

The Effect of Body Mechanics Training Program for Intensive Care Nurses in Reducing Low Back Pain

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Abstract: Low back pain remains a common and costly problem among the nursing profession. Many studies report higher prevalence of back pain and occupational back injuries for nurses compared with other occupational groups. **This study aimed to evaluate the effect of body mechanics training program for intensive care nurses to reduce back pain.** A quasi- experimental research design was conducted in Emergency Unit , Neurological Intensive Care Unit at Tanta University Hospital and oncology intensive care unit at Tanta Cancer Institute affiliated to Ministry of Health .A purposive sample of 42 nurses were included in the study .Three different tools were used to collect data. **Tool I :** Interview questionnaires sheet : It consists of two parts **Part one:** concerned with sociodemographic characteristics ,**Part two:** assess nurses 'knowledge regarding low back pain and body mechanics .**Tool II** A Self Administered back pain structured Questionnaire Sheet for assessment of back pain ,**Tool III** :An Observational checklist :which was developed to observe using body mechanic principles among the studied participants while sitting, standing, walking, bending , lifting and patients handling . Data collection was done pre, post implementation from August 2014 to February 2015. **Result:** revealed that about two third of them 65% had low back pain for 8-30 days , majority of them 77.5% , 80% had reducing in work and leisure activities related to low back pain and half of them 50% were seen by physiotherapist. There were highly statistically significant difference regarding total knowledge about back pain, body mechanics knowledge and performance pre- and post- program implementation $p=0.0000$.

Conclusion& Recommendations: revealed that there are differences between intensity, quality, duration and rhythms of low back pain for studied nurses in pre and post program implantation. The study should be replicated on large sample and different hospitals setting in order to generalize the results.

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Key words: low back pain, body mechanics, training program,

I. Introduction

Musculoskeletal disorders are important public health problems. Among them are back conditions, a complex problem for certain occupational groups, such as nursing personnel⁽¹⁾. Prevalence study researches defined low back pain as an uncomfortable sensation in the lumbar and buttock regions originating from neurons near or around the spinal canal that are injured or irritated by one or more pathological process.⁽²⁾

On an average, 37% of the low back pain (LBP) cases occur due to work-related constructs. This situation is changing between 12% and 38% in woman, and between 31% and 45% in men.^(3,4) Although LBP is not a cause of death, its incidence is quite high and it is an important disease burden for the society⁽⁵⁾ According to the World Health Organization, 800,000 disability adjusted Life Years are lost because of the LBP problem in the world⁽⁶⁾. One-third of the work loss occurring due to work accidents and occupational diseases is happening because of these disease groups⁽⁷⁾. In the European Low Back Pain Prevention Guide (2004), it was reported that the work absence ratios are high because of the temporary or chronically LBP.⁽⁸⁾

The prevalence study **stated** that the most common causes of low back pain are mechanical or secondary. Mechanical causes of low back pain include dysfunction; of the musculoskeletal and ligamentous structure. Pain can originate from the disc, annulus, facet joint and muscle fibers. Secondary causes include metabolic disease, referred pain from other sources, fibromyalgia and psychogenic pain so that its management requires treatment for the underlying condition.^(9,10) Most low back pain is caused by one of many musculoskeletal problems, including acute lumbosacral strain, unstable lumbosacral ligaments and weak muscles, osteoarthritis of the spine, spinal stenosis, intervertebral disk problems, and unequal leg length. Obesity, postural problems, structural problems, stress, overstretching of the spinal supports, and occasionally depression may also result in back pain^(11,12).

Nursing was in the past identified as an occupation whose practitioners were at risk of developing low back pain LBP⁽¹³⁾. The 1-year prevalence of low back pain in nurses has been reported to be between 45% and 74%.⁽¹⁴⁾ In one study, the lifetime prevalence of low back pain was 82.03%, and the point prevalence of low back pain among 247 nurses was 43.78%⁽¹⁵⁾. Another study involving 3,169 health care workers, including non-

specialized nurses, intensive care nurses, surgical nurses, and x-ray technologists, showed the prevalence rate for low back pain to be 76% ⁽¹⁶⁾

Providing nursing care is related to frequent flexion and extension of the body, including manual lifting. Activities connected to lifting and transferring patients represent major physical demands for nursing personnel, which in many cases result in injuries. ⁽¹⁷⁾

Biomechanical research revealed the human effort in manual lifting, change of patient position in bed, patient transfer from bed to wheelchair or stretcher, patient transfer from wheelchair to toilet and vice versa as major risks for developing LBP. ⁽¹⁸⁾ Therefore it seems reasonable that nursing personnel should remain in good physical condition, not being overweight, with a supple and firm body. Although body mass index (BMI) was not clearly. ⁽¹⁹⁾

"Body mechanics" is a two-word phrase used to describe the movements we make each day during normal activities, including lying in bed, sitting, standing, lifting, pulling, pushing and walking. Good body mechanics will help remedy and prevent future back problems, while bad body mechanics contribute to back problems and other muscle and bone problems. ⁽²⁰⁾

Body mechanics can be both good and bad and can have direct effects on back pain. Jobs of healthcare team members require pushing, pulling, carrying and lifting during patient care activities. Prolonged performance of these actions leads to muscles injuring the patients as well as nurses. To avoid these problems, proper body mechanics should be used when completing a task. Improper body mechanics can cause severe musculoskeletal strains and fatigue thereby increasing the risk of injury. Proper body mechanics should be consciously used in performing a physical activity ⁽²¹⁾. A nurse should have thorough scientific knowledge of body mechanics and its proper use in their daily practice, muscles which cannot provide the best support and strength are forced into exertion, strain, injury, fatigue of the body tissue ⁽²²⁾. 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. ⁽²³⁾

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. ⁽²⁴⁾ 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 ⁽²⁵⁾.

Low back pain remains a common and costly problem among the nursing profession. Many studies report higher prevalence of back pain and occupational back injuries for nurses compared with other occupational groups ⁽²⁶⁾. In Egypt, back pain affects 60% of the population and Nurses have been reported to have one of the highest levels of back work-related injuries in all occupational groups. ⁽²⁷⁾

Aim of the study

To evaluate the effect of body mechanics training program for intensive care nurses to reduce back pain

Hypotheses:

1. The nurses' knowledge and practices will improve after educational and training program
2. The nurse who will use body mechanics principles will experience improve in low back pain

II. Subjects and Methods

Research design

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

Settings

The study was conducted in Emergency Unit, Neurological Intensive Care Unit at Tanta University Hospital and oncology intensive care unit at Tanta Cancer Institute affiliated to Ministry of Health.

Sampling:

A purposive sample of nurses was taken from the previously mentioned study settings. The total number was 42 nurses were included in the study, 10 nurses from Emergency Unit and 12 nurses from Neurological Intensive Care Unit at Tanta University Hospital and 20 nurses from two oncology intensive care units at Tanta Cancer Institute. Nurses included in this study were female only, with different age, educational levels and years of experience and who had suffered episodes of low back pain during last year and willing to participate in the study. Two nurses were excluded from the study, one nurse had sick leave and other nurse had surgery during the implantation phase of study, the sample size was 40 nurses.

Tools for data collection

Three different tools were used to collect data for this study. They included Interview questionnaires sheet, a self administered back pain structured questionnaire sheet and a body mechanics observational checklists.

1. Tool I : Interview questionnaires sheet : It consists of two parts

Part one: The first part was concerned with sociodemographic characteristics of studied nurses such as age, qualification, years of experience, marital status, number of children, height, weight, body mass index, way of transporting , general health condition , past medical history and attendance of related training courses.

Part two: It was developed by the researchers based on the related literature to assess nurses 'knowledge regarding low 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.

2- Tool II A Self Administered back pain structured Questionnaire Sheet:

It was written in a simple Arabic language **for assessment of back pain it consisted of two parts:**

Part one : it was adopted from Mc Caffery et al 1999 ⁽²⁸⁾

It was used to initial pain assessment regarding back pain it included description of pain characteristics (when pain start, quality, location, onset, frequency , duration, time of worse pain, difference in intensity with time, rhythm , tolerance, factors aggravating pain, pain management strategies).

Part two : It was adopted from **Kuorinka** et al ⁽²⁹⁾ Standardized Nordic questionnaire for analysis of musculoskeletal symptoms in an ergonomic and occupational health The reliability and validity of the questionnaires has been investigated .The general questionnaire shows a body map diagram divided into nine anatomic regions and asks about the presence of physical troubles including ache, pain, discomfort etc. For the past 12 months and past 7 days in each of the body areas. It also includes grades of severity by using a measure of functional status: "Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?" All answers are in the form of a dichotomous yes/no response. It took about 15-20 minute to fill out the questionnaire.

2. Tool III :An Observational checklist :which was developed to observe using body mechanic principles among the studied participants while sitting, standing, walking, bending and lifting , patients handling (including positioning and moving patient in bed, transfer patient from bed to wheelchair ,transfer patient from bed to trolley. The observational checklist was estimated according to **Chansirinukor et al,** ⁽²⁶⁾ and **Ozcan,** ⁽²⁷⁾ scales. It was scored as 2 (for using the principles of body mechanic and maintaining them), 1 for using principles of body mechanic but not maintaining them) and 0 (for not using them at all). The total score was calculated by summing up all items and dividing them into percentages.

- All tools were used pre program implementation. Tool 1 part 11, tool 11 and tool 111 were used immediately post program and after three months for follow up .

Scoring systems

1. Pain Assessment with the "0—10 Numeric As regard intensity of low 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.

2. Assessment sheet for measuring weight and height and calculate the body mass index (BMI) according to the **WHO (2000)**⁴ classification: normal BMI= 18.5-24.9 kg/ M2, overweight BMI= 25.0-29.9 Kg/M2, obesity BMI= 30.0-39.9 kg/M2 and the extreme obesity BMI=40.0kg/M2.

3. knowledge questionnaire, total score ranged from (0-20). It described as follows; less than 50% was graded as poor, 50% to less than 75% score was graded as fair and more than 75% score was graded as good.

4. performance checklist, total score ranged from (0-166). The scoring system described as: total score \leq 50% considered Unsatisfactory, from 50% to $<$ 75% considered Satisfactory, and \geq 75 considered good practice level.

Statistical analysis:

- The analysis was performed using statistical software SPSS version 18.
- For quantitative data, the range, mean and standard deviation were calculated.
- For qualitative data, a comparison between one group before and after intervention was done by using Chi-square test (χ^2).

- For a comparison between more than two means, the F-value of ANOVA was calculated.
- Significance was adopted at $P < 0.05$ for interpretation of results of tests of significance.
- Correlation was done by using person correlation test.

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.

An official permission to conduct the study was obtained from directors of Tanta University Hospitals and Tanta Cancer Institute affiliated to Ministry of Health. The participant nurses were complaining from low back pain and fulfilled the inclusion criteria were involved in this study. A complete description of the purpose and nature of the study was approached to the participants and the consent was taken from each of them

Procedures of the study:

Data collection was done pre, post implementation from August 2014 to February 2015. The research data were collected using (1) questionnaire of low back pain (2) nurses' knowledge assessment sheet (3) observational check list for nurses' performance of body mechanics 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. 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 40, divided into eight main groups according to study settings, and then implementation of the program was carried out. The duration of each session took approximately 30-45 minutes, 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.

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. It was written in Arabic language.^{3,4,8,11,13} 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 expertises in Medical Surgical Nursing at faculty of Nursing for the content validity.

III-Results :

Table(1):Distribution of the studied nurses according to their sociodemographic data:

| sociodemographic characteristics | | Studied sample | |
|--|-----------------|----------------|-------|
| | | (n = 40) | |
| | | N | % |
| Age (years) | From 18-25 | 30 | 75.0 |
| | From 26-40 | 6 | 15.0 |
| | From 41-60 | 4 | 10.0 |
| Marital status | single | 19 | 47.5 |
| | married | 21 | 52.5 |
| Level of education | Diploma | 30 | 75.0 |
| | High education | 10 | 25.0 |
| No. of children | No children | 27 | 45.5 |
| | 1 -3 Childs | 5 | 12.5 |
| | > 3 Childs | 8 | 20.0 |
| Job | Head nurse | 7 | 17.5 |
| | Practical Nurse | 33 | 82.5 |
| Years of experience | < 5 | 30 | 75.0 |
| | 5-10 | 6 | 15.0 |
| | > 15 | 4 | 10.0 |
| training course of body mechanics | Yes | 0 | 0 |
| | No | 40 | 100.0 |
| Hours of working per day | 5-8 hrs | 16 | 40.0 |
| | 9-12 hrs | 24 | 60.0 |
| Nurse patients ratio | 2 | 6 | 15.0 |
| | 3 | 23 | 57.5 |
| | 4 | 7 | 17.5 |
| | 5 | 4 | 10.0 |

Table 1 show the sociodemographic characteristics of studied nurses, the majority of studied group (75.0%) ranged from 18-35 years old and more than half of them 52.5 % were married and about half of them had no children . in relation to level of education and years of experience majority of them had diploma 75.0% and had years of experience less than 5 years . all studied nurses had no training course of body mechanics . 60% of them have worked 9-12 hours per day . In relation to nurse patients ratio, it was 57% of them provided care for three patients per day.

Table 2: Distribution of studied sample according to past medical history and general conditions of health:

| Past medical history and general conditions of health | | Studied sample (n = 40) | |
|---|----------------------------|----------------------------|------|
| | | N | % |
| Past medical history | Nothing | 10 | 25.0 |
| | Diabetes | 1 | 2.5 |
| | hypertension | 7 | 17.5 |
| | arthritis | 4 | 10.0 |
| | Injuries | 1 | 2.5 |
| | hypertension and arthritis | 3 | 7.5 |
| | Others | 14 | 35.0 |
| General condition of health | very good | 14 | 35.0 |
| | Good | 20 | 50.0 |
| | Moderate | 6 | 15.0 |

Table 2 illustrate past medical history, half of nurses had good general condition of health and only 15% had moderate general condition of health .

Table 3: Distribution of studied sample according to Standardized Nordic questionnaire:

| Items of Standardized Nordic questions | | Studied sample (n = 40) | |
|--|-------------------|----------------------------|-------|
| | | N | % |
| 1. Have low back trouble | yes | 40 | 100.0 |
| | No | 0 | 0 |
| 2. Hospitalized because low back trouble | yes | 0 | 0.0 |
| | No | 40 | 100.0 |
| 3. Changing job or duties because low back trouble | yes | 29 | 72.5 |
| | No | 11 | 27.5 |
| 4. Total length time during last 12 month had low back trouble | 8-30 days | 26 | 65.0 |
| | More than 30 days | 14 | 35.0 |
| 5. Low back trouble Reducing work activity | yes | 31 | 77.5 |
| | No | 9 | 22.5 |
| 6. Low back trouble reducing leisure activity. | yes | 32 | 80.0 |
| | No | 8 | 20.0 |
| 7. Total length of time low back trouble Prevent normal work during last 12 months | 0 days | 1 | 2.5 |
| | 7 days | 9 | 22.5 |
| | 8-30 days | 23 | 57.5 |
| | More than 30 days | 7 | 17.5 |
| 8. Seen by physiotherapist, chiropractor | Yes | 20 | 50.0 |
| | No | 20 | 50.0 |

Table 3 : illustrate distribution of studied sample according to Standardized Nordic questionnaire 100% of studied nurse have low back pain , about two third of them 65% had LBP for 8-30 days , majority of them 77.5% , 80% had reducing in work and leisure activities related to LBP and half of them 50% were seen by physiotherapist or chiropractor.

Table (4): Comparison between the studied nurses according to pain assessment throughout period of the study.

| Items | Pre (n=40) | | Immediately (n=40) | | Three month post (n=40) | | χ^2 P | |
|-----------------------------|---------------------|----|--------------------|----|-------------------------|----|---------------|------------------|
| | N | % | N | % | N | % | | |
| Location | No | 0 | 0 | 24 | 60 | 0 | 0 | 40.009 0.000* |
| | Cervical | 0 | 0 | 1 | 2.5 | 0 | 0 | |
| | Lumber | 36 | 90 | 13 | 32.5 | 32 | 80 | |
| | Sacral | 4 | 10 | 2 | 5 | 6 | 15 | |
| | cervical and lumber | 0 | 0 | 0 | 0 | 2 | 5 | |
| Onset of back pain | No | 0 | 0 | 24 | 60 | 0 | 0 | 40.860 0.000* |
| | Sudden | 3 | 7.5 | 8 | 20 | 13 | 32.5 | |
| | Gradually | 37 | 92.5 | 8 | 20 | 27 | 67.5 | |
| Intensity | No pain | 0 | 0 | 14 | 35 | 0 | 0 | 60.111 0.000* |
| | Mild | 8 | 20 | 23 | 57.5 | 21 | 52.5 | |
| | Moderate | 26 | 65 | 1 | 2.5 | 16 | 40 | |
| | Sever | 6 | 15 | 2 | 5 | 3 | 7.5 | |
| Quality of pain | No | 0 | 0 | 14 | 35 | 13 | 32.5 | 94.806 0.000* |
| | Sharp | 6 | 15 | 0 | 0 | 3 | 7.5 | |
| | Aching | 27 | 67.5 | 3 | 7.5 | 22 | 55 | |
| | Throbbing | 0 | 0 | 21 | 52.5 | 0 | 0 | |
| | Cramping | 0 | 0 | 2 | 5 | 0 | 0 | |
| | Shooting | 4 | 10 | 0 | 0 | 2 | 5 | |
| Time of the worse back pain | Sharp and aching | 3 | 7.5 | 0 | 0 | 0 | 0 | 16.528 0.002* |
| | No pain | 0 | 0 | 14 | 35 | 8 | 20 | |
| | In the morning | 16 | 40 | 10 | 25 | 12 | 30 | |
| Rhythmcity of back pain | In the evening | 24 | 60 | 16 | 40 | 20 | 50 | 57.474 0.000* |
| | No pain | 0 | 0 | 14 | 35 | 0 | 0 | |
| | Intermittently | 1 | 2.5 | 0 | 0 | 1 | 2.5 | |
| | Nearly Constantly | 6 | 15 | 0 | 0 | 6 | 15 | |
| | constantly | 15 | 37.5 | 20 | 50 | 15 | 37.5 | |
| | Occasionally | 0 | 0 | 4 | 10 | 0 | 0 | |
| signs and symptoms | After shifts | 18 | 45 | 2 | 5 | 18 | 45 | 4.379 0.626 |
| | Nothing | 35 | 87.5 | 39 | 97.5 | 36 | 90 | |
| | Nausea | 1 | 2.5 | 0 | 0 | 1 | 2.5 | |
| | Somnolence | 1 | 2.5 | 0 | 0 | 0 | 0 | |
| | Dizziness | 3 | 7.5 | 1 | 2.5 | 3 | 7.5 | |

Significant at level P< 0.05

Table (4): continue: Percentage distribution about back pain characteristics as stated by the studied nurses preprogram intervention.

| Items | | (n=40) | |
|-----------------------|--|--------|------|
| | | N | % |
| Factors increase pain | Cold | 10 | 25 |
| | standing long time | 20 | 50 |
| | sitting long time | 22 | 55 |
| | Cold | 25 | 62.5 |
| | high heel | 20 | 50 |
| | patient' positing or turning & Lifting | 33 | 82.5 |
| Factors relive pain | Relaxation | 20 | 50 |
| | sitting with support low back | 10 | 25 |
| | Others | 3 | 7.5 |
| | Warm compresses | 10 | 25 |
| | message | 20 | 50 |
| | analgesic & anti-inflammatory | 30 | 75 |
| | binder | 12 | 40 |

Table 4 : Illustrated the characteristics of pain the results revealed that 90% of them had pain in lumber region in pre-management. 60% of them had no onset of LBP in immediate post management.. while tow third of them 65 % had moderate pain in pre- management. 57.5%, 52.5% of them had mild pain in immediate and follow up management respectively. More than two third of them 67.5% and 55% had aching pain in pre management, and in follow up management .while 52.5% had throbbing after immediate post management. .the results showed that 60%, 40% and 50% of studied nurses had the worst time of back pain in the evening. In relation to factors increase pain, the study revealed that majority of nurses 82.5% had LPB due to patient turning and positioning and 62%, and 50 % of them had LPB related to cold , wearing shoes with high heels. In relation to factors decrease pain 75% of them mentioned analgesic and anti-inflammatory relieved pain, while 50% of them mentioned relaxation and massage relieved LPB.

Table (5): Comparison between the studied nurses according to their knowledge regarding low back pain throughout period of the study:

| Items | Mean ± SD | | | F | P |
|--|------------|------------|------------------|-------|--------|
| | Pre-test | Immediate | Three month post | | |
| 1. The spin or vertebral column extends from the base of the skull to the pelvis | 0.45±0.504 | 0.78±0.423 | 0.72±0.452 | 5.768 | 0.004* |
| 2. The 33 vertebra are divided into 7 cervical, 12 thoracic, 5 lumber, 5 sacral and 4 coecyx | 0.42±0.501 | 0.50±0.506 | 0.45±0.504 | 4.128 | 0.003* |
| 3. Relieving pressure and preventing friction. | 0.52±0.506 | 0.65±0.483 | 0.60±0.496 | 0.646 | 0.526 |
| 4. Back pain result from improper body movement | 0.45±0.504 | 0.58±0.501 | 0.50±0.506 | 6.325 | 0.002* |
| 5. Back pain is result from lifting heavy objects | 0.65±0.483 | 0.78±0.423 | 0.65±0.483 | 0.968 | 0.383 |
| 6. Factors leading back pain | 0.85±0.362 | 0.90±0.304 | 0.80±0.405 | 0.775 | 0.463 |
| 7. Initial diagnosis of low back pain | 0.62±0.490 | 0.75±0.439 | 0.68±0.474 | 7.652 | 0.000* |
| 8. Prevention of low back pain | 0.58±0.501 | 0.72±0.452 | 0.62±0.490 | 1.006 | 0.369 |

Significant at level P< 0.05

Table 5: shows differences between nurses' knowledge regarding low back pain and body mechanics pre, immediate post program implementation an follow up test. there were highly statistically significant difference regarding total knowledge about back pain and body mechanics pre- and post- program implementation $p=0.0000$) While regarding relieving pressure and preventing friction, back pain is result from lifting heavy objects, factors leading back pain and Prevention of low back pain the difference was not significant.

Table (6): Comparison between the studied nurses according to their knowledge regarding body mechanic throughout period of study

| Items | Mean ± SD | | | F | P |
|---|-------------------|--------------------|--------------------|---------------|---------------|
| | Pre-test | Immediate | Three month post | | |
| 1. Basic rules of body mechanics | 0.40±0.496 | 0.40±0.496 | 0.52±0.506 | 1.638 | 0.199 |
| 2. Purposes | 0.48±0.506 | 0.78±0.423 | 0.68±0.474 | 4.245 | 0.017* |
| 3. When lifting, pushing | 0.50±0.506 | 0.75±0.439 | 0.68±0.474 | 2.931 | 0.057 |
| 4. Prevention of injury if patient | 0.62±0.490 | 0.92±0.267 | 0.85±0.362 | 6.613 | 0.002* |
| 5. Protection of self | 0.45±0.504 | 0.80±0.405 | 0.78±0.423 | 7.666 | 0.001* |
| 6. Reposition resident in bed | 0.40±0.496 | 0.82±0.385 | 0.80±0.405 | 12.224 | 0.000* |
| 7. keep the object close to the body when lifting | 0.38±0.490 | 0.75±0.439 | 0.72±0.452 | 8.279 | 0.000* |
| 8. keep the feet apart to maintain the balance | 0.32±0.474 | 0.75±0.439 | 0.75±0.439 | 11.852 | 0.000* |
| 9. You can use abdominal muscles for pooling or lifting | 0.32±0.474 | 0.72±0.452 | 0.72±0.452 | 10.095 | 0.000* |
| 10. Bending hips/knees and get close to object | 0.40±0.496 | 0.75±0.439 | 0.52±0.506 | 5.438 | 0.006* |
| 11. Walker, can, and gait belt is assistive devices | 0.40±0.496 | 0.78±0.423 | 0.75±0.439 | 8.545 | 0.000* |
| 12. Lock bed wheels & wheel chair wheels before moving | 0.48±0.506 | 0.82±0.385 | 0.78±0.423 | 7.380 | 0.001* |
| Total Knowledge score | 9.70±2.700 | 14.88±4.077 | 13.60±4.454 | 19.937 | 0.000* |

Significant at level P< 0.05

Table 6 : shows differences between nurses' knowledge regarding low back pain and body mechanics pre , immediate post program implementation an follow up test there were highly statistically significant difference regarding total knowledge about back pain and body mechanics pre- and post- program implementation ($p=0.0000$) while regarding basic rules of body mechanics, when lifting, pushing the difference was not significant

Table (7): comparison between studied sample according to nurses' performance regarding body mechanic throughout period of study:

| Items | | Pre (n=40) | | Immediately (n=40) | | Three month post (n=40) | | χ^2 P |
|---|--------------|------------|------|--------------------|------|-------------------------|------|------------------|
| | | N | % | N | % | N | % | |
| 1. Standing | poor | 28 | 70 | 2 | 5 | 5 | 12.5 | 68.527 0.000* |
| | Satisfactory | 6 | 15 | 2 | 5 | 10 | 25 | |
| | Good | 6 | 15 | 36 | 90 | 25 | 62.5 | |
| 2. Sitting | poor | 31 | 77.5 | 2 | 5 | 15 | 37.5 | 79.624 0.000* |
| | Satisfactory | 8 | 20 | 5 | 12.5 | 5 | 12.5 | |
| | Good | 1 | 2.5 | 33 | 82.5 | 20 | 50 | |
| 3. Walking | poor | 38 | 95 | 3 | 7.5 | 15 | 37.5 | 88.807 0.000* |
| | Satisfactory | 2 | 5 | 7 | 17.5 | 7 | 17.5 | |
| | Good | 0 | 0 | 30 | 75 | 18 | 45 | |
| 4. Lifting | poor | 32 | 80 | 6 | 15 | 14 | 35 | 53.198 0.000* |
| | Satisfactory | 8 | 20 | 13 | 32.5 | 14 | 35 | |
| | Good | 0 | 0 | 21 | 52.5 | 12 | 30 | |
| 5. Lift an Object From the Floor | poor | 29 | 72.5 | 6 | 15 | 14 | 35 | 39.332 0.000* |
| | Satisfactory | 3 | 7.5 | 7 | 17.5 | 14 | 35 | |
| | Good | 8 | 20 | 27 | 67.5 | 12 | 30 | |
| 6. Positioning the client | poor | 24 | 60 | 9 | 22.5 | 15 | 37.5 | 17.683 0.042* |
| | Satisfactory | 13 | 32.5 | 11 | 27.5 | 10 | 25 | |
| | Good | 3 | 7.5 | 20 | 50 | 15 | 37.5 | |
| 7. moving from sitting to standing | poor | 32 | 80 | 5 | 12.5 | 9 | 22.5 | 44.160 0.000* |
| | Satisfactory | 8 | 20 | 10 | 25 | 8 | 20 | |
| | Good | 0 | 0 | 25 | 62.5 | 23 | 57.5 | |
| 8. Moving from a lying to standing | poor | 33 | 82.5 | 8 | 20 | 15 | 37.5 | 64.510 0.000* |
| | Satisfactory | 7 | 17.5 | 1 | 2.5 | 1 | 2.5 | |
| | Good | 0 | 0 | 31 | 77.5 | 24 | 60 | |
| 9. Moving from the floor to sitting or standing | poor | 30 | 75 | 4 | 10 | 9 | 22.5 | 40.446 0.000* |
| | Satisfactory | 10 | 25 | 9 | 22.5 | 9 | 22.5 | |
| | Good | 0 | 0 | 27 | 67.5 | 22 | 55 | |
| 10. Transferring patient from bed to bed / trolley | poor | 19 | 47.5 | 2 | 5 | 10 | 25 | 58.966 0.000* |
| | Satisfactory | 13 | 32.5 | 2 | 5 | 4 | 10 | |
| | Good | 8 | 20 | 36 | 90 | 26 | 65 | |
| 11. Transferring patient from bed to the wheelchair | poor | 25 | 62.5 | 7 | 17.5 | 16 | 40 | 35.662 0.000* |
| | Satisfactory | 15 | 37.5 | 14 | 35 | 14 | 35 | |
| | Good | 0 | 0 | 19 | 47.5 | 10 | 25 | |
| 12. L. Transferring from Wheelchair | poor | 24 | 60 | 11 | 27.5 | 16 | 40 | 16.333 0.045* |
| | Satisfactory | 16 | 40 | 11 | 27.5 | 11 | 27.5 | |
| | Good | 0 | 0 | 18 | 45 | 13 | 32.5 | |

Table 7: shows comparison between studied sample according to their performance regarding body mechanic as Standing, sitting, walking, lifting, positioning, moving and transferring the client throughout period of study. There is highly significance difference regarding pre- program, immediate post program and three months post program $p= 0.0000$

Table (8): Comparison between total knowledge and total performance scores of low back pain among studied sample throughout period of the study.

| Items | | Pre (n=40) | | Immediately (n=40) | | Three month post (n=40) | | χ^2 P |
|---------------------------------|-------------|---------------|----|-----------------------|----|-------------------------------|------|------------------|
| | | N | % | N | % | N | % | |
| Total nurses' knowledge score | Unsatisfied | 20 | 50 | 4 | 10 | 5 | 12.5 | 41.251 0.000* |
| | Satisfied | 20 | 50 | 36 | 90 | 35 | 87.5 | |
| Total nurses' performance score | Unsatisfied | 32 | 80 | 10 | 25 | 18 | 45 | 85.000 0.000* |
| | Satisfied | 8 | 20 | 30 | 75 | 22 | 55 | |

Table 8: Comparison between total knowledge and total performance scores of low back pain among studied sample throughout period of the study. There is highly significance difference regarding pre- program , immediate post program and three months post program p= 0.0000

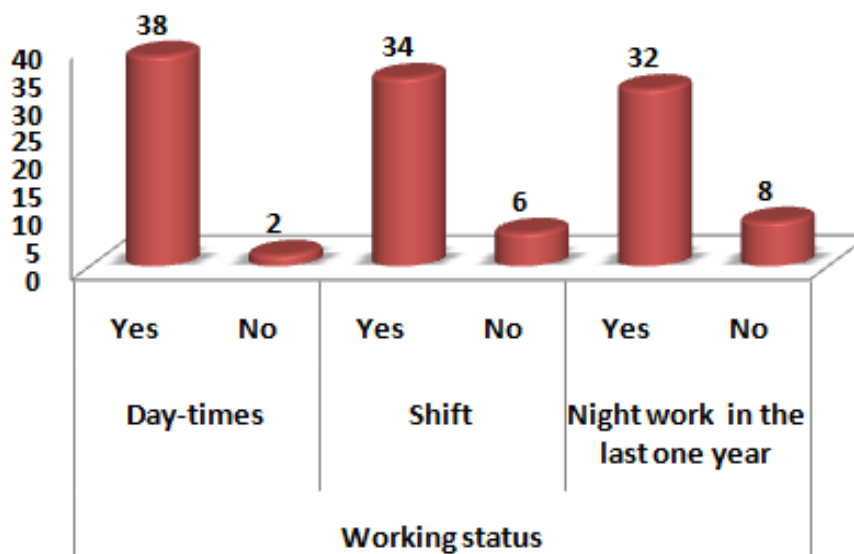


Figure (1): Distribution of the studied nurses according to their working status:

Figure (1) shows Distribution of the studied nurses according to their working status in last year , about one third of nurses 38% worked at day time and other two thirds 34% and 32% worked at afternoon and at night shifts respectively

Transportation to work

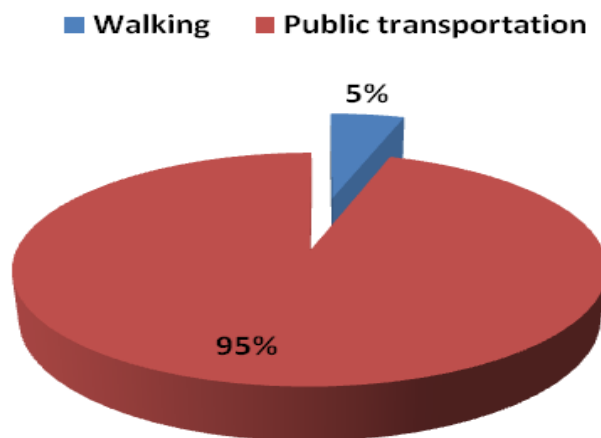


Figure (2): Distribution of the studied nurses according to their work transportation:

Figure (2): shows distribution of the studied nurses according to their way of transportation 95 % of them used public transportation and 5% of them preferred walking

BMI

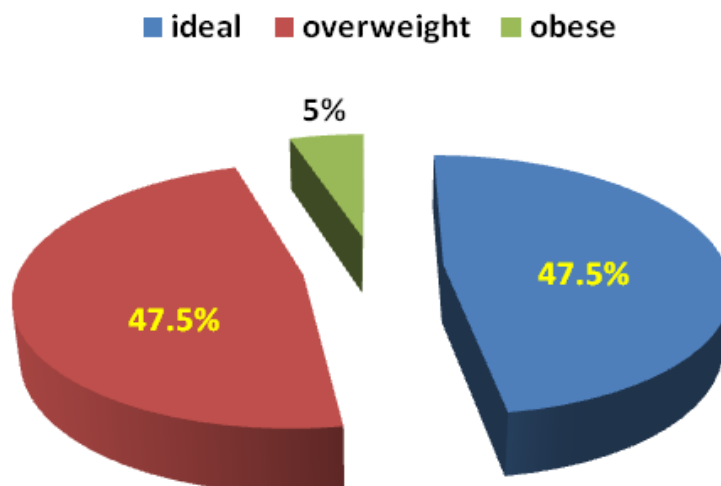


Figure (3): Distribution of the studied nurses according to their body mass index:

Figure (3): shows distribution of the studied nurses according to their body mass index about half of them 47.5% had ideal weight and other , nearly half 47.5% had obesity , and 5 % were overweight .

IV-Discussion

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 **Karahan 2004**⁽³⁰⁾. This quasi-experimental study evaluated the effect educational program on performance of Intensive Care nurses to decrease the low back pain. in this study all participants were female nurses and worked in intensive care unit ICU and all of them have low back pain , this is supported with **Sun et al .2007** ⁽³¹⁾ found that the prevalence of low back pain was 87% in ICU nurses. shortage of male nurses in this working inwards, that may enforce them to do more physical work and may explain the high prevalence of LBP. **Lamina and Hanif 2009** ⁽³²⁾ found in their study in 2009 that LBP was more prevalent among female nurses (67.5%) than the male nurses (32.5%)

All of studied nurse have low back pain, 90% of them had pain in lumber region about two third of them 65% had LBP for 8-30 days , majority of them 77.5% , 80% had reducing in work and leisure activities related to LBP and half of them 50% were seen by physiotherapist or this is supported by **Sun et al. 2007** ⁽³¹⁾, found that the prevalence of low back pain was 87% in ICU nurses. Also **Halim et al 2008** ⁽³³⁾ 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 .

More than three quarters of studied group (75.0%) age ranged from 18-35 years old. This is supported with **Mohammadi et al 2000** ⁽³⁴⁾ who found that the highest prevalence of low back pain was seen in those working less than 3 years (68.3%). Study that made by **Al Dajah, and Al Daghdi 2013**⁽⁸⁾ found majority of the sample (62.94%) were with 1-5 years' experience and with age less than 30 years⁽⁸⁾. In other studies showed that with experience, nurses learn how to protect their backs, and by the time they become fit and make right decision about their abilities (**Lamina Sikiru and Hanif Shmaila 2009** ⁽³²⁾). In the other hand in a study made by Roupa et al. high LBP prevalence was reported in both groups between the ages of 45–64 ⁽²⁵⁾. With the studies that are showing low back complaints are increasing with age ⁽²⁶⁾. there are also studies, which are showing there is no connection between age and the prevalence of LBP ⁽¹⁶⁾. This may not be connected to the report of study carried out by **Kiriri 2009** that the incidence of chronic diseases increases with age; that increase could be a reflection of both physiological changes and cumulative environmental (occupation) and genetic risk factor exposure. ⁽¹⁵⁾

In relation to level of education all studied nurses had no training course of 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 training²⁵.

According to their way of transportation 95 % of them uses public transportation and 5% of them preferred walking this results are agreement with **Al Dajah, and Al Daghdi 2013** This high prevalence of LBP among nurses in Sydar region may reflects the unawareness of body mechanics and lack of back muscles fitness.⁽⁸⁾

The results of the study found that majority of nurses had low back pain due to long standing, turning and positioning patients, this is supported by **Marras et al., 1999; Retsas & Pinikahaba, 2000**. Providing nursing care is related to frequent flexion and extension of the body, including manual lifting ⁽³⁴⁾ . Activities connected to lifting and transferring patients represent major physical demands for nursing personnel, which in many cases result in injuries in a study of **Karahan and Bayraktar (2004)** which examined the body mechanic behaviors and LBP complaints in nurses, it was found that most of the nurses started to have LBP after they have started working ⁽³⁰⁾

More than half of the nurses reported that they have to work in the same position for more than 1 hour during their work period. It could be explained that sitting and standing in the same position related to the LBP complaints. **Mohammadi et al 2002** reported that sitting in the same position for a long period increase the prevalence of mechanic LBP In the studies made by Occupational risk factors have a very important role in the development of LBP and disability. Occupation groups, including work, which requires too much physical activity risk factors and lifting heavy things, bending over and exposing the body to vibration have a higher LBP incidence. Occupations which include lifting, pushing, pulling, bending over by turning and sudden pelvic moves are reported to be the ones with the highest LBP incidence ⁽³⁵⁾. The results showed half of the studied nurses were obese, this agreement with **Karahan et al.2009** found higher prevalence of overweight or obese participants among nurses suffering from back pain.³⁶

Low back pain prevalence among the study group was 90 % who complained of moderate and mild LBP for a period of a week or more. The results are in agreement with other studies ^(37,38). Reports from other

populations have shown that nurses, nursing aides, and orderlies have the highest rates of LBP in the medical industry⁽¹⁹⁾

In the present study, 72.5% of participants were absent from work or changed job or work because of the low back pain. However, 65% had low back pain for 7--30 days, during last 12 month. In a study done by **Sikiru and Hanifa (2010)**³⁹ nurses generally lost about 202 working days in 12 months amounting to about 0.14%. This was considered very low. LBP has been identified as one of the main causes of loss of hours and days among the working class citizens. **Frost and Mofett**^[40] reported that the time off work due to LBP in England in 1989 increased by 40% in comparison to 5.6% for other complaints. The survey showed by **Triolo**^[41] indicated that nurses lost 750,000 days a year as a result of back pain.

The reasons for low loss of working hours and days in the present study might not be unconnected to fear of premature retirement or termination of appointment by employers on the pretence of ill-health. Also, nurses and employers often reject excused duty (complete rest) due to severe shortage of staff coupled with high turnout of patients; **Owen (2000)** found that 20% of nursing personnel had changed jobs at least once due to LBP problems⁴². In a survey conducted with over 43,000 members of nursing personnel in five countries, 17% to 39% reported that they planned to leave their job in the next year due to the physical and psychological demands of the profession (**Aiken et al.,2001**)⁴³. These findings are especially alarming given the current shortage of nursing personnel and the increasing need for nursing care projected over the next decades (**Massey et al., 2009; DiMattio et al., 2010**)^{44, 45}.

The current study showed that training to prevent low back pain significantly improved knowledge and behaviors of the nurses. It was determined that the mean knowledge scores of the nurses immediately and 3 months after the intervention were higher than their pre training scores, and this difference was statistically significant. The mean performance scores increased immediately after the training compared to the pre training status, but decreased 3 months after the training. On further analysis, mean scores for all performance increased just after training compared to the pre training status, and this change was statistically significant. This is supported with (**McCannon, Miller, & Elfessi, 2004**)⁴⁶.

The importance of training to prevent low back pain is emphasized in the literature. Training to prevent low back pain must increase knowledge and result in positive behaviors. **Brown (2003)**⁴⁷ emphasized the importance of practical demonstration of body mechanics and patient lifting. **Schneider et al. (2004)**⁴⁸ reported significant improvement in patient lifting and carrying behaviors after an ergonomics training program; pre training and post training quizzes indicated that training was effective and understood by 35 nursing assistants, registered nurses, and licensed practical nurses. **Johnsson, Carlsson, and Lagerstrom (2002)**⁴⁹ found that health care staff who participated in training on patient lifting and carrying performed six of seven behaviors better than they had prior to training.

On the other hand, some studies of training programs for hospital staff did not show any statistically significant differences associated with musculoskeletal problems, disability, or sick leave at 12-month monitoring (**Johnsson et al., 2002;**⁴⁹ **Warming et al., 2009**)⁵⁰. However, **Warming et al. (2009)**⁵⁰ emphasized that an individual randomized intervention subgroup (transfer technique/physical training) had significantly improved low back pain disability

Regarding back pain knowledge differences of the studied nurses pre- & post intervention, the current result revealed that 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 education¹⁵.

The results of the current study showed that, majority of the studied nurses had unsatisfactory practice regarding total performance of body mechanics 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 were contradicted with **Engkvist et al., 2001**⁵¹ who mentioned that training in body mechanics and body awareness has been shown to be ineffective. **Sun et al., 2007**³¹ 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.

V-Conclusion

All studied nurses had back pain pre program implementation. Majority of them had back pain in lumber region, there is a significance difference between intensity, quality, duration and rhythms of low back pain for studied nurses in pre and post program implantation. There a significance difference between knowledge and nurses' performance of body mechanics for studied nurses in pre and post program implantation.

VI. Recommendations

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.
3. Guidelines for preventing low back pain should be provided and the nurses should encourage and support to practice low back pain preventive measures to prevent the injury and promote a better quality of life of the nursing personnel.
4. The study should be replicated on large sample and different hospitals setting in order to generalize the results.
5. 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.

VII. 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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