# Effect Of Implementing Body Mechanics And Ergonomics Training Program On Nurses' Low Back Pain And Quality Of Nursing Work Life

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**Abstract:Aim of the study:**to assess the effect of implementing a body mechanics and ergonomics training program on nurses' knowledge and practices of low back pain, disability level and quality of nursing work life.**Research design:** an interventional, quasi-experimental, one-group, pretest/posttest study was utilized. **Setting:** Damanhour National Medical Institute, all inpatient medical; and surgical units (N=15). **Sample:** 50 staff nurses (30 nurses: surgery units and 20 nurses: medical units), who met the inclusion criteria. **Tools of the study:**Tool (I):composed of two sections: demographic data andPain assessment Questionnaire (Pain Intensity Scale); tool (II): Nurses' body mechanics practices observational checklistto evaluate nurses' body mechanics practices; tool (III): Body mechanics and ergonomics knowledge assessment to assess nurses' knowledge regarding back pain, body mechanics and ergonomics; tool (IV): Oswestry Low Back Disability Questionnaire: to measure nurses' permanent functional disability; lastly, tool (V): Brooks' Quality of Nursing Work Life survey to assessing quality of nursing work life. **Results:** There are highly significant differences between the three times of program implementation and total low back pain characteristics; total observed body mechanics and ergonomics practices; total disability levels; and total quality of nursing work life. Total low back pain was positively correlated with total disability level, and total body mechanics and ergonomics practices were positively correlated with quality of nursing work life. Total disability level was negatively correlated with both total body mechanics and ergonomics practices and total quality of nursing work life. No correlations were found between total low back pain and both total body mechanics and ergonomics practices and total quality of nursing work life. **Conclusion:** it is concluded that body mechanics and ergonomics training program had positive effect on nurses' knowledge and practices, in relation to: low back pain, disability level and quality of nursing work life at immediately after and post three months from program implementation compared to pre-program implementation. **Recommendations:**hospital administrators shoulddevelop policies for safe patient's transfer and handling (no lift policy); as well as nurse benefit programs and safe patient handling and mobility training programs. Staff Nurses should adhere to safety guidelines and no lift policy.
**Keywords:**Low back pain, body mechanics, ergonomics, quality of nursing work life.

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## I. Introduction

In the 21st century, globalization had obliged the economy to advance towards services and information technologies, thus making efficient and resourceful nursing staff as organization's most valuable asset for its success [1]. However, hospitals have traditionally placed more focus on the safety needs of the patient than the safety needs of their nurses. The complexity of providing patient care in a modern hospital environment requires rethinking this approach to safety, as "the interplay between factors related to the patient, nurse and physical environment poses a dangerous ergonomic hazard to all". Over 59 million healthcare workers are exposed to a variety of work-related hazards, including biological, physical, ergonomic, environmental, and psychosocial [2]. Nursing is viewed among 40 occupations with high incidence of diseases related to excessive workload. It is obvious that nurses' physical and mental health problems with higher work-related stressors are crucial factors in reducing the quantity and quality of their work life [3]. Many patients are also unable to cooperate with repositioning leading to risks for both the patient and the hospital staff during transfer activities. Additionally, as nursing workforce ages, patient acuity continues to increase, putting nurses at more risk for Musculoskeletal Disorders (MSDs), especially back pain [4].

Musculoskeletal injuries in nurses are a result of continual manual lifting; thus, creation of a safer working environment for nurses is essential to reducing back pain and injuries across health care settings [5,6].

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MSDs are defined by National Institute for Occupational Safety and Health (NIOSH) (2012)[3]as: "injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and disc disorders of the nerves, tendons, muscles and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture". Among direct care nurses, Low Back Pain (LBP) is the most common symptom indicative of MSD [7]. Low back injuries, among nursing staff have been associated with substantial retention issues and turnover within the workforce as well as with elevated costs of care delivery because of lost wages, time off, and injury-related medical costs. Its burden is also enormous in terms of nurses' quality of work life, productivity, and their absenteeism, making these common conditions the single largest contributor to musculoskeletal disability worldwide. LBP is defined as: "an uncomfortable sensation localized between the 12th rib and the inferior gluteal folds, originating from neurons near or around the spinal canal". The prevention and control of MSDs fall within the realm of the applied science of ergonomics [8].

Generally, employers have recognized that body mechanics and ergonomics programs can be successfully applied to prevent and reduce the severity of MSDs, and consequently LBP among their nurses [8,10]. Ergonomics is defined as "the study of the interface between individuals and their work environment .The environment may be a work tool or piece of equipment or the spatial surroundings in which work is conducted". Additionally, body mechanics refers to: "the method of efficiently using the body when making movements, such as bending the body, lifting a heavy object or person, stretching an arm, sitting, standing, or lying while performing tasks" [11]. Their goal is to "minimize human operator injuries, stress and fatigue, and also promote work output and productivity; while minimizing expenditures". It is recommended that institutions should utilize strategies to promote safety for nurses and patients as patient handling and lifting in awkward positions, to prevent the lifter's fatigue. The incidence of work-related injuries in hospitals has been evaluated on the basis of educational programs used to train nurses to employ better body mechanics while performing their jobs; and to address the culture of safety within the hospital, such as combining education, lifting devices, and a change in policy and expectations for nurses' safety [12].

Work-related MDSs have been associated with physical and emotional impact on nurses and their families; thus, it is positively associated with turnover intention, job dissatisfaction and decrease in quality of work life among nurses [13]; it is also the major cause for the absence of nurses in their professional positions, which severely affect their work life quality and professional performance [14]. The Quality of Nursing Work Life (QNWL) is: "the degree to which registered nurses is able to satisfy important personal needs through their experiences in their work organization while achieving the organization's goals" [15]. QNWL is a comprehensive concept including various aspects of work itself and the work environment; and it can be influenced by various factors, thus, organizations have focused attention on how to scientifically assess the work conditions and mental statuses of nurses [16].

The principles of QNWL emphasizes that nurses are the most valuable resource of the organization, who should be treated with respect and dignity as they are trustworthy, responsible and capable of making a valuable contribution [17]. QNWL encompasses four dimensions, namely: (1) the work life/home life dimension, which is defined as the interface between the nurses' work and home life; since nurses are primarily female, this dimension reflects the role of mother (child care), daughter (elderly parent care), and spouse (family needs, available energy). (2) The work design dimension that is the composition of nursing work and describes the actual work nurses perform at their immediate work environment, such as: workload, staffing, and autonomy. (3) The work context dimension, which includes the practice settings in which nurses' work and explores the impact of the work environment on both nurse and patient systems. It includes relationships with supervisory personnel, co-workers, inter-disciplinary health team colleagues, the provision of resources to do the job, and promotion of lifelong learning by the institution. Finally, (4) the work world dimension that is defined as the effects of broad societal influences and change on the practice of nursing, such as: the image of the profession, economic issues, and job security, which are concerns of most nurses, regardless of role or setting[15].

## 1.2 Significance of the study

The musculoskeletal disorders are one of the fastest growing work-related disorders that is considered major occupational health problem in nursing. Registered nurses are at the highest risk for work-related MSDs; and more than 10,000 U.S. registered nurses suffer annually from it, leading to lost work days [5]. Nurses identified back injury as their second most important health and safety concern; and they reported that they continued working with back pain through manual patient handling that is still an integral part of nursing tasks for many nurses, requiring special precaution to protect their safety, such as the use of good body mechanics[6]. The annual prevalence of low back problems in nursing personnel is reported to be between 26-75% internationally [18]. However, Karahan and Bayraktar (2004) reported that body mechanics were used incorrectly among many nurses; as well as, lifting, sitting, and moving patients to the side of the bed[11]. Additionally, Jones and Kumar (2001) indicated that 75% of the cost of low back pain and injury was incurred

by the 5% of the population with chronic or permanent impairment, presenting a persuasive argument for the use of secondary prevention methods like ergonomic evaluations and retraining methods[19].

The most recent workplace injury data demonstrated that ergonomic related injuries resulted in direct nurses' compensation costs of $14.4 billion in the United States [20]. The most alarming number was the estimated indirect costs associated with ergonomic-related injuries, which included: reduced productivity due to time away from work and low morale; increased expenditures due to time to recruit a replacement for the injured nurse and job changes; persistent medical problems and disability; and to training the new nurse; and finally, decreased production and quality due to the new nurse initially functioning below the established standard while learning the various functions of the position. These indirect costs were estimated to be in excess of $50 billion, which consequently will affect the quality of work life[12,21].For these reason, the ANA (2004) has stated that its primary goal is "to motivate the healthcare settings to take actions that reduce the incidence of musculoskeletal injuries among nurses while improving the quality of nursing care and consequently their work life" [6]. An increasing body of evidence also supports the positive effect of QNWL on the organization like enhanced performance, organizational efficiency, better service quality and customer satisfaction[22].

Quality work life initiatives are also essential for health care units to attract new nurses and retain their workforces [23]. Furthermore, a progressive culture of ensuring better QNWL can improve their self-actualization along with positive effects on quality of care and productivity [16]. Psychosocial work factors, such as high job demands, low social support and job dissatisfaction, have also been associated with work-related MSDs [24]. Preventive measures range from detailed task analysesand ergonomics training, to an organization-wide program such as a participative ergonomics training program [25]. Success and progress of a hospital depend on its staff, if it is not capable to attract and retain qualified and motivated human resources, the health care organization will face difficulties for performing vital responsibilities and duties; thus reducing the organization's efficiency [26]. In Egypt, three studies dealt with back pain. The first is related to occupational factors leading to back pain [27]; the second is about effect of back school for relief back pain among nurses at Ain-Shams University Hospital [28]; and the third, related to body mechanics and back pain environment among nurses [29]. However, no researches were done on designing a program to improve LBP and quality of nursing work life. Due to the fact that improving the quality of nursing work life is one of the most effective methods to motivate and help designing and enriching nurses' job; hence, the present study aims to develop an interventional training body mechanics and ergonomics practices program to assess its effect on nurses' low back pain and quality of their work life.

## II.  Aim of the study

The present study aims to assess the effect of implementing a body mechanics and ergonomics training program on nurses' knowledge and practices of low back pain, disability level and quality of nursing work life.

**2.1 Study hypothesis:**
H1: The body mechanics and ergonomics training program will have a positive effect on nurses' knowledgeof low back pain and disability level post-program implementation.
H2: The body mechanics and ergonomics training program will have a positive effect on nurses' practices on low back pain intensity and disability level post-program implementation.
H3: The body mechanics and ergonomics training program will have a positive effect on nurses' quality of work life.

## III. Subjects and method

**3.1. Research design:** an interventional, quasi-experimental, one-group, pretest/posttest study was utilized. **3.2. Setting:** The study was conducted at Damanhour National Medical Institute. It encompasses all inpatient medical; and surgical units (N=15), namely: medical units (general medical A & B; hepatology; renal; hematemesis; and neurology); and surgical units (general surgical A, B, C, & D; orthopedics; neurosurgery; urology; diabetic foot surgery; and E.N.T surgery). The institute is affiliated to the General Organization for Teaching Hospital and Institutes; and is considered the main teaching hospital in El-Beheira governorate equipped with 330 beds. The facility offers a full range of services including acute inpatient care, intensive care units, and partial hospitalization services; as well as paramedical services.

**3.3. Sample:**
Sample included 50 staff nurses (30 nurses from surgery units and 20 nurses from medical units), who were working in the previously mentioned settings and who met the following inclusion criteria: female only, 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, and who were not suffering from inflammatory disorders, neurological diseases, metastatic disease, spinal surgery and pregnancy.

**3.4. Tools of the study:**

The data was collected through self-administered questionnaire containing five major tools:

**Tool (I):** is composed of two sections. The *first section* is a questionnaire addressed **demographic data** related to nurse's age, educational level, experience (years), marital status, number of children, working unit, working hours, body mass index and presence of associated diseases and LBP related to position. Nurse'sBody Mass Index (BMI) was estimated pre-intervention. BMI = weight (Kg)/height (cm) $^2$. Underweight is considered if BMI < 18.5, normal weight if BMI 18.5 – 24.9, overweight if BMI 25 – 29.9 and obese if BMI > 30 (Gupta et al., 2007). The *second section* is the **Pain assessment Questionnaire (Pain Intensity Scale)**: it consists of questions related to pain site, frequency, low back pain, duration of LBP, andalleviatingfactors. In addition to, a linear numerical scale, which uses a 10-point numerical scale describing the degree of pain experienced with "zero" indicating no pain at all and "10" representing the worst degree of pain. 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.

**Tool (II)**: **Nurses' body mechanics practices observational checklist**: It was used to evaluate nurses' body mechanics practices during five specified patient-handling tasks: lifting and carrying an object (normal, and above shoulder level); pulling patients to the side of the bed; putting patients in a lateral position; pulling patients up in bed; and lifting patients to their feet. Responses were measured on four choices: (3) done correct and complete practice; (2) correct and incomplete practice; (1) incorrect practice; and (0) not done. Score of ≥75% for the practices was considered satisfactory; whereas a score of <75 % was considered unsatisfactory.

**Tool (III)**: **Body mechanics and ergonomics knowledge assessment:**It was developed by the researchers based on the related literature [30-32] to assess nurses' knowledge regarding back pain, body mechanics and ergonomics, as a pre- and post-training questionnaire. It included 25 questions, divided into: five questions concerned with low back pain (basic anatomy and physiology of the spinal column, causes and risk factors, signs and symptoms, diagnostic measures, and when to call doctor); ten questions related to body mechanics (definition, importance, general principles, and correct body alignment); and 15 questions related to ergonomics (principles with doing general physical task as lifting and pushing or pulling objects, principles during helping patient's positioning and patient's transfer). All questions were prepared in accordance with training program content with total score 50 degrees. The Score "two" was given for correct and complete answer; "one" was given for each correct and incomplete 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 good if Knowledge≥ 75%, fair 50-<75%, and poor knowledge≤ 50%.

**Tool (IV)**: **Oswestry Low Back Disability Questionnaire:** it was developed by Fairbank and Pynsent (2000) [33]to measure nurses' permanent functional disability and is considered the 'gold standard' of low back functional outcome tools. It includes 10 items related to: pain intensity; personal care; lifting heavy weights; walking; sitting; standing; sleeping; sex life; social life; and traveling. **Scoring system:** 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) was "no disability"; (5-14) was "mild disability"; (15-24) was "moderate disability"; (25-34) was "sever disability"; and (35-50) was "complete disability".

**Tool (V)**: **Brooks' Quality of Nursing Work Life survey (Brooks' QNWL survey)**. It was developed by Brooks (2001)[34], to assessing quality of nursing work life. It consists of (42-item) grouped under four subscales, namely: (1) work life/home life (7-item), (2) work design (10-item), (3) work context (20-item), and (4) work world (5-item). Responses were measured on a 6-point Likert rating scale ranging from (1) strongly disagree to (6) strongly agree. The total score ranged from 42 to 252. A low total scale score indicates a low overall QNWL; while a high total scale score indicates a high QNWL. To facilitate analysis, the rating scale of Brooks' QNWL survey was truncated into 2 areas of agree and disagree. The results reported and subsequent sections are the percentages of nurses who responded with ratings of agree to strongly agree (ratings of 4, 5, and 6) or the percentage of nurses who responded with ratings of strongly disagree to disagree (ratings of 1, 2, and 3).

**3.5 Method:**

An official permission was obtained from the Director of Damanhour National Medical Institute 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 gain better cooperation and full support, to stimulate nurses to participate positively in the study.Ethical considerations: the purpose of the study was explained to each staff nurse and oral informed consent to participate in the study was obtained from them. Confidentiality and anonymity of participants; as well as their right to withdraw from the research at any time were ensured without any consequences.

Afterwards, the study was conducted through four consecutive phases: assessment, planning, implementation and evaluation.

• **Assessment phase***:* This phase aimed to identify the studied nurses' characteristics and back pain characteristics; to assess nurse's knowledge and practices regarding back pain and body mechanics identify degree of disabilities, to identify work related factors and perceived quality of nursing work life. Therefore, the researcher observed each nurse twice: once during morning shift and once during afternoon shift using tool (II) to assess nurses' practice about body mechanics and ergonomics. Tools (I, III, IV, & V) were translated into Arabic and tested for content and face validity by a jury of five experts (three professors of medical surgical nursing and two professors of nursing administration) and some modifications were done. The tools used in this study hadhigh reliability, by using Cronbach's Alpha Coefficient test: the Pain assessment Questionnaire (Pain Intensity Scale) (0.91); the Oswestry Low Back Disability Questionnaire (0.89); and Brooks' Quality of Nursing Work Life survey (Brooks' QNWL) (0.90).

**Pilot study:**
The pilot study commenced, once ethical approval had been obtained, to test the clarity, feasibility and applicability of the study tools. It was conducted on (10%) 5 nurses who were excluded from the study sample. Based on the results of the pilot study, modifications and omissions of some details were done and then the final forms were developed.

• **Planning and preparatory phase:** based on the assessment phase, the program content and media (in the form of the program handout and visual materials) were prepared by the researchers, in Arabic language to suit nurses' level of understanding, to improve the nurses' performance regarding back pain, body mechanics and ergonomics during caring for the patients based on the related literature [35,36]. It included theoretical knowledge and some illustrative pictures on: 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; purpose of body mechanics, correct body alignment; and ergonomics, principles with doing general physical task as lifting and pushing or pulling objects (normal and above shoulder level), principles during helping patient's positioning and patient's transfer. The program handout was revised by a group of seven experts (five medical surgicalnursing and two nursing administration). Accordingly, some modifications were done, and then the final forms were developed.

• *Implementation phase:* Tools (I, III, IV, & V) was filled in the clinical area by the studied nurses in the presence of the researchers. Nurses were divided into three main groups according to study settings; and then implementation of the program was carried out at the hospital library for each group separately based on the assessment phase (20 medical nurses (one group) or 15 surgical nurses (two groups)). Total of 4 sessions and the duration of each session took approximately 1 to 1.5 hours, sessions started according to nurses' spare time. Educational sessions were held for 4 days/week. At the start of the program, each nurse obtained program handout. *In the first 2 sessions,* the researcher started to establish rapport with nurses, then verbal instructions,based on program handout, about body mechanics; and ergonomics, with illustrative pictures. *In the second 2 sessions,* demonstration and return demonstration about the techniques of applying proper body mechanics and ergonomics was used, such as: standing, sitting, walking, pick up an object, reaching to higher object and proper patient lifting, transfer and positioning. Nurses could re-demonstrate the skill until the researcher made sure it was successfully mastered. Each nurse was contacted at least once/week for about 3 months to reinforce provided knowledge and skills and to respond to their questions if any. Methods of teaching used were: interactive lectures, group discussion and demonstration with re-demonstration. Instructional media was used; it included program handout and audiovisual materials. The nurses were interested in the topic and they asked to repeat such program for nurses in different health care settings.

• **Evaluation phase***:* the evaluation phase was emphasized by using the study tools to assessing the effect of training program on nurses' knowledge and practice at immediately and after three months post-program implementation; for disability level and intensity of low back pain for nurses; as well as their perceived quality of work life.

Data was collected three times (pre; immediately post; and post three months from program implementation), by the above mentioned tools that were distributed among the subjects at their working units. Each questionnaire took approximately from 30 to 45 minutes/staff nurse. The data was collected for a period of 5 months started from the 1$^{st}$ of July 2017 to the 31$^{st}$ of December 2017.

*Statistical analysis:* Data were collected, tabulated, statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 20. The following statistics were applied. *1. Descriptive statistics:* in the form of mean percent score with standard deviation; and qualitative data were presented in the form of frequencies and percentages. *2. Analytical statistics:* significance test Pearson's chi square test and Mont Carlo exact test, the last one is alternative for the Pearson's chi square test if there were many small expected values; correlation coefficient (r), Student t-test and Fisher-exact probability test. All

statistical analysis was done using two tailed tests and alpha error of 0.05. 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.

## IV. Results

Table (1) illustrates that the mean age of nurses was 36.83 years. The majority of the studied sample age ranged between 30-40 years old (62%). Out of total nurses, 72 % passed Diploma of Secondary Nursing School.  It was found that 60 % of the nurses worked in surgical units, compared to 40 %, who worked in medical units. Less than half of them (42%) had from one year to less than 5 years of experience; followed by 22% of them, who had from five to less than ten years.  The majority of nurses were married (86%). Above half of nurses had less than three children (58%).Moreover, 32 % of nurses were overweight; compared to 26% obese. Above two thirds of nurses (68%) worked from 8 to 12 hours/day. Moreover, about three quarters of them donot have chronic diseases (74%).

**Table (1):** Demographic characteristics of studied nurses working at Damanhour National Medical Institute (n = 50)

| Demographic characteristics | No. | % |
|---|---|---|
| **Age** | | |
| Less than 30 | 11 | 22.0 |
| 30-40 | 31 | 62.0 |
| More than 40 | 8 | 16.0 |
| Age (mean ± SD) | 36.83±17.34 | |
| **Educational level** | | |
| Diploma of Secondary Nursing School | 36 | 72.0 |
| Diploma of Technical Institute of Nursing | 8 | 16.0 |
| Bachelor of Nursing Sciences | 6 | 12.0 |
| **Working unit** | | |
| Surgical | 30 | 60.0 |
| Medical | 20 | 40.0 |
| **Years of experience** | | |
| Less than one year | 9 | 18.0 |
| 1-5 years | 21 | 42.0 |
| 5-10 | 11 | 22.0 |
| More than 10 years | 9 | 18.0 |
| **Marital status** | | |
| Single | 5 | 10.0 |
| Married | 43 | 86.0 |
| Widow | 2 | 4.0 |
| Divorced | 0 | 0.0 |
| **Number of children** | | |
| None | 7 | 14.0 |
| Less than 3 | 29 | 58.0 |
| More than 3 | 14 | 28.0 |
| **Body Mass Index (BMI)** | | |
| underweight | 2 | 4.0 |
| Normal | 19 | 38.0 |
| Overweight | 16 | 32.0 |
| Obese | 13 | 26.0 |
| **Working hours** | | |
| 5-8 hours | 16 | 32.0 |
| 8- 12 hours | 34 | 68.0 |
| **Presence of chronic disease** | | |

| Demographic characteristics | No. | % |
|---|---|---|
| Yes | 13 | 26.0 |
| No | 37 | 74.0 |

Table (2) indicates that there are highly significant differences between pre, immediately after and after three months from program implementation and total low back pain (LBP) characteristics, severity of LBP, incidence of LBP, and position that affects pain, where (P = 0.000) for all. Furthermore, significant differences were found between the three times of program evaluation and causes of LBP and pain quality, where (P = 0.023 and 0.041), consecutively. However, there are no significant differences between the three times of program evaluation and pain sites, the start of complaints, timing for pain worsening, and LBP is affected by nursing work.

Pertaining to total LBP characteristics, The majority of nurses complained of both cervical and lumbar pain sites, pre, immediately after and after three months from program implementation (58%, 60%, 54%), respectively. Regarding causes of pain, the majority of them stated that it was from work at pre, immediately after and after three months from program implementation (92%, 80%, 86%), consecutively. Concerning the severity of pain, 46% of nurses found it severe at pre program implementation; compared to nurses, who found it moderate at immediately after and after three months of program implementation (30%, 22%), consecutively. Pertaining to the quality of pain, below half of nurses viewed it as strain pain at pre, immediately after and after three months from program implementation (42%, 38%, 46%), consecutively.

**Table (2):** Percentage distribution of nurses' Low Back Pain (LBP) characteristics, pre, immediately after and post three months from body mechanics and ergonomics practices training program implementation at Damanhour National Medical Institute (n = 50)

| Low Back Pain (LBP) characteristics | Pre | | Immediately after | | Post three months | | χ2 P |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | |
| **Pain site** | | | | | | | |
| Cervical | 9 | 18.0 | 8 | 16.0 | 9 | 18.0 | 32.231 |
| Lumbar | 29 | 58.0 | 30 | 60. 0 | 27 | 54.0 | 0.427 |
| Both | 12 | 24.0 | 12 | 24.0 | 14 | 28.0 | |
| **Causes** | | | | | | | |
| Work | 46 | 92.0 | 40 | 80.0 | 43 | 86.0 | 43.354 |
| Others | 0 | 0.0 | 3 | 6.0 | 2 | 4.0 | 0.023* |
| Unknown | 4 | 8.0 | 7 | 14.0 | 5 | 10.0 | |
| **When the complaint start**/year | | | | | | | |
| Less than one | 6 | 12.0 | 8 | 16.0 | 5 | 10.0 | 33.112 |
| 1-5 | 13 | 26.0 | 13 | 26.0 | 15 | 30.0 | 0.237 |
| More than 5 | 31 | 62.0 | 29 | 58.0 | 30 | 60.0 | |
| **Severity** | | | | | | | |
| Mild | 8 | 16.0 | 24 | 48.0 | 31 | 62.0 | 47.341 |
| Moderate | 19 | 38.0 | 15 | 30.0 | 11 | 22.0 | 0.000** |
| Severe | 23 | 46.0 | 11 | 22.0 | 8 | 16.0 | |
| **Pain quality** | | | | | | | |
| Sharp | 4 | 8.0 | 2 | 4.0 | 3 | 6.0 | |
| Knife like | 3 | 6.0 | 3 | 6.0 | 1 | 2.0 | 41.029 |
| Stabbing | 12 | 24.0 | 10 | 20.0 | 13 | 26.0 | 0.041* |
| Strain | 21 | 42.0 | 19 | 38.0 | 23 | 46.0 | |
| others | 10 | 20.0 | 16 | 32.0 | 0 | 0.0 | |
| **Incidence of pain** | | | | | | | 58.370 |
| Sudden | 41 | 82.0 | 22 | 44.0 | 16 | 32.0 | 0.000** |
| Gradual | 9 | 18.0 | 28 | 56.0 | 34 | 68.0 | |
| **Timing of worse pain** | | | | | | | 39.569 |
| In morning | 8 | 16.0 | 6 | 12.0 | 8 | 16.0 | 0.534 |
| In night | 42 | 84.0 | 44 | 88.0 | 42 | 84.0 | |
| **Positioning affect pain** | | | | | | | 52.012 |
| Yes | 50 | 100.0 | 45 | 90.0 | 33 | 66.0 | 0.000** |
| No | 0 | 0.0 | 5 | 10.0 | 17 | 34.0 | |
| **LBP affected by nursing work** | | | | | | | 38.201 |
| Yes | 50 | 100.0 | 47 | 94.0 | 49 | 98.0 | 0.642 |
| No | 0 | 0.0 | 3 | 6.0 | 1 | 2.0 | |
| **Total LBP characteristics** | | | | | | | 49.257 |
| Fair | 45 | 90.0 | 12 | 24.0 | 9 | 18.0 | 0.000** |
| Good | 5 | 10.0 | 38 | 76.0 | 41 | 82.0 | |

*Significant at level P< 0.05**;** **highly significant at P<0.01

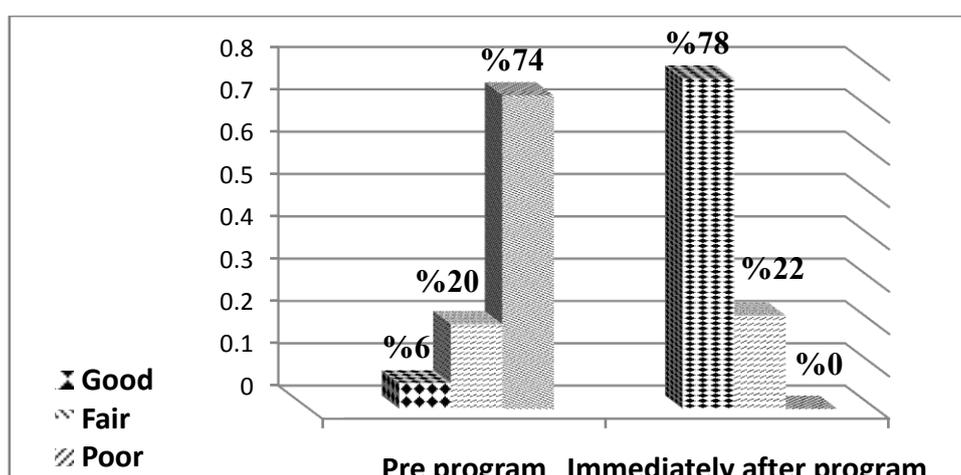Good ≥ 60% absence of LBP characteristics; Fair < 60%.

Table (3) shows that all the observed body mechanics and ergonomics practices (patient handling tasks) were highly significant differences between pre, immediately after and after three months from program implementation; except pulling patients up in bed and lifting patients to their feet, which was significant only (P = 0.013 and 0.020), respectively. Total body mechanics and ergonomics practices observed, pulling patients to the side of the bed, putting patients in a lateral position, lifting and carrying an object were satisfactory after three months from program implementation (70%, 86%, 68%, 62%), respectively; compared to unsatisfactory at pre and immediately after program implementation (76%, 82%, 74%, 78%; 54%, 68%, 58%, 60%), consecutively.

**Table (3):** Percentage distribution of nurses' observed body mechanics and ergonomics practices, pre, immediately after and post three months from body mechanics and ergonomics practices training program implementation at Damanhour National Medical Institute (n = 50)

| Body mechanics and ergonomics practices (patient-handling tasks) | | Pre | | Immediately after | | Post three months | | $\chi^2$ P |
|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | |
| Lifting and carrying an object | Satisfactory | 11 | 22.0 | 20 | 40.0 | 31 | 62.0 | 12.179 |
| | Unsatisfactory | 39 | 78.0 | 30 | 60.0 | 19 | 38.0 | 0.000** |
| Pulling patients to the side of the bed | Satisfactory | 9 | 18.0 | 16 | 32.0 | 43 | 86.0 | 11.982 |
| | Unsatisfactory | 41 | 82.0 | 34 | 68.0 | 7 | 14.0 | 0.000** |
| Putting patients in a lateral position | Satisfactory | 13 | 26.0 | 21 | 42.0 | 34 | 68.0 | 11.217 |
| | Unsatisfactory | 37 | 74.0 | 29 | 58.0 | 16 | 32.0 | 0.001** |
| Pulling patients up in bed | Satisfactory | 10 | 20.0 | 27 | 54.0 | 31 | 62.0 | 12.248 |
| | Unsatisfactory | 40 | 80.0 | 23 | 46.0 | 19 | 38.0 | 0.013* |
| Lifting patients to their feet | Satisfactory | 8 | 16.0 | 31 | 62.0 | 33 | 66.0 | 10.971 |
| | Unsatisfactory | 42 | 84.0 | 19 | 38.0 | 17 | 34.0 | 0.020* |
| **Total Body mechanics and ergonomics practices** | Satisfactory | 12 | 24.0 | 23 | 46.0 | 35 | 70.0 | 12.135 |
| | Unsatisfactory | 38 | 76.0 | 27 | 54.0 | 15 | 30.0 | 0.000** |

Satisfactory = Score of ≥75%; unsatisfactory = score of <75 %
*Significant at level P< 0.05; **highly significant at P<0.01



Good Knowledge≥ 75%; fair 50-<75%; poor ≤ 50%
**Figure (1):** Distribution of total nurses' knowledge score, pre and immediately after body mechanics and ergonomics practices training program implementation at Damanhour National Medical Institute (n = 50).

Figure (1) illustrated that above three quarters of nurses' knowledge score related to back pain, body mechanics and ergonomics were good (≥ 75%) immediately after program implementation (78%); compared to (74%) of them, who had poor knowledge pre program implementation.

Table (4) indicates that nurses' total level and levels of disability were highly significant difference between the three times of program evaluation (pre, immediately after and after three months) (P = 0.001,

0.000), respectively.  Total disability level mean±SD increased post three months from program implementation (21.32 ± 5.12).  As regards to level of disability, approximately half of nurses had moderate disability (46%) at pre program implementation; contrasting to the majority of them had mild disability immediately after and post three months from program implementation (42%, 58%), respectively.

**Table (4):** Distribution of nurses' level of disability at pre, immediately after and post three months from body mechanics and ergonomics practices training program implementation at Damanhour National Medical Institute (n = 50).

| Level of disability (Oswestry scores) | Pre | | Immediately after | | Post three months | | $\chi^2$ p |
|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | |
| **Disability level** | | | | | | | |
| 0 – 20% No Disability | 2 | 4.0 | 2 | 4.0 | 4 | 8.0 | |
| 20 – 40% Mild Disability | 10 | 20.0 | 21 | 42.0 | 29 | 58.0 | 16.451 |
| 40 – 60% Moderate Disability | 23 | 46.0 | 9 | 38.0 | 17 | 34.0 | 0.000** |
| 60 – 80% Severe Disability | 14 | 28.0 | 8 | 16.0 | 0 | 0.0 | |
| 80 – 100% Complete Disability | 1 | 2.0 | 0 | 0.0 | 0 | 0.0 | |
| **Total disability level** | | | | | | | P! |
| Min. – Max. | 0.0 – 35.0 | | | | | | 14.379 |
| Mean ± SD. | 14.28 ± 5.82 | | 19.12 ± 4.32 | | 21.32 ± 5.12 | | 0.001** |

P!: One WAY ANOVA *Significant at level P< 0.05**; **highly significant at P<0.01

Table (5) indicates that nurses' total quality of nursing work life (QNWL); as well as work life/home life were highly significant differences between the three times of program evaluation (pre, immediately after and after three months) (P = 0.002, 0.003), respectively.  Significant differences were found between pre, immediately after and post three months of program implementation and work context and work world subscales (0.026, 0.012), consecutively.  However, no significant difference was found between the three times of program implementation and work design subscale.  Total QNWL mean percent score increased post three months from program implementation (163.74 ± 24.21); compared to pre and immediately post program implementation (146.21 ± 22.32, 153.89 ± 23.67), respectively.

**Table (5):** Distribution of perceived nurses' quality of nursing work life (QNWL) mean percent pre, immediately after and post three months from body mechanics and ergonomics practices training program implementation among nurses at Damanhour National Medical Institute (n = 50).

| Quality of Nursing Work Life (QNWL) Subscales | Minimum | Maximum | Pre | | Immediately after | | Post three months | | p |
|---|---|---|---|---|---|---|---|---|---|
| | | | Mean % | SD | Mean% | SD | Mean % | SD | |
| work life/home life (7-item) | 9 | 40 | 21.31 | 4.13 | 24.51 | 4.32 | 25.30 | 4.67 | 0.003** |
| work design (10-item) | 19 | 54 | 32.65 | 4.87 | 34.61 | 4.91 | 37.93 | 5.67 | 0.059 |
| work context (20-item) | 23 | 115 | 71.36 | 13.34 | 77.54 | 14.17 | 81.39 | 14.98 | 0.026* |
| work world (5-item) | 3 | 30 | 17.87 | 2.98 | 18.71 | 3.15 | 18.91 | 3.74 | 0.012* |
| Total QNWL (42-item) | 65 | 240 | 146.21 | 22.32 | 153.89 | 23.67 | 163.74 | 24.21 | 0.002** |

P: One WAY ANOVA       *Significant at level P< 0.05**; **highly significant at P<0.01

Table (6) presents the correlations among the study variables (low back pain characteristics, disability level, body mechanics and quality of nursing work life).  A strong positive correlation was found between total low back pain and total disability level (r = 0.785).  Additionally, intermediate positive correlation exists between total body mechanics and ergonomics practices and quality of nursing work life (r = 0.592).  On the other hand, negative intermediate correlations were found between total disability level and both total body mechanics and ergonomics practices and total quality of nursing work life (r = -0.461, -0.741), respectively.  However, total low back pain and both total body mechanics and ergonomics practices and total quality of nursing work life are not significantly correlated and are weak negatively correlated (r = -0.068, -0.115), consecutively.

**Table (6):** Correlation matrix between low back pain characteristics, disability level, body mechanics and ergonomics practices and quality of nursing work life among nurses at Damanhour National Medical Institute (n = 50)

| | Total low back pain characteristics | Total Disability level | Total body mechanics & ergonomics practices | Total Quality of nursing work life |
|---|---|---|---|---|
| **Total low back pain characteristics** | 1 | | | |
| **Total Disability level** | 0.785* | 1 | | |
| **Total body mechanics & ergonomics practices** | -0.068 | -0.461* | 1 | |
| **Total Quality of nursing work life** | -0.115 | -0.741* | 0.592* | 1 |

*: Significant Pearson correlation co-efficient

**Interpretation of correlation co-efficient**
Weak (0.1-0.24)   Intermediate (0.25-0.74      Strong (0.75-0.99)

## V.  Discussion

Health care organizations need to focus on the work life aspect of the nurses to stimulate positive attitude and behavior at the workplace such as reduced absenteeism, improved job satisfaction, enhanced commitment and low turnover [22,37]. Therefore, it is crucial to identify the work experiences of nurses to develop effective strategies to improve perceptions of quality of work life, reduce their turnover intention, reduce costs associated with turnover, and retain the workforce required for quality patient care. Moreover, the health care organizations should focus on development and implementation of innovative practices to reduce work-related MSDs, which in turn will satisfy nurses' needs and will enhance the overall performance, productivity and competitiveness and survival of the organization [38].

On the other hand, increased productivity is likely to be transitory if achieved at the expense of the body mechanics and ergonomics practices and quality of nurses' work life. Therefore, the high rate of musculoskeletal disorders, especially back injuries, among nurses involved in direct patient care was reported the highest incident rates of nonfatal work-related injuries, in the U.S. care facilities [8]. Moreover, low back pain is among the principal musculoskeletal disorders that affect mainly nurses in developed as well as in developing countries[3,12]. Thismay contribute tovarious social, highhealthcare costs, shortage of nursing personnel, emotional problems and decreased in their quality of work life, which recently, is being recognized as an imperative criterion for defining the success and sustainability of an organization [39]. It is documented that training nurses is one of the most efficient and cost-effective ways to prevent low back pain and consequently occupational health problems.Therefore, the present study aims to assess the effect of implementing a body mechanics and ergonomics practices training program on nurses' knowledge and practices of low back pain, disability level and quality of nursing work life.

The present study examined the intercorrelations among the study variables (Low Back Pain (LBP) characteristics; disability level; body mechanics and ergonomics practices; and Quality of Nursing Work Life (QNWL)). The findings demonstrated a strong positive correlation between total low back pain and total disability level; and intermediate positive correlation existed between total body mechanics and ergonomics practices and quality of nursing work life.  On the other hand, negative intermediate correlations were found between total disability level and both total body mechanics and ergonomics practices; and total quality of nursing work life. However, total low back pain and both total body mechanics and ergonomics practices and total quality of nursing work life have weak negativecorrelation. This is emphasized by Sikiru and Hanifa (2009)[40],who reported a strong association between musculoskeletal disorders and both work related factors that were found among nurses. Moreover, they mentioned that majorityofnurses' LBP was related to their occupational hazard; as well as poor working conditions and incorrect lifting postures. Additionally, Yasobant and Rajkumar (2014) [41] found a significant correlation between back pain and excessive handling of patients along with educational training.Furthermore, SadeghZare et al. (2016)[26]implied that nurses mostly suffer from physical damages; and consequently the authorities should take effective measures to improve their quality of work life. They argued that measures, such as: reducing the workload, providing advisory services in hospitals and implementation of training programs can increase quality of nursing work life.

These findings are also consistent with that of Carllus and Considine (2001), who emphasized that with increasing prevalence of chronic diseases and physical pains, it could explain the drop in nurses' work life quality[42]. Additionally, it is shown that regular and continuous physical activity impacts on the health and work life quality improvement so that while maintaining physical and mental performance, the risk of many chronic diseases decreases [43].  This was supported by Liu et al. (2015)[44],who indicated that management's concern about safety, along with an ergonomic intervention program, had improved nurse's participation and

compliance, which in turn reduced both work-related injuries and lost workdays;and improve quality of patient care and quality of work life [45]

Regarding nurses' demographic characteristics, the results of the present study illustrated that the majority of them had from 30 to less than 40 years old; married; hold Diploma of Secondary Nursing Technical School; and were obese. These results were consistent with Roupa et al. (2008)[46] found that the overwhelming majority of the hospital ward nurses involved were 30-41 years of age and were suffering from back pain. Furthermore, about two thirds of the studied nurses, who suffered from low back pain, were working in surgical units. This may be due to that back pain,as the most common work-related Musculoskeletal Disorder (MSD),is significantly associated with locally stressful physical activities that are found mainly in surgical departments, because of the increased manual handling of postoperative patients within a short period of time. This is consistent with Sandhya et al. (2015)[47], whoconcluded that the prevalence of low back pain is high among staff nurses due to stress, workload, and inadequate nurse-patient ratio as in surgery units.

Concerning years of experience, the findings of the current study revealed that the majority of studied nurses had less than five years of nursing experience. This may be attributed to the increased staff workload and fatigue that hinder their ability for independent self-learning and updating knowledge. Additionally, there is lack of information resources, such as: procedure manual and written policy about principles of body mechanics and ergonomics practices at the department level throughout employment duration; and the fact that the majority of them did not receive any training programs about body mechanics and ergonomics at this few years of nursing experience. They practice also by imitating the older nurses. This is in agreement with the findings of Ibrahim et al. (2015); and Vidya et al. (2014),who reported that the majority of the studied nurses with less than ten years of experience suffer from LBP[48, 49].

As for marital status, the results of the present study illustrated that the majority of the studied nurses were married and about half of them had one to three children and were overweight and obese. This is in agreement with Crook et al. (2001), who found a higher prevalence of overweight or obese nurses suffering from back pain[50]. On the other hand, it was indicated that underweight nurses has a strong and significant association with work-related MSDs; as it is related to a lack of physical strength and 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 [51]. Moreover, the majority of nurses started their work in the morning shift, lasting from 8 to 12 hours. This finding indicated that LBP may occur by the cumulative adverse effect on the vertebra during the duration of work. This finding was supported by Kamel et al. (2003), who concluded that duration of work has showed a significant effect on the occurrence of LBP[52].

As regards to back pain characteristics, the findings of the present study showed statistically significant differences in total low back pain characteristics,severity of LBP, incidence of LBP, and position that affects painbetween pre, immediately after and after three months from program implementation. Moreover, more than half of nurses stated that common location of back pain is lumbar vertebra, before, immediately after and after three months from program implementation. This may be due to the highest pressure is exercised on lumbar region, when the nurse handle, lift and transfer manually or with wrong movement patients. This finding is in line with Halim et al. (2008), who found that most respondents claimed that the commonest site to develop back pain was at the lower back area[53]. Regarding quality of back pain, the present study revealed that the majority of studied nurses described back pain as strain type, at the three times of program evaluation; more than two third of them suffered from back pain for more than five years and the onset was sudden, before program implementation; compared to gradual at immediately after and after three months from program implementation.

Furthermore, all the nurses pointed out that their nursing work was the main cause for back pain; as well as standing and walking were the factors aggravating pain that become worse at night, both at the three times of program implementation. This goes in line with Sikiru (2010)[40] who found that the workplace is one of the most significant factors leading to the occurrence of lower back pain; as well asNaude (2008), who found that sitting, standing and walking for more than six hours per day had the highest percentages of back pain, indicating that a balance should exist between prolonged sitting, standing and walking[54]. It should be noted that lifting and heavy physical duty, including bending and twisting, is part of the occupational activities of hospital nurses and thus plays a huge role in the development of back pain. Regarding severity of back pain, the results of the current study mentioned that there was significant differences in severity of back pain between three times of program evaluation; and about half of nurses had severe back pain pre-program implementation; compared to gradual at immediately and after three months from program implementation. This result was consistent with Hartvigsen et al. (2009), who found that significant differences were found after attending a body mechanics program in reducing back pain among the group of nurses than prior to program implementation[55].

According to body mechanics and ergonomics practices, the findings revealed that there were highly significant differences regarding practices pre and both times of post-intervention, indicating satisfactory practices. Furthermore, the majority of the nurses had unsatisfactory levels of total body mechanics and

ergonomics practices, and for patient handling tasks (pulling patients to the side of the bed; putting patients in a lateral position; and lifting and carrying an object), at pre and immediately after program implementation; compared to satisfactory, after three months from program implementation. However, the two patient handling tasks (lifting patients to their feet; and pulling patients up in bed) was unsatisfactory before and satisfactory at both immediately after and after three months from program implementation. This may be related to the attendance of the interventional training program and the emphasis on psychomotor skills application both during and after the program implementation; unavailability of positional orientation and in-service training program, absence of continuous supervision and guidance, increase in number of patients, shortage of the nurses and increase workload, which negatively impact their performance and their quality of work life. In agreement with these findings isKochitty (2015)who showed that most of the nurses had poor practices regarding body mechanics and ergonomics; and that the majority of them had proper knowledge and practices concerning body mechanics practices, after attending a structured teaching program[56]. Additionally,Hartvigsen et al. (2009)found that an intensive educational intervention program on reducing back pain among nurses trained and educated in body mechanics, patient transfer and lifting techniques was effective and helpful and had significant differences[55].

 Regarding nurses' knowledge scores, the current results revealed that the majority of nurses had poor knowledge, regarding back pain, body mechanics and ergonomics practices before program implementation; compared to good knowledge immediately after intervention. This might be attributed to nurses' unawareness due to inadequate basic education, unavailability of pre-service and in-service training program, absence of continuous supervision and evaluation. In addition, it might be due to absence of hospital policy and guidelines for body mechanics and ergonomics. Other reasons might be increased workload, and number of patients, and unavailability of conducting such program in the hospital training plan. This goes in the same line with Tinubu (2010), who identified that training in body mechanics and body awareness has been shown to be effective in improving knowledge[57]. Moreover, Kochitty (2015) revealed that the majority of the studied nurses had poor knowledge regarding proper body mechanics in pretest of self-instructional module in proper use of body mechanics[56].

 Regarding disability levels, the present study revealed that there was highly significance difference in functional disability level at pre, immediately after, and after three months from program implementation. Moreover, approximately one quarter of the studied nurses had mild disability; while about one half of nurses had moderate disability and less than one third of them has severe disabilities, before program implementation; compared to an increase in mild and decrease in severe disability level at immediately after and post three months from program implementation. This may be attributed to the correct usage of body mechanics and ergonomics practices among the nurses after program attendance. These results indicated that using body mechanics and ergonomics practices had its positive effect on functional ability with female nurses who had LBP and reflected on their health. This was contradicted with the findings of Punnett et al. (2005), who pointed out that low back pain does not directly produce premature mortality but causes substantial disability[58].

 Pertaining to quality of nursing work life, the findings of this study revealed that nurses' total Quality of Nursing Work Life (QNWL); as well as work life/home life were highly significant differences between the three times of program evaluation (pre, immediately after and after three months). Moreover, significant differences were found between pre, immediately after and post three months of program implementation and work context and work world subscales. However, no significant difference was found between the three times of program implementation and work design subscale. This may be due to that nurses – as being female – are able to satisfy both their important home life and work life needs, through their multifunction roles, such as: mother, elderly care (living with extended family), spouse (family needs); as well as a nurse, which can be adapted and regulated over time (e.g., arranging child care at the nursery at work). Moreover, nurses can manage their work environment to make it more suitable for their needs. They have good relationships with their supervisors, colleagues, and other interdisciplinary health team members, in the provision of work. Additionally, in rural area, the image of nursing has improved due to the job security offered and the economic issues, because of their needs to earn money to overcome the economic issues. All these concerns can be changeable for nurses over time and when they are managing effectively. On the other hand, the actual nursing work, their workload, staffing, empowerment, and autonomy have not changed extensively over time because there are problems, which were not solved, such as: staff shortage and increased workload considering the organization as the main largest educational hospital in El-Beheira governorate. In line with these findings is that of Shermont and Krepcio (2006), who found that acceptable pay, good mentors and colleagues, attractive benefits, flexible scheduling, and positive interactions with physicians were the top five reasons for high QNWL[59]. Furthermore, Moradi et al. (2014) identified factors, such as: unit size, number and type of patients, hospital policies, and physical environment affect QNWL. Moreover, the higher nurses' perceptions of QNWL was positively influenced after attending the training program, which impacted their needs for self-development, which is an important component of job satisfaction and consequently the quality of work life[60]. This is

congruent with the results of Almalki et al. (2012) [23], who supported that decrease opportunities for professional development, in Saudi Arabia were unsatisfactory. Similarly, Alhusaini (2006) found that nurses were not offered any training courses or continuing education programs[61].

On the other hand, this findings are incongruent with Yan et al. (2018)[14], who indicated that the work life quality of the nurses was lower compared with the normal individuals, which may be related to the working characteristics of the nursing professionals such as labor intensive, high pressure, and an irregular working shifting, lower income, and social support. Additionally, among the subscales, the minimal score was presented in the subscale of having adequate staff and support resources to provide quality patient care, which implied that the nurses were not satisfactory with the number of staff and the facility, which were mainly associated with the following aspects: the nurses are busy caring for the patients and seldom pay attention to the hospital affairs; the nurses are usually neglected by the leaders due to lacking of management capabilities and professional trainings. Moreover, Lake (2002) stated that nurses were satisfactory to their nursing environment[62].

As regards to QNWL subscales, work context was the first subscale; followed by work design; then, work life/home life; and finally, work world, all mean percent scores increased immediately after and post three months from program implementation compared to pre-program implementation. This may be related to nurses, who perceived their work to be vital and had positive effects for them, for their patients and their organization, despite the issues that may be encountered during working times. The first dimension is work context as perceived by nurses, which deals with healthy work relations, good communication, and opportunities for self-development and advancement in career. This may be due to that nurses perceive their initiation to attend training programs at no or low fees, to get the extra monthly payment, which is ensured by the Ministry of Health and Population. Additionally, majority of nurses felt that they can participate in decisions because their continuous presence in the inpatients units. In accordance with these findings are those of Brooks et al. (2007)[15] who demonstrated that management practices, relationship with co-workers, professional development opportunities and the work environment influenced positively the QNWL. This is also supported by Martocchio and Laio (2009)[63], who found that all members of an organization contribute somehow in decisions that impact on their job and their working context through an open and appropriate communication channel, which will contribute to an increase in nurses' job satisfaction and QNWL. Contrarily, Alhusaini (2006) [60] found that Saudi nurses were dissatisfied with the relationship with their coworkers, especially physicians, and had poor communication and interaction with them and this negatively influenced their job satisfaction and QWL.

The work design dimension of QNWL was the second perceived dimension among nurses, with an emphasis on main work elements, as: manpower, time, and ability, which will in turn influence job satisfaction. This may be related to the nurses' feelings that they are the most important manpower in the organization. Moreover, they try to adapt their work schedule with their needs. In contrast with these findings is that of Hayes et al. (2006)[64], who mentioned that turnover behavior is influenced by organizational characteristics associated with workload, management style, promotional opportunities and work schedules. Moreover, it was found that each additional patient per nurse; as well as the inadequacy of patient care supplies and equipment has been associated with nurses' job dissatisfaction [65]. Hegney et al. (2006) also concluded that nurses found that their workload was heavy, and were unable to complete their work in the time available[66]. Workload has been cited as the principle cause for nurses considering leaving their workplace and their profession.

The third dimension was work life/ home life, since all studied nurses were females and the majority are married and have children, which would add domestic loads and burden to their work responsibilities. In line with this, Millicent and Richard (2010)[67], who clarified that nurses with families can experience more demanding family role tasks additionally with their potentially increase demand of work role tasks causing further perception of lack of balance. Therefore, it was clarified that the lack of work-life balance is an important factor that impact QNWL and negatively influenced their lives [68]. Furthermore, it is reported that nurses thought on-site child care and daycare for the elderly were important for their quality of work life[15]. The arrangement of work schedule based on individual's ability to achieve a work-family balance is obviously demonstrated [69]. This is supported by Millicent and Richard (2010) [67], who concluded that nurse's negative perception of a work schedule should increase the potential for the existence of work-family conflict through the perception of the scheduled hours as too excessive, irregular, or inflexible that should increase pressures on the nurse's perception of ability to serve in the family role and fulfill expected demands.

Finally, the findings of this study illustrated that the work world was the least dimension of QNWL perceived by nurses. This may be related to the poor salary that is incompatible with job demands and their feelings about their influences on patients' lives and their families, which may be blurred due to work overload. Unfortunately, these are essential for job satisfaction, and consequently the QNWL. Congruently with these results are many researchers, who found that low satisfaction with items, such as: salary and the image of nursing were reported as sources of job dissatisfaction for nursesand this consequently, were found to elucidate 40% of the variance in QNWL satisfaction [68]. In Saudi Arabia, nursing is ranked lower than other medical jobs, such as medicine and pharmacy, and the public does not appreciate the role of nurses in providing health

care, believing that nurses are no more than the assistants to physicians, which negatively affects nursing practice and retention . Lastly, the work life epitomizes a significant domain, which borders the job content and job context of nurses, who can ascribe pleasure from their work world only when the fundamental expectations about their workplace and job are suitably fulfilled, because quality of work life is believed to be the perception derived from the rudiments of workplaces that are physically and psychologically desirable [70].

## VI. Conclusion

The current study findings concluded that body mechanics and ergonomics training program had positive effect on nurses' knowledge and practices, in relation to: low back pain, disability level and quality of nursing work life at immediately after and post three months from program implementation compared to pre-program implementation. There are highly significant differences between the three times of program implementation and total low back pain (LBP) characteristics; total observed body mechanics and ergonomics practices; total disability levels; and total quality of nursing work life. In addition to that, total low back pain was positively correlated with total disability level. Additionally, total body mechanics and ergonomics practices were positively correlated with quality of nursing work life. Total disability level was negatively correlated with both total body mechanics and ergonomics practices and total quality of nursing work life. On the other hand, total low back pain was not correlated with both total body mechanics and ergonomics practices and total quality of nursing work life.

## VII.    Recommendations

In light of the findings of the present study, it is recommended that:
- Hospital administrators should:
- Develop policies for safe patient's transfer and handling (no lift policy); and guidelines for using effective body mechanics and ergonomics practices to prevent any occupational health hazards, e.g. low back pain; as well as ensure the availability of ergonomic chairs and automatic adjustable patient beds to control occupational health hazards.
- Develop and implement nurse benefit programs that would improve the work life of nurses. Methods to reward and recognize the nurse's contribution to patient care are needed. Shared governance, clinical ladders, and self-scheduling, are a few of the strategies that could be implemented in the clinical setting to improve nursing work life.
- Contribute to preventing low back pain by providing and sustaining safe patient handling and mobility training programs and monitoring work conditions and promote a culture of safety to reduce the burden of low back pain and health care work-related injuries among the nurses working in different settings, and thus promote quality of nursing work life.
- Encourage staff meetings and monthly safety committee meetings to provide an opportunity for improving reporting of back injuries, through encouraging open discussions regarding the importance of reporting injuries.
- Staff Nurses should adhere to safety guidelines and no lift policy.
- Further researches include effect of such program on intensive health care team members and effect of occupational health hazards training program on nurses' safety practices. Assessing the effectiveness, efficacy, and cost-benefit of specific strategies aimed at improving the QNWL.

## Acknowledgments

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