

**Effect of educational program on performance of Intensive Care Nurses to Decrement the low Back pain**

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**Abstract:** Musculoskeletal disorders are an important public health problem. Among them are back conditions, Low back pain has been found to be the most prevailing musculoskeletal condition as well as a common cause of disability in high and low income countries, with 85% prevalence. Nurses have been reported to have one of the highest levels of back work-related injuries in all occupational groups. The great amount of physical work such as patient handling and transfers as well as psychological stress related to their type of work, are said to increase the prevalence of low back pain among nurses. **Aim :** To evaluate the effect of educational program on performance of Intensive Care nurses to decrement the low back pain. **Subjects and Methods: Design:** A quasi experimental design was used. **Setting:** This study was conducted at intensive care units affiliated to Eldemerdash and Ain Shams University Hospitals. **Sample:** A purposive sample included 35 intensive care nurses. **Tools for data collection:** Self Administered back pain structured Questionnaire, body mechanics observation checklists, Oswestry low back pain Disability Questionnaire. **Results:** there were statistically significant differences between pre and post intervention as regards their knowledge and practices regarding back pain and body mechanics. As well, there was no significant difference in intensity of back pain and disability between pre & post intervention. There were a statistically positive correlation between intensity of low back pain and age, years of experience, number of children and body mass index. While there were no statistically significant relations between intensity of low back pain and gender and marital status. **Conclusions:** The educational program was helpful on the improvement knowledge and practices of the nurses with back pain, while it wasn't leading to decreasing intensity of back pain and disability. **Recommendations:** The study should be replicated on large sample and different hospitals setting in order to generalize the results, developing a simplified and comprehensive booklet including guidelines about correct lifting and handling techniques and further study is recommended to evaluate the association between low back pain and its associated factors.

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**1. Introduction**

Today, the musculoskeletal disorders are one of the most frequent health problems related directly to working conditions (Naidoo & Coopoo, 2007). Low back pain is not only considered to be the most common reason for functional disability worldwide, but also estimated to affect almost 90% of the universal population (Brennan *et al.*, 2007). Moreover, low back pain is said to be among the leading musculoskeletal disorders that predominantly affect the working population in developed as well as in developing countries ( Sanya & Ogwumike, 2005 Burdorf & Jansen, 2006 ; Cilliers, 2007; Roffey *et al.*, 2010a). Furthermore, low back pain has been found to be a global health dilemma affecting the global economic, societal, and public health sectors, thus increasing and incurring billions of dollars in medical expenditures each year (Louw *et al.*, 2007). Moreover, low back pain is said to be the most prevalent musculoskeletal occupational hazard with a life time prevalence of about 90% according to

Roffey *et al.*, 2010a and 60-85% according to Burdorf & Jansen, 2006.

Nurses have been reported to have one of the highest levels of back work-related injuries in all occupational groups. The great amount of physical work such as patient handling and transfers as well as psychological stress related to their type of work, are said to increase the prevalence of low back pain among nurses (Vieira *et al.*, 2006). Likewise, of all the health related occupations the nursing staffs were indicated as the most workers that are highly exposed to back disorders due to the manual handling involved in their profession such as lifting and transferring of patients. Consequently, biomechanical investigations reported that such movements result into high spinal stresses (Jones & Macfarlane, 2005; Roupa *et al.*, 2008).

Back pain is defined as any discomfort or pain at the back in the past 12 months. (Kaila-Kangas *et al.*, 2004). Also, low back pain is defined as pain and discomfort, localized below the costal margin and above the inferior gluteus folds, with or without leg

pain. Back pain can be divided anatomically: neck pain, middle back pain and lower back pain. By its duration: acute (less than 6 weeks), sub acute (6 – 12 weeks), chronic (greater than 12 weeks). By its cause: nonspecific back pain, back pain with radiculopathy or spinal stenosis, and back pain associated with another specific cause (such as infection or cancer) (**Vanwye, 2010**). Non specific pain indicates that the cause is not known precisely. but is believed to be due from the soft tissues such as muscles, fascia, and ligaments. Back pain is classified according to etiology in mechanical or nonspecific back pain and secondary back pain. Approximately 98% of back pain patients are diagnosed with nonspecific acute back pain which has no serious underlying pathology. However, secondary back pain which is caused by an underlying condition accounts for nearly 2% of the cases. Underlying pathology in these cases may include metastatic cancer, spinal osteomyelitis and epidural abscess which account for 1% of the patients. Also, herniated disc is the most common neurologic impairment which is associated with this condition, from which 95% of disc herniations occur at the lowest two lumbar intervertebral levels (**Slipman, 2008**). While this categorization is convenient for clinical purposes, it is less helpful when considering the matter of prevention, where back pain and its consequences tend to occur in an episodic manner (**De Vet et al., 2002**)

Despite this high prevalence of low back pain among nurses, the etiology and the nature of back pain are not yet well understood. Many studies have been performed in various occupational settings, indicating a strong association between musculoskeletal disorders and work related factors. This was also found among nurses. The contribution of psychosocial factors and work pressure was also evident, but not as clear as has been shown for the physical factors (**Eriksen et al., 2004**). Work settings that are associated with increased work-related pressures among health workers have been attributed to the development of lumbar pains as well as other muscular pains in the body, fatigue as well as disrupted sleeping patterns to the employees (**Roupa et al., 2008**). **Bejia et al., 2005** found that 69.9% of nurses who suffered low back pain were exposed to heavy manual workloads. While, **Mwilila, 2008** stated that, among the perceived causes of low back pain reported by nurses was the working environment where by nurses mentioned that they are expected to do more work when the patients are many.

Moreover, a number of scholars have concluded that the definite causes of low back pain may not be well known or rather have not been well documented. However, there are some frequently reported risk factors which are related to both working and non-

working individuals. These factors include: type of work such as heavy manual work, repetitive bending, twisting, lifting, pulling & pushing, forceful movements, static postures like prolonged sitting and awkward postures (**Kwon et al., 2006 ; Vuuren et al., 2007; Roffey et al., 2010b; Sikiru 2010**). on the other hand **Yip, 2004**, added that being new on the ward was a strong risk factor of nurses suffering low back pain due to the increased physical work load encountered.

Risk indicator for back pain includes sex, age, weight, height, number of children, smoking habits, regular physical exercise, driving time, job, duration of work time, work time a week, manual lifting of weights heavier than 10kg, and uncomfortable working positions. In summary, risk factors of back pain can be divided into 3 groups which are socio demographic factors (Age, gender, education level, smoking, body mass index, number of children), physical and work factors (Static and awkward body position, heavy physical work, night shifts, lifting, bending, twisting, pulling, and pushing) and psychosocial factors (Perceived high pressure on time and workload, low job control, job dissatisfaction, monotonous work, and low support from co-workers and management) (**Latza, 2000**). Meanwhile, **Alexandrea et al., 2001** stated that, Risk factors for back pain can be either of individual origin or related to the workplace. The main occupational risk factors are: lifting and handling of patients, uncomfortable and immobile postures, inadequate equipment, improper workplace design, heavy physical work, and inadequate work organization

However, **Waddell & Burton, 2001** suggest that back pain could be more linked to normal every day activities than to occupational activities alone, meaning that the activities of daily living of individuals might be the major predisposing factors of low back pain. Similarly, **Yip, 2002** reports a 30-50% of self-reported low back pain among nurses in Hong Kong that was associated with housework and this consequently led to daily activity limitation, sleeping and walking interruptions included. **Roffey et al., 2010b** suggested that low back pain could be due to injury of the neuro-muscular-skeletal system of the lumbar spine such as muscles, ligaments, nerves, discs as well as the vertebrae. **Bejia et al., 2005** in their study also add that advanced age was a risk factor of low back pain occurrence due to the possibility of degenerative processes in the spine that accompany old age. Further literature findings suggests that a number of diseases develop as a result of old age thus making the elder employees less productive as far as physically demanding work is concerned(**Aittomaki et al., et al., 2005**).

On the other hand, **Dahm et al., 2010** reported that poor muscle strength and flexibility can lead to poor posture, which may further lead to dysfunction of the respective muscles and joints in the back resulting into back pain. In addition, studies have suggested other common low back pain causes that are physiological and are associated with various factors. They include soft tissue injury in the spine such as; sprain or strain on the muscles due to overload, ligaments and joints due to poor postures of the spine and prolapsed disc due to improper lifting as well as poor postures of the back. In addition, injury to the above mentioned structures may further cause pressure on the spinal nerves which innervate the legs and spine thus causing low back pain. Besides, low back pain may also be caused by fractures of the vertebral bodies that occur as a result of weakening of the bones due to osteoporosis, rheumatoid arthritis and osteoarthritis which is sometimes also secondary to kidney disease (**Light, 2009 ; Vitente, 2010**).

The management goals when treating back pain are to achieve maximal reduction in pain intensity as rapidly as possible; to restore the individual's ability to function in everyday activities; to help the patient cope with residual pain; to assess for side-effects of therapy; and to facilitate the patient's passage through the legal and socioeconomic impediments to recovery. For many, the goal is to keep the pain to a manageable level to progress with rehabilitation, which then can lead to long term pain relief. Also, for some people the goal is to use non-surgical therapies to manage the pain and avoid major surgery, while for others surgery may be the quickest way to feel better. Not all treatments work for all conditions or for all individuals with the same condition, and many find that they need to try several treatment options to determine what works best for them. The present stage of the condition (acute or chronic) is also a determining factor in the choice of treatment. Only a minority of back pain patients (most estimates are 1% - 10%) require surgery (**Dahm et al., 2010**).

Training seems to play an important role in reducing the incidence of injury, as shown by the fact that about 80% of injuries occur among nursing aides, orderlies, and attendants compared with 20% occurring among registered nurses. Research has shown that training programs can be effective. Patient transfer involves adjusting the patient in bed, transferring a patient from bed or chair to toilet. These maneuvers have consistently been related to low back injuries in nurses, and are perceived to be the most stressful tasks performed by these occupations. Not surprisingly, efforts have been made to prevent low back injuries following patient handling, including education in lifting techniques, ergonomic interventions and mechanical equipment

and individually designed physical training programs. Nurses can be advised to do regular exercise to strengthen their back muscles, employer to ensure ergonomic adjustment to reduce risk of back pain such as manual handling, awkward body position at work and monotonous work posture management (**Halim et al., 2008**).

There are several ways that hospitals, care facilities and nursing professionals can reduce injury risks. These include: using lifting assistance devices, using appropriate equipment, use appropriate beds, use back belts, implement regular equipment maintenance procedures, ergonomic design of workplaces, providing better training, provide adequate staffing and systematic record-keeping (**Daniels et al., 2010**).

### Justification of the problem

The safety of nurses from low back pain (LBP) is remains challenge and important to nurses themselves as well as to the patients they serve. The presence of healthy and well-rested nurses is critical to provide vigilant monitoring, empathic patient care and vigorous advocacy. In hospital, most nurses are not aware of consequences of bad body mechanics. Nurses have attributed the onset of LBP to their patient handling activities. About 40% of all back pain episodes and 75% of compensable back injuries appear to be related to lifting, transfer or movement of patients (**Tinubu et al., 2010**).

This problem occurs in practice and nurses receive little or no training in this specific area of patients' care. From here, the education program will improve nurses' awareness toward safety procedure as how to doing lifting, transfer or movement of patients (**Schneider et al., 2005**).

### Aim of the study

To evaluate the effect of educational program on performance of Intensive Care nurses to decrement the low back pain.

This has been achieved through the following specific objectives:

1. Assess the nurses' knowledge regarding low back pain and body mechanics.
2. Assess the nurses' practice regarding body mechanics during practice of general physical tasks and during patients handling.
3. Identify the factors leading to low back pain among nurses.
4. Design, implement and disseminate the educational program for nurses to decrement the low back pain based on nurses' actual needs assessment.

5. Evaluating the effect of educational program on performance of Intensive Care nurses to decrement the low back pain and disability level.

#### Hypothesis:

The present study hypothesized that:

- 1- Nurses will show an improvement in their knowledge and practices to decrement the low back pain post-program program implementation.
- 2- The low back pain intensity and disability level will be reduced post-program program implementation.
- 3- There are factors contributing to low back pain.

## 2. Subjects and Methods

### Research design

A quasi experimental study design was utilized to accomplish this study.

### Settings

The study was conducted in Cardio-thoracic Intensive Care Unit and Emergency Unit at Ain Shams University Hospital and Neurosurgery Intensive Care Unit at Eldemerdash Hospital .

### Subjects

A purposive sample of nurses was taken from the previously mentioned study settings. The total number was 35 nurses were included in the study, whereas 20 nurses from cardiothoracic Intensive Care Unit, 7 nurses from Emergency Unit and 8 nurses from Neuro-surgery Intensive Care Unit. Nurses were included in this study were from both gender, with different age, educational levels and years of experience and who had suffered episodes of back pain for at least six months and willing to participate in the study. Criteria for exclusion were the nurses suffering from constant or persisting severe pain judged on clinical grounds to be due to irritation of nerve root, inflammatory arthritis and major surgeries in past one

### Tools for data collection

Four different tools were used to collect data pertinent for this study. They included A Self Administered back pain structured Questionnaire, A body mechanics observational checklists, Oswestry low back pain and neck disability questionnaire and Work related risk factors assessment sheet.

#### 1. A Self Administered back pain structured Questionnaire:

It was written in a simple Arabic language and comprises three parts. **The first part** was concerned with sociodemographic characteristics of studied nurses such as age, gender, qualification, years of

experience, marital status, number of children, height, weight, body mass index and attendance of related training courses. **The second part: it was adopted from Rotorua Pain Specialists 2008.** It was used to assess nurses' history regarding back pain and description of pain characteristics (when pain start, quality, location, onset, frequency , duration, time of worse pain, difference in intensity with time, rhythmicity, tolerance, factors aggravating pain, pain management strategies). As regard intensity of back pain was assessed by using Pain Assessment with the "0—10 Numeric" (Pain Intensity Scale). This scale is often displayed as a line numbered from zero to ten asking the person in pain to assign a number, from zero to ten, and it was adopted from **Marco et al., 2006** and. **The third part:** It was developed by the researchers based on the related literature (**McCaffery & Pasero, 1999 ; Taylor et al., 2009 ; Daniels et al., 2010 ; Ignatavicius & Workman, 2010 ; Christensen & Kockrow, 2011 ; Lewis et al., 2011 ; Monahan et al., 2011**) to assess nurses' knowledge regarding back pain and body mechanics. Knowledge regarding back pain included seven items related to function of spinal cord, factors leading to back pain, how to diagnose, how to prevent, when to call doctor and common measures to overcome. While, knowledge regarding body mechanics included six items related to definition, aim, general principles, correct body alignment, principles with doing general physical task as lifting and pushing or pulling objects, principles during helping patient's positioning and patient's transfer.

### Scoring systems

1. Pain Assessment with the "0—10 Numeric" (Pain Intensity Scale). The values on the pain scale correspond to pain levels as follows: 1 – 3 = mild pain, 4 – 6 = moderate pain and 7 – 10 = severe pain.
2. Nurses' body mass indexes (BMI) were estimated pre guidelines intervention.  $BMI = \text{weight (Kg)} / \text{height (m)}^2$ . It was considered that underweight if  $BMI < 18.5$ , normal weight if  $BMI 18.5 - 24.9$ , over weight if  $BMI 25 - 29.9$  and obese if  $BMI > 30$ . (**Gupta et al., 2007**).
3. The total score of knowledge was 100 degree. The Score one was given for each correct answer and zero for incorrect answer. For each area of knowledge, the scores of the items were summed-up and the total score divided by the number of the items. These scores were converted into a percent score. The total nurses' knowledge was considered satisfactory if the percent score was 60% or more, and unsatisfactory if less than 60%.

## 2 – A body mechanics observational checklists:

The observational checklists were developed and constructed by the researchers based on the related literature (**Taylor et al., 2009 ; Netina, 2010 ; Perry & Potter, 2010 ; Potter et al., 2011 ; Taylor et al., 2011**) and validated by the seven experts in medical surgical nursing department. An observational checklists were designed to assess nurses' practices regarding proper body mechanics during the actual nursing care. It included two parts. The first part was used to assess the nurses' practice regarding body mechanics during practice of general physical tasks (including maintain proper body ligament, reaching, pivoting, pushing, pulling and lifting) .The second part was used to assess nurses' practice regarding body mechanics during patients handling (including positioning and moving patient in bed, transfer patient from bed to wheelchair ,transfer patient from bed to trolley and vice versa).

### The scoring system

The total score of practice was 100 degree. The item observed to be done correctly were scored "1" and the items not done or incorrectly done was scored"0". For each procedure, the scores of the items were summed - up and the total divided by the number of the items. These scores were converted into a percent score. The practice was considered satisfactory if the percent score was 60% or more of the sum of the total practice score, and unsatisfactory if less than 60 %.

## 3- Oswestry low back pain disability questionnaire:

This questionnaire was filled by the researcher to measure functional disability and to assess how the back pain affected on the ability to manage in everyday life. It was included 10 sections namely: pain intensity, personal care (dressing, bathing, etc.), lifting, walking, sitting, standing, sleeping, sex life, social life and traveling. Every section included 6 box and mark in each section only one box which applies. It was adopted from **Fairbank and Pynsent, 2000**. It was written in Arabic language. Back translation was done to ensure the correct translation.

### Scoring systems

Simply count up the points and plug the total in below: For each question there is a possible of 5 points: 0 for the first question, 1 for the second question, 2 for the third question etc. The score 0-4 considered there was no disability, the score 5-14 considered there was mild disability, the score 15-24 considered there was moderate .disability, the score 25-34 considered there was sever disability and the score 35-50 considered there was completely disabled.

## 4- Work related risk factors assessment sheet:

It was adopted from (**Felitto and Graze (1997)**). It was used to assess work related risk factors facing the nurses during their work. It was cover the following: The working environmental factors, Presence of lift devices factors, duration, frequency and job design factors and finally the load factors. The nurses' answers are often displayed as a found or not found and yes or not.

### Educational Program:

Educational Program was designed by the researchers to improve the nurses' performance regarding back pain and body mechanics during caring for the patients based on the related literature (**Dewit, 2009 ; Daniels et al., 2010 ; Netina, 2010 ; Perry & Potter, 2010; Smeltzer et al., 2010 ; Lewis et al., 2011**). It was written in Arabic language. Knowledge about back pain included basic anatomy and physiology of the spinal column, causes and risk factors, signs and symptoms, diagnostic measures, pharmacological and non pharmacological management and when to call doctor. Knowledge about body mechanics included definitions, purpose, correct body alignment, principles during doing general physical tasks and principles during caring for patients. The booklet was revised by a group of seven expertise in Medical Surgical Nursing at faculty of Nursing, at Ain Shams University for the content validity.

### Pilot study:

The pilot study commenced once ethical approval had been obtained. The pilot study was conducted on 5 nurses who were excluded from the study sample. In order to test the clarity, feasibility and applicability of the study tools. Based on the result of the pilot study, modifications and omissions of some details were done and then the final forms were developed.

### Procedures of the study:

This study was conducted through four consecutive phases: assessment, planning, implementation and evaluation. Data collection was done pre, post implementation from October 2011 to February 2012.

- **Assessment phase:** This phase aimed to identify the studied nurses' characteristics and back pain characteristics ; to assess nurse's knowledge and practice regarding back pain and body mechanics identify degree of disabilities and to identify work related factors.
- **Planning and preparatory phase:** based on the assessment phase, the program content and media (in the form of the program booklet and visual materials) were prepared by the

researchers. Based on the opinion of a panel of expertise some modifications were done, and then the final forms were developed.

- **Implementation phase:** The observation checklists were filled out by the researchers who were available 2 days per week alternatively at morning or afternoon shifts in different study settings while the nurses were involved in patient care. The questionnaire format was filled in the clinical area by the studied nurses in the presence of the researchers. The total numbers of nurses were 35, divided into seven main groups according to study settings, and then implementation of the program was carried out at the previously mentioned study settings for each group separately based on their needs. The duration of each session took approximately 1 to 1.5 hours, sessions started according to nurses' spare time. Arabic language was used to suit the nurses' level of understanding. Methods of teaching used were real situations, modified lectures, group discussion and demonstration. An instructional media was used; it included program booklet and audiovisual materials. Most of the studied nurses in all study settings were cooperative with the researchers. The studied nurses were interested in the topic and they asked to repeat such this program for nurses in different health care settings.
- **Evaluation phase:** the evaluation phase was emphasized on estimating the effect of educational program on nurses' knowledge and practice regarding low back pain and body mechanics post-program implementation to determine the level of improvement in nurses' knowledge and practices. Also, the evaluation phase was emphasized on estimating the effect of the educational program on disability level and intensity of low back pain for nurses.

#### **Administrative design and ethical consideration:**

An official permission was obtained from the Director of Ain Shams University Hospital and the heads of the departments in which the study was conducted. Meeting and discussions were held between the researchers and nursing administrative personnel to make them aware about the aims and objectives, as well as to get better cooperation during the implementation phase. It was important to have their full support, especially to find out some sort of motivation to stimulate nurses to participate positively in the study. The aim of the research was explained to the participants. Verbal consent was obtained from each nurse to participate in the study, after clarifying the procedures of the study. Participants were informed about their right to refuse

participation and to withdraw at any time without any consequences. Confidentiality of data was ensured.

Statistical design: data entry and analysis were done using the Statistical Package for Social Science (SPSS) version 10. Data were presented in the tables and charts using actual numbers and percentages. Appropriate statistical methods were applied (percentage, chi-square (X<sup>2</sup>), correlation coefficient (r) and Fisher-exact probability test. Regarding *P* value, it was considered that: non-significant (NS) if  $P > 0.05$ , Significant (S) if  $P < 0.05$ , Highly Significant (HS) if  $P < 0.01$

**Table (1):** Percentage distribution of socio demographic characteristics of the studied nurses.

Socio demographic characteristics	Total (35)	
	No.	%
<b>Age (years):</b>		
20-35	11	31.43
> 35	24	68.57
<b>Gender:</b>		
Male	7	20
Female	28	80
<b>Qualification</b>		
Diploma nurse	20	47.14
Technician	7	20
Bachelor	8	22.86
<b>Years of experience</b>		
< 5	5	14.29
5-10	6	17.14
10-15	2	5.71
>15	22	62.86
<b>Marital status</b>		
Single	17	48.57
Married	18	51.43
<b>Number Of children</b>		
None	3	16.67
1-3	10	55.56
>3	5	27.77
<b>BMI</b>		
Ideal	5	14.29
Overweight	18	51.43
Obese	12	34.29
<b>Training course about body mechanics</b>	0	0

Table (1) shows that characteristics of the studied nurses. About two thirds (68.57%) of them were more than 35 years old and the majority (80 %) of them were female. Regarding qualification and years of experience, (47.14% & 62.86%) were diploma nurses and more than 15 years of experience. Concerning marital status, (51.43%) were married whose more than half (55.56%) of them had one to three child. Also, (51.43%) of the studied nurses were overweight and none of them attended training course about body mechanics.

**Table (2):** Medical Past history and low back pain management strategies among the studied nurses.

Items	Total (35)	
	No.	%
<b>I- Medical Past history</b>		
- Presence of chronic illness		
Diabetes	12	34.29
- Fever & infection	11	31.43
- Urinary problems (N=13 nurses)		
Frequency	5	14.29
Incontinences	4	11.43
Frequency & incontinences	4	11.43
- Injuries		
Fall	0	0
Accident	3	8.57
Twisting	18	51.43
- Numbness	5	14.29
- Hospitalization & surgery associated with back pain	0	0
- Smoking	2	5.71
<b>II- Pain management strategies</b>		
- Non-pharmacological back pain management		
Rest in bed	35	100
Binder	7	20
Physiotherapy	6	17.14
Hot compresses	16	45.71
Relaxation	33	94.29
Distraction	10	28.57
- Pharmacological back pain management		
Analgesic	28	80
Anti inflammatory	12	34.29
None	7	20

Table (2) illustrates past history of the studied nurses. About one third (34.29%, 31.43% & 37.15%) of them had diabetes, recent fever and urinary problems respectively. Also about half (51.43%) of them had a twisting injuries and the minority (14.29%) of them suffering numbness. None of them was hospitalized and made a surgery associated with back pain. Also, only (5.71%) of them were smoker.

Regarding non pharmacological back pain management, all of them rest in bed, the majority (94.29%) of them do relaxation and near half (45.71%) of them do hot compresses. While the minority (20% & 17.14%) of them wear binder and do physiotherapy respectively. Concerning pharmacological back pain management, the majority (80%) of them take analgesic. While one fifth (20%) of them didn't take medication for relieve of back pain.

**Table (3):** Percentage distribution about back pain characteristics as stated by the studied nurses pre-program intervention.

Items	Total (35)	
	No.	%
<b>Location of back pain</b>		
Cervical	19	54.29
Lumbar	35	100
Cervical & Lumbar	19	54.29
<b>Causes of back pain</b>		
Known (work)	34	97.14
Unknown	1	2.85
<b>When pain start</b>		
One year ago	4	11.43
2-5 years	6	17.14
> 5 years	25	71.43
<b>Quality of back pain</b>		
Throbbing	8	22.86
Shooting	3	8.57
Knife like	2	5.71
Hot burning	4	11.43
Heavy	6	17.14
Throbbing, burning& numbness	10	28.57
Throbbing, burning& cramping	2	5.71
<b>Onset of back pain</b>		
Sudden	11	31.43
Gradually	24	68.57
<b>Time of the worse back pain</b>		
In the morning	0	0
In the afternoon	0	0
In the evening	16	45.71
Late at night	19	54.29
<b>Intensity of back pain differ with time</b>		
Improve	2	5.71
Not improve	6	17.14
Worse	27	77.14
<b>Rhythmicity of back pain</b>		
Constantly	1	2.85
Nearly Constantly	5	14.29
Intermittently	10	28.57
Occasionally	19	54.29
<b>Factors aggravating pain</b>		
Standing	31	88.57
Sitting	2	5.71
walking	30	85.71
physical effort	27	77.14

Table (3) illustrates low back pain characteristics as stated by the studied nurses' pre-program intervention. All and nearly all of nurses (100% & 97.14%) stated that common location of back pain is lumber vertebra and that work is the main cause of low back pain. More than two third (71.43% & 68.57%) of them suffered from low back pain for more than 5 years and the onset was gradually respectively. Regarding quality of back pain more than one quarter (28.57%) of nurses described back pain as Throbbing, burning&

numbness. Also, 77.14% and 54.29% of them stated that the intensity of back pain was worse with time and was worse late at night respectively. The most

(88.57% & 85.71%) of studied nurse pointed to standing and walking were the factor aggravating pain respectively.

**Table (4):** Differences between nurses' knowledge regarding low back pain and body mechanics pre and post program implementation.

Items nurses' knowledge	Satisfactory level (n=35)				Z	P value
	Pre		Post			
	No.	%	No.	%		
Back pain						
Function of the spine	5	14.29	27	77.14	5.28	0.0000
Factors causing back pain	7	20	29	82.86	5.26	0.0000
Diagnosis	20	57.14	33	94.29	3.62	0.0003
Prevention	10	28.57	30	85.71	4.83	0.0000
Doctor call	6	17.14	32	91.43	6.24	0.0000
Methods of pain management	8	22.86	31	88.57	5.53	0.0000
<b>Total Knowledge regarding back pain</b>	<b>16</b>	<b>45.71</b>	<b>33</b>	<b>94.29</b>	<b>4.43</b>	<b>0.0000</b>
Body mechanics						
Definition	8	22.86	28	80	4.78	0.0000
Aim	7	20	30	85.71	5.51	0.0000
General Principles	15	42.86	32	91.43	4.33	0.0000
Principles with doing physical tasks	10	28.57	28	80	4.32	0.0000
Principles during helping patient positioning, movement and transfer	5	14.29	26	74.29	5.05	0.0000
<b>Total knowledge regarding body mechanics</b>	<b>9</b>	<b>25.71</b>	<b>26</b>	<b>82.86</b>	<b>4.06</b>	<b>0.0000</b>
<b>Total knowledge</b>	<b>10</b>	<b>28.57</b>	<b>31</b>	<b>88.57</b>	<b>5.10</b>	<b>0.0000</b>

Table (4) shows differences between nurses' knowledge regarding low back pain and body mechanics pre and post program implementation. Less than half and about one quarter (45.71% & 25.71%) of them had satisfactory total knowledge pre- program implementation regarding back pain & body mechanics respectively. While, the majority

(94.29% & 82.86%) of them had satisfactory knowledge post-program implementation respectively. Also, there were highly statistically significant difference regarding total knowledge of back pain and body mechanics pre- and post-program implementation ( $Z= 4.43$  &  $p=0.0000$ ) and ( $Z=4.06$ ,  $p=0.0000$ ) respectively

**Table (5):** Differences between nurses' practice regarding low back pain and body mechanics pre and post program implementation.

Items nurses' practice	Satisfactory level (n=35)				Z	P value
	Pre		Post			
	No.	%	No.	%		
<b>General principles of physical task</b>						
Maintain Proper Body Alignment.	0	0	23	65.71	5.85	0.0000
Reaching	17	48.57	25	71.43	1.95	0.0510
Pivoting	3	8.57	24	68.57	5.16	0.0000
Pushing	5	14.29	26	74.29	5.05	0.0000
Pulling	0	0	27	77.14	6.63	0.0000
Lifting and Carrying	4	11.43	28	80	5.76	0.0000
<b>Total</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>65.71</b>	<b>5.85</b>	<b>0.0000</b>
<b>Principles during helping patient positioning, movement in bed</b>						
Transfer from bed to wheel chair	0	0	25	71.43	6.24	0.0000
Transfer from wheel chair to bed	0	0	20	57.14	5.29	0.0000
Transfer from bed to trolley	4	11.43	21	60	4.24	0.0000
Transfer from trolley to bed	4	11.43	22	62.86	4.45	0.0000
<b>Total</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>57.14</b>	<b>5.29</b>	<b>0.0000</b>
<b>Total practice</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>60</b>	<b>5.48</b>	<b>0.0000</b>

Table (5) shows differences between nurses' practice regarding low back pain and body mechanics pre and post program implementation. None of them had satisfactory practice regarding general principles of physical tasks and principles during helping patient

pre-program implementation, while more than half (65.71% & 57.14%) of them had satisfactory practice post program implementation respectively. Also, there were a highly statistically significant differences regarding practice pre and post program

implementation ( $Z = 5.85$  &  $p = 0.0000$ ) and ( $Z = 5.29$ ,  $p = 0.0000$ ) respectively.

**Figure (1):** Difference of low back pain intensity among the studied nurses' pre and post program implementation.

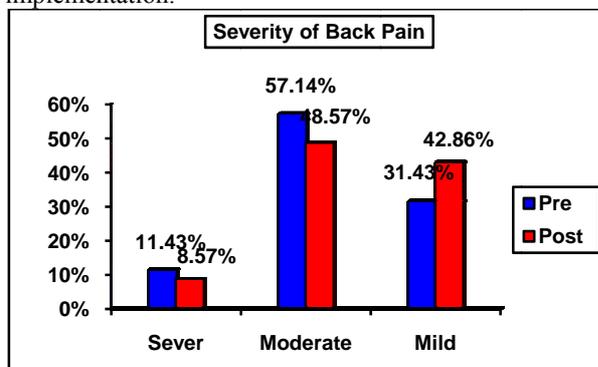


Figure (1) shows that there was no significant difference in intensity of back pain pre & post program implementation ( $X = 2.8$  &  $P > 0.05$ ).

**Figure (2):** Difference of disability level among the studied nurses suffering from low back pain pre and post program implementation.

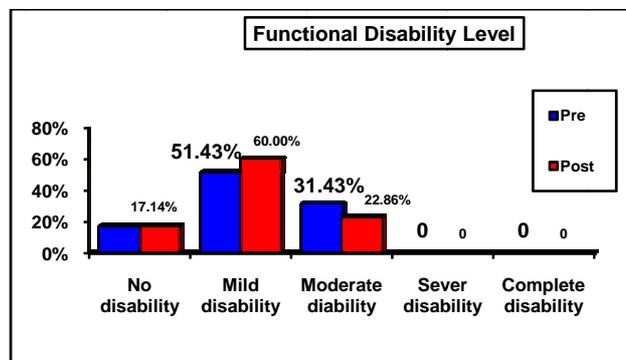


Figure (2) shows disability level among the studied nurses suffering from low back pre and post program implementation. There was no statistically significance difference in functional disability level pre & post implementation ( $X = 2.1$  &  $P > 0.05$ ).

**Table (6):** Correlation between intensity of low back pain among the studied nurses and total knowledge and practice pre program implementation.

Total level of the nurses' knowledge & practice	Total No (35).	Intensity of back pain pre intervention			r	P value
		Mild N = 11	Moderate N = 20	Sever N = 4		
Knowledge						
Satisfactory	10	6	3	1	0.01	0.05 S
Unsatisfactory	25	5	17	3		
Practice						
Satisfactory	0	0	0	0	0.99	0.05 S
Unsatisfactory	35	11	20	4		

Table (6) shows correlation between intensity of low back pain among the studied nurses and total knowledge and practice pre implementation. There were statistically positive correlations between intensity of low back pain and nurses' knowledge and practice regarding body mechanics and back pain pre program implementation. Also, the intensity of back pain increased with unsatisfactory knowledge and practice.

Table (7) shows relation between intensity of low back pain and socio demographic characteristics of the studied nurses. There were statistically significant correlations between intensity of low back pain and age, years of experience, number of children and body mass index. While there were no

statistically significant relations between intensity of low back pain and gender and marital status.

This table (8) reveals work related risk factors affecting nurses' performance in ICU contributed to low back pain. As regard the working environment, not all machinery/workbench at a convenient height and commonly storage areas are too high/low/awkward to reach. As well as, unavailability of lift devices and shower or toilet chair. In-relation to duration, frequency and job design factors, commonly the nurses reported long duration (> 8 hours), fixed static work, insufficient rest or recovery time insufficient number staff member and high work load. Concerning the load factors, all of the nurses reported that, frequently heavy and the patients most commonly dependent

**Table (7):** Relation between intensity of back pain and socio demographic characteristics of the studied nurses.

Socio demographic characteristics	Severity of back pain			Total No (35).	Test	P value
	Mild N = 11	Moderate N = 20	Sever N = 4			
Age 20 - 35 > 35	7 4	3 17	1 3	11 24	r = 0.95	0.05 S
Years of experience < 5 5 - 10 10 - 15 > 15	3 3 0 5	2 2 1 15	0 1 1 2	5 6 2 22	r = 0.89	0.05 S
Number of children None 1 - 3 > 3	4 5 2	1 14 5	0 1 3	5 20 10	r = 0.92	0.05 S
Body math index (BMI) Ideal Over weight Obese	3 5 3	2 11 7	0 2 2	5 18 12	r = 0.73	0.05 S
Gender Female Male	9 2	17 3	2 2	28 7	X=2.585 Df= 2	0.274 NS
Qualification Diploma Technician Bachelor	2 4 5	16 2 2	2 1 1	20 7 8	X=11.22 Df= 4	0.024 NS
Marital status Single Married	7 4	8 12	2 2	17 18	X=2.585 Df= 2	0.274 NS

**Table (8):** Percentage distribution about work related risk factors affecting nurses' performance in ICU contributed to low back pain as stated by the nurses.

Work Related Risk Factors	Total (n=35)	
	Yes	No
The working environment		
Enough room space to move freely in a good posture?		100%
Provision for alternative working positions/seats?		100%
Machinery/workbench at a convenient height?		100%
Is a floor slipper/uneven / littered?		100%
Lightening adequate	100%	
Storage areas not too high/low/awkward to reach?		100%
Presence of lift devices		
Mechanical lift assist equipment		100%
Gait or transfer belt with handles		100%
Slide board		100%
Draw sheets	100%	
Transfer mats	100%	
Shower or toilet chair		100%
Pelvic lift device		100%
Duration, frequency and job design		
Can the task be shared/rotated between staff?	100%	
Long duration (> 8 hours)?	100%	
Fixed, static work?	100%	
Sufficient rest or recovery time		100%
Insufficient number staff member?	100%	
High work load?	100%	
The load		
Frequently heavy?	100%	
The patients most commonly dependent?	100%	

**4. Discussion:**

This quasi-experimental study evaluated the effect educational program on performance of

Intensive Care nurses to decrement the low back pain. Back pain is an acute or chronic condition restricting people's physical activities. Nurses suffer from low

back pain two folds more than ordinary people and lose more working days than usual. It is generally accepted that nursing staff belong to the group of high-risk professions with regard to the occurrence of musculoskeletal injuries, especially in the area of the lumbar spine (**Mayl et al., 2003**). In addition, **Sun et al., 2007** found that the prevalence of low back pain was 87% in ICU nurses.

Regarding the characteristics of the studied nurses. The results of the present study illustrated that about two thirds of them were more than thirty five years old, near half were diploma nurses and none of them attended training course about body mechanics. This was supported with **Roupa et al., 2008** who found that the overwhelming majority of the individuals involved were 30-41 years of age and employed as hospital ward nurses suffering back pain. With respect to their level of education, it should be pointed out that a mere 2.5% of the nurses had completed only basic training.

Also, the results of the present study illustrated that the majority of them were female, married whose more than half of them had one to three child, were overweight and obese and had fifteen years of experience. While **Mohammadi et al., 2002** who found that the highest prevalence was seen in those working less than 3 years (68.3%). Low back pain was more prevalent in females (73.8%) than in males (46.3%). Single individuals had the lowest low back pain prevalence (36.4%). **Crook et al., 2001** found a higher prevalence of overweight or obese participants among nurses suffering from back pain.

Regarding past history of the studied nurses, the results of the present study showed that about one third of them had diabetes. Meanwhile, **Ritzwoller et al., 2006** established that Prevalence estimates for low back pain in patients with diabetes ranged from 4,8% to 5,1%

Also, the study result revealed that only two of the studied nurses were smoker. **Hestback et al., 2006** found that smoking have been found to contribute towards increased back pain levels. While, **Kwon et al., 2006** found no statistically significant correlation between smoking and back pain. This results may be due to the majority of the studied nurses were female and the Egyptian culture not accepted that especially females to be smokers.

Concerning back pain characteristics as stated by the studied nurses pre-intervention, the results of the present study show that all and nearly all of nurses stated that common location of back pain is lumber vertebra and that work is the main cause of back pain respectively. Also, **Halim et al., 2008** found that most respondents claimed the commonest site to develop back pain was at the lower back area.

This could be due to lumbar region received the highest pressure when a person manually lifting.

Regarding non-pharmacological back pain management strategies among the studied nurses pre intervention, the results revealed that all of them rest in bed, the majority of them do relaxation and near half of them do hot compresses. This was congruent with **Stevenson and Hay, 2004** found that the rest was the most use in the treatment of low back pain but stated that it might led to increased disability. This might be due to rest and relaxation in bed and hot compresses causing muscle relaxation and decrease strain of muscles leading to decrease back pain.

Concerning pharmacological back pain management, the majority of them take analgesic. While less than quarter of them didn't take medication for relieve of back pain. This was supported by **Punnett et al., 2005** found that the use of medication are very common among people with back pain. This might be due to medication is the fastest and effective method to relieve pain.

Regarding quality of back pain, the present study revealed that more than quarter of studied nurses described back pain as throbbing, burning & numbness, more than two third of them suffered from back pain for more than 5 years and the onset was gradually. **Mahmoud, 2001** reported that 13.2% described quality of back pain as burning and 30.2% as Throbbing.

The most of studied nurses pointed to their work was the main cause for back pain and standing and walking were the factors aggravating pain. Also, more than half of them stated that the back pain was worse late at night. This goes in the same line with many researchers, among them **Smedley et al., 2004** who found that stress in the workplace is one of the most significant factors leading to the occurrence of lower back pain and **Naude, 2008** who found that sitting, standing and walking for more than six hours per day had the highest percentages of back pain, this may be an indication that a balance should exist between prolonged sitting, standing and walking. It should be noted that lifting and heavy physical duty, including bending and twisting, is part of the occupational activities of hospital employees and thus plays a huge role in the development of back pain.

The result shows that there was no significant difference in intensity of back pain between pre & post-program implementation. This result was congruent with **Hartvigsen et al., 2009** who found in a study the effectiveness of body mechanics in reducing back pain among nurses and significant differences were found between the two groups.

The results of the current study showed that all of the studied nurses had back pain and more than

half of nurses had moderate back pain pre-program implementation while less than half of them had moderate back pain post-program implementation with no significant statistical difference between pre & post program implementation. **Halim et al., 2008** illustrated that, 51% of nurses claimed to have mild pain, 46% claimed to have moderate pain and 72% claimed it was work related. While **Wongthanakit et al., 2005**, stated that about 76.2% of the nurses had low back pain preventive behavior at a moderate level.

Regarding intensity of back pain, the present study revealed that most of the studied nurses had worse back pain with time. That was supported with **Trinkoff et al., 2006** who illustrated that the intensity of the problem of lower back pain depends on the rank and working hours of the individual nurse. While Nevertheless, **Martinelli, et al., 2004** found the incidence of lumbar spine injuries to be lower in those nurses who had been specially trained in how to prevent occupational lower back pain. In the same line, the findings of a study from the University of Canada by **Roupa et al., 2006** showed that the frequency of occurrence of lower back pain and hence personal functionality were influenced by the duties of the individual nurse and in particular by the amount of loads he/she was called upon to lift on a daily basis.

Regarding functional disability level, the present study revealed that about one half of nurses had mild disability and about one third of them has moderate disabilities pre-program implementation, while increased number in mild disabilities to about two third post-implementation and decreased the number to less than one quarter post-implementation in moderated disabilities with no statistically significance difference in functional disability level between pre- & post-program implementation. That was supported with **Punnett et al., 2005** that pointed to low back pain does not directly produce premature mortality but causes substantial disability and has

Regarding back pain knowledge differences of the studied nurses pre- & post intervention, the current result revealed that less than half of them had satisfactory knowledge pre-intervention, while the majority had satisfactory knowledge post intervention and there was a highly statistically significant difference regarding total knowledge of back pain pre and post intervention. This goes in the same line with **Sikiru, 2010** who found that, the general nurses' knowledge scores were lower overall, but increased as they became more experienced in nursing, despite the lack of formal education.

Regarding nurses' knowledge about methods of prevention of back pain, the current study showed that less than one third of the studied nurses had

satisfactory pre intervention while the majority of them had satisfactory knowledge post intervention and there was a highly statistically significant difference between them. This was supported with **Wongthanakit, et al., 2005** who found that practical skills, the encouragement from head nurses, colleagues and family members, positive attitudes about low back pain and insufficient knowledge of low back pain preventive behaviors altogether could explain 35.7% of low back pain preventive behaviors.

Regarding nurses' knowledge about back pain management, the current study showed that less than one quarter of the studied nurses had satisfactory pre intervention while the majority of them had satisfactory knowledge post intervention there was a highly statistically significant difference between them. This was supported with **Adriaansen et al., 2005** who found that educational program had contributed to an increase in knowledge scores in relation to pain management.

Regarding body mechanics knowledge of the studied nurses pre- & post intervention, about one quarter of them had satisfactory knowledge pre intervention, while, the majority of them had satisfactory knowledge post intervention. Also, there was a highly statistically significant difference regarding total knowledge of body mechanics between pre- and post-intervention. **Tinubu, 2010** identified that training in body mechanics and body awareness has been shown to be effective in improving knowledge about these.

The results of the current study showed that, none of the studied nurses had satisfactory practice regarding general principles of physical tasks and principles during helping patient pre intervention, while about two third and more than half of them had satisfactory practice post intervention respectively. Also, there were highly statistically significant differences regarding practice pre and post intervention respectively. These was contradicted with **Engkvist et al., 2001** who mentioned that training in body mechanics and body awareness has been shown to be ineffective.

**Sun et al., 2007** found that heavy and frequent lifting was of most concern especially amongst the nursing staff and highest during observation of lifting and transferring of patients in bed, injection and suctioning. A high percentage of nursing staff (59%) experienced low back pain. Heavy physical duty is a part of the nursing staff's occupational activities and 90% of nursing staff reported that they frequently lifted objects or people during a working day. This can be used to explain why in this study a fairly large number of the nurses (58%) had low back pain.

Regarding practice of the studied nurses according principles during helping patient the result

show that none of them had satisfactory level pre intervention. This finding is in line with **Smith et al., 2005** who established that manual handling of patients is the main cause of back pain among nursing staff. Another explanation may be the possible ignorance with regards to kinetic handling during these nursing activities which includes lifting and transferring patients (**Sun et al., 2007**). It is clear from the literature that frequent and heavy lifting and loading of the spine increases the presence of low back pain. There should be a balance between the weight of the load placed on the spine and the ability of the spine to tolerate the load.

**Naude, 2008**, noted that lifting and heavy physical duty, including bending and twisting, is part of the occupational activities of hospital employees and thus plays a huge role in the development of back pain. Not incorporating the correct kinetic handling skills or working in a bad environment can aggravate the problem.

Concerning nurses' practice regarding general principles of physical tasks, the results of the present study revealed that none of them had satisfactory practice regarding proper body alignment and pulling, while the minority of them had satisfactory practice regarding pivoting, pushing and lifting pre intervention. This was contradicted with **Karahan and Bayraktar, 2009** who found that, the majority of the nurses used body mechanics correctly while sitting (53.6%), standing (58.7%), carrying (64.3%), pulling or pushing (79.4%), moving the patient to the side of the bed without an assistant (53.4%), moving the patient to a sitting position in bed (71.4%) and assisting the patient to a standing position (66.6%). However 57.1% of the nurses lifted and 82% extended incorrectly. The study concludes that some of the nurses do not use body mechanics correctly and the majorities have low back pain. However 57.1% of the nurses lifted and 82% extended incorrectly.

Concerning nurses' practice regarding principles for helping patient, the results of the present study revealed that none of them had satisfactory practice regarding positioning, movement in bed and transferring except the minority of them had satisfactory practice regarding transferring patient from bed to trolley and vice versa pre intervention while level of practice improved post intervention to about near two third regarding positioning, movement in bed and transferring patient from bed to trolley and vice versa and there were highly statistically significant differences regarding practice pre and post intervention respectively. This was go in the same line with **Hartvigsen et al., 2009** that found that the effectiveness of an intensive educational intervention program on reducing back pain

among nurses trained and educated in body mechanics, patient transfer and lifting techniques and significant differences were found between the two groups, and both groups thought that education in patient transfer techniques had been helpful.

**Silverstri, 2010** mentioned that, the factors related to back pain may be socio demographic factors (as age, gender, education level, smoking, body mass index, number of children), physical and work factors (Static and awkward body position, heavy physical work, night shifts, lifting, bending, twisting, pulling, and pushing).

The present study showed a significant positive statistically correlation between age of the studied nurses and severity of back pain which increased above 35 years old. Also, between years of experience and severity of back pain which increased above 15 years of experience. That was supported with **Jeffries et al., 2007** and **Halim et al., 2008** who found that prevalence of back pain is higher among older nurses compared to younger nurses where nurses aged > 40 years old has higher prevalence of backache which is 80.7%, although statistically it is not significant relationship between age and the presence of low back pain. While, **Roupa et al., 2008** found that pain affects all age groups equally pain affects all age groups equally. That may explained that workers at later age have more spinal damage which occurs while they are working. These accumulations of micro trauma fasten the degeneration process which occurs.

The current study shows that no significant statistically relation between gender of the studied nurses and severity of back pain. **Naude, 2008** found that only female gender was associated with increased risk of back pain and pain as a result of injury to the lumbar spine do not differ according to gender. Also **Mohammadi et al., 2002** found that back pain was more prevalent in females (73.8%) than in males (46.3%). In addition, it was congruent with **Schneider et al., 2005** who established that the chances of developing low back pain with female were significantly higher when compared to males.

The present study showed significant statistically relation between severity of back pain and qualification of the studied nurses which increased among diploma nurses. This may be due to diploma nurses have less knowledge and work more. That was contradicted with **Roupa et al., 2008** that found that back pain influences all levels of education equally.

The present study illustrated that no significant statistically relation between severity of back pain and marital status. While there was a significant statistically positive correlation between severity of

back pain and number of children of the studied nurses. This was supported with **Mogren, 2006** who found that low back pain with multiple pregnancy is another common problem and 72% of pregnant women with low back pain take sick leave as a result of low back pain. Also, **Schneider et al., 2005** established that the chances of developing low back pain if you were being married increased more especially with frequent pregnancy.

The present study showed that significant statistically positive correlation between severity of back pain and body mass index of the studied nurses which most of them were overweight and obese. This was supported by **Crook et al., 2001** that found that higher prevalence of back pain might was among overweight or obese participants, while, there was no correlation between BMI and low back pain. Also, **Naude, 2008** found that BMI was not associated with low back pain. **Janke et al., 2007** stated that the relationship between obesity and back pain may not be direct, but may be influenced by lifestyle choices and being sedentary.

The present study showed that there was a statistically positive correlation between severity of back pain and nurses' knowledge and practice regarding body mechanics and back pain pre intervention. Also, the severity of back pain increased with unsatisfactory knowledge and practice. This was supported by **Waters et al., 2007 ; Brown, 2009 ; Karahan and Bayraktar, 2009** who reported that repetitive nursing care that involves high-risk manual tasks such as lifting, transferring, repositioning patients pushing, lifting and moving heavy equipment put nurses at an increased risk for developing sprains and strains to the lower back, neck, shoulders, wrists, and knees and there was significant statistically relation among them.

There are certain work related risk factors that seem to be associated with the risk of low back pain. The working condition is considered as a main cause of the back pain. This may be due to incorrect hospital work system. The result of current study revealed some work related risk factors affecting nurses' performance in ICU contributed to low back pain.

As regard the working environment, no enough room space to move freely in a good posture, not all machinery/workbench at a convenient height and commonly storage areas are too high/low/awkward to reach. This was supported with **Nelson and Fragala, 2004** who stated that the working environment is a risk factor, Health care workers may be forced to assume awkward postures because rooms and other spaces are small in size, crowded or have obstructions. These factors may also prevent getting help from other employees or using assist equipment.

Poorly maintained floors can cause slipping, tripping and abrupt movements when lifting or moving patients, residents or equipment

As well as, the result of current study revealed that unavailability of lift devices and shower or toilet chair were work related risk factors affecting nurses' performance in ICU contributed to low back pain. **Nelson and Baptiste, 2004** stated that, the ambulation lifts support a patient or resident during ambulation. The individual pushes the lift along as they walk. A strap in the back prevents them from falling backwards. Also, the draw sheets or incontinence pads commonly used to slide patients or residents between horizontal surfaces, or for repositioning in beds or chairs. To ensure an adequate grip, the provider should roll up the edges. This will also reduce forceful exertions and awkward upper body postures. The sheets or pads should be used in combination with friction-reducing devices such as slide boards, slippery sheets, plastic bags, or low friction mattress covers.

In-relation to duration, frequency and job design factors, the current study revealed that commonly the nurses reported long duration (> 8 hours), fixed, static work, insufficient rest or recovery time insufficient number staff member and high work load. Concerning the load factors, all of the nurses reported that, frequently heavy and the patients most commonly dependent. **Nelson et al. (2003b)** emphasized on, the nursing shortage has been exacerbated by occupational injuries and related disabilities. It is estimated that each year 12% of nursing personnel will consider a job transfer to decrease risk and another 12%-18% will actually leave the nursing profession due to chronic back pain. Meanwhile, **Owen and Staehler, 2003** stated that, the high-risk patient handling tasks are characterized by significant biomechanical and postural stressors imposed on the caregiver. Not surprisingly, factors such as the patient's weight, transfer distance, confined workspace, unpredictable patient behaviour, and awkward positions such as stooping, bending, and reaching significantly contribute to the risk of performing patient handling tasks.

### Conclusions:

Less than half and about one quarter of the studied nurses had satisfactory total knowledge pre-program implementation regarding back pain & body mechanics respectively. While, the majority of them had satisfactory knowledge post-program implementation. Also, there were highly statistically significant difference regarding total knowledge of back pain and body mechanics pre- and post-program implementation. There was no statistically significance difference in functional disability level

pre & post implementation. There was no significant difference in intensity of back pain pre & post program implementation. There were statistically positive correlations between intensity of low back pain and nurses' knowledge and practice regarding body mechanics and back pain pre program implementation. There were statistically significant correlations between intensity of low back pain and age, years of experience, number of children and body mass index pre program implementation. While there were no statistically significant relations between intensity of low back pain and gender and marital status pre program implementation.

### Recommendation

1. Health education on proper posture and correct lifting techniques should be introduced in the workplace to reduce the burden of low back pain among the nurses working in different setting
2. Guidelines for preventing low back pain should be provided and the nurses should encourage and support the practice of low back pain preventive measures to prevent the injury and promote a better quality of life of the nursing personnel.
3. The study should be replicated on large sample and different hospitals setting in order to generalize the results.
4. Developing a simplified and comprehensive booklet including guidelines about correct lifting and handling techniques.
5. Further study is recommended to evaluate the association between low back pain and its associated factors

### Implication

The present study has implication for nursing practice and education. For practice, the intensive care nurses play an important role in caring for the patients through expert efficient care. So, the results of the study could be used to determine target areas for development of procedure and educational program regarding to the principles of body mechanics, proper lifting, transferring and handling the patients to assist themselves to live better without suffering from low back pain.

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