A. (2020).** Low Back Pain, Disability and Quality of Life among Health Care Workers. *Int. J. Pharm. Res. Allied Sci*, 9(2), 34-44.
- Zanoli, G., Strömqvist, B., Jönsson, B., Padua, R., & Romanini, E. (2002).** Pain in low-back pain: Problems in measuring outcomes in musculoskeletal disorders. *Acta Orthopaedica Scandinavica*, 73(sup305), 54-57.