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Determinants of Low Back Pain among Operating Room Nurses in Gaza Governmental Hospitals

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Declaration

I certify that this thesis submitted for the degree of Master, is the result of my own research, except where otherwise acknowledged, and that this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Samer Khader Al Nawajha

Signed

Date: February   , 2011

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Abstract

Globally, Low Back Pain (LBP) comprises a significant occupational hazard in nursing profession. This study aimed to identify determinants of LBP among operating room nurses at governmental hospitals in Gaza governorates. The design of this study is a quantitative, descriptive, analytical, cross-sectional one. The study population consisted of 159 nurses who represented all the target population. The researcher used a self-constructed, self administered questionnaire. In total, 143 respondents completed the questionnaire with a response rate of 90.0%. Different statistical procedures were used for data analysis including cross tabulation, percentages, mean and Chi square test. Face, content and criterion related validity were done. Reliability testing was done by using the split half test (0.812), and Cronbach's Alpha coefficient was good (0.763).

The results revealed that the overall prevalence of low back pain among operating room nurses was 70.6. Around one third of the participants complained of moderate pain, 21.0% complained of severe pain, and 14.7% complained of mild pain. Regarding the features of pain, 25.7% described their pain as a stiffness sensation in nature, 17.8% reported numbness, 16.8% were not clear in their description of the experienced pain. Less than 4% reported a mixture of numbness and tingling. Nearly half reported complaining of an intermittent pain, while 6.9% had a continuous pain. The prevalence of pain was 68.2% among males and 78.8 among females. The highest complaint of LBP was among age group 31 – 40 years '84.0%' followed by the age group 48 – 58 years '75.0%'. The highest complain of low back pain (100.0%) was reported among those who have a long work experience (23 – 36 years). Regarding the place of work, Al Emarity Hospital had the highest percentage of LBP (100.0%) followed by AlShifa Medical Complex (84.3%). The prevalence of LBP was 73.3% among single participants especially those with BMI more than 30; with a prevalence of 82.8%.

There were no statistical significant differences between gender, age, marital status and years of experience and LBP distribution. There were significant differences between the place of work and experiencing low back pain in favor of Al Emaraty Hospital. Prolonged time standing during surgery was the main risk factor for low back pain (67.1%), followed by work overload (65.0%), lifting and transferring patients (62.9%). The majority of operating room nurses have adequate knowledge regarding safety measures during work; however, there were obvious gaps in work environment, shortage staffing, lack of comfortable seats, lack of mechanical devices for patients' lifting and high level of noise.

The study concluded that work related LBP was high among operating room nurses which might affect work quality, productivity and the quality of nurses life. The results of the study imply the need for designing operating room departments in a way that considers safe ergonometric conditions. Measures to reduce LBP at work include; ensuring adequate staffing, providing breaks between operations and providing needed equipment.

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List of Abbreviations

BLS	Bureau Labor of Statistics
BMI	Body Mass Index
EGH	European Gaza Hospital
EODS	European Occupational Diseases Statistics
GS	Gaza Strip
GNP	Gross National Product
HMSO	Her Majesty's Stationery Office
LBDs	Low Back Disorders
LBP	Low Back Pain
MOH	Ministry of Health
MSDs	Musculoskeletal Disorders
NIOSH	National Institute for Occupational Safety and Health
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NINDS	National Institute of Neurological Disorders and Stroke
NGOs	Non Governmental Organization
OR	Operation Room
PLO	Palestinian Liberation Organizations
RCTs	Randomized Clinical Trials
UNRWA	United Nations Relief and Works Agency
WB	West Bank
WRMSDs	Work Related Musculoskeletal Disorders
WHO	World Health Organization

Chapter One

Introduction

1.1 Introduction

Work related musculoskeletal disorders (WRMSDs), in particular low back pain (LBP), pose a major health and socioeconomic problem in modern society. It has been shown that 60–80% of the general population suffer from LBP at some time during their lives. Among nurses the lifetime prevalence was found to be slightly higher, varying between 56% and 90% (Maul, *et al.* 2003). Despite this high prevalence, the etiology and the nature of LBP are not yet well understood. Many studies have been performed in various occupational settings, indicating a strong association between LBP and work related factors. This was also found among nurses. The contribution of psychosocial factors and work pressure was also evident, but not as clear as has been shown for the physical factors. 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 (Roupa, *et al.* 2008).

LBP is prevalent in many industrialized societies. Prevalence rates of 39%1 and 21.2% have been reported in the general population in these societies. An estimated 12% of nurses leave the profession annually because of back injuries, and over half complain of chronic back pain (Nelson, 2006). Higher prevalence rates occur in the occupational setting. In the hospital environment, nurses are known to be a high risk group because of patient lifting and other postural requirements of their job. Several studies have focused on the prevalence and risk factors of LBP among nurses, while other studies have highlighted the problem among physiotherapists. As several other categories of workers in the hospital are subjected to muscular strains and stresses in the course of their work, they may also suffer from LBP and will benefit from prevention programs for LBP in the workplace (Omokhodion, *et al.* 2000).

Musculoskeletal disorders (MSDs) comprise significant occupational injuries and disability in nursing profession. Risk factors are known to include workplace activities such as manual handling, heavy lifting, strenuous tasks and work environment. Personal and psychosocial factors such as frequent low mood, low work support from superiors and body size variability are also important predictors in the development of this condition. Various international studies have shown that hospital nurses represent a significant nursing sub-group who are often affected by MSDs (Smith, *et al.* 2003).

Lifting and moving patients manually has been identified as a high risk activity. Moving or lifting patients in bed was perceived to have precipitated 61% of the LBP episodes and 60% of the lost workdays (Nelson, 2006). Years in the nursing profession may also be relevant, with a growing body of evidence suggesting that younger nurses are at greatest risk. Identification of individual physical predictors of back pain is more elusive. Prospective studies find predominantly non-significant relationships or inconsistent results. However, reduced lateral bending of the spine has been identified as a risk factor in two studies (Dawson, *et al.* 2007).

In Gaza strip governmental hospitals, there are several factors leading to LBP among operating room (OR) nurses due to occupational hazards leading them to suffer from it. The shortage of staff among nurses in Gaza hospitals in general, and specifically in OR put the nurse in a critical position corresponding to the LBP problems. Solutions must be put by educating policy makers, the workforce, and the nurses of tomorrow about leading risk factors to decrease the prevalence of LBP episodes.

1.2 Research problem

This study aims to identify the determinants of LBP among OR nurses in Gaza governmental hospitals. There are problematic characteristics for nurses with LBP; the OR nurses with LBP must get a special care as they are exposed to occupational factors on multiple sides. They perceive the work in a different way from healthy workers. One study showed that 18% of nursing personnel stopped working because of LBP (Maul, *et al.* 2003). Nurses have an

increased risk of back trouble. Compared to other professions, nurses have an increased risk of back pain and a six times higher prevalence of back injury (Dawson, *et al.* 2007).

Low back disorders (LBDs) represent the most common and most costly MSDs experienced in the workplace. Up to 80% of adults will eventually experience back pain at some time during their life and 4 - 5% of the population has an acute LBP episode every year, which indicates that in the united states alone an additional 11-13 million people will develop low back disorders (LBDs) annually. Much of these LBDs is associated with occupational factors and significantly increases workers compensation costs (Marras, 2000).

This problem highlights a special consideration in the working environment for the nurse as a human being. Back pain, and related injuries, were the most severe and costly injuries among nurses. Globally, the prevalence of musculoskeletal conditions among nursing staff, according to Smith, *et al.* 2004 reached 70% in 2004 while the percentage for lumbar spine pain was 56.7% (Roupa, *et al.* 2008). Stubbs, *et al.* 1983 in the UK were able to prove that over the course of a year, lower back pain afflicted 43.1% of all nursing staff (Roupa, *et al.* 2008). "In 1986 , Arad et al. in a study carried out at the Royal North Hospital of Australia amongst 1033 nurses, found 87% incidence and a 42% prevalence for LBP" (Roupa, *et al.* 2008). In OR particularly, to the best of my knowledge; no one take this problem in consideration in the past and present in Gaza strip. It is considered a very important because it is incorporated within effective service and efficiency. Moreover, back pain among OR nurses position them in a very tiredness regarding effective work; increasing incidence lead to increasing prevalence especially in OR nurses.

Given the high incidence and prevalence of WRMSDs injuries associated with care giving, and it is not surprising that their associated costs are also significant. In 1990, the estimated cost of back pain ranged from 50 to 100 billion dollars annually in the United States (Nelson, 2006). The problematic consequences for the hospitals include, but are not limited to productivity, recruitment and retention of nurses, and hospitals costs.

1.3 Justification of the study

Back pain is considered very important issue for nursing staff in OR. The performance may be limited by it. There is a lack of studies about the determinants of LBP among OR nurses in Palestine particularly; where it impedes the work in the OR departments by nurses absenteeism, especially in Gaza, also the stress related to the back pain must be taken into consideration because it is very important to link such issue and to test it. The prevalence of LBP among physical therapy professionals in Gaza Strip is 56.9% (Masoud, 2008). As I had been working in the operation room, to the best of my knowledge, it is very important to study the determinants of LPB among OR nurses since the workload over them is back-breaking.

Lack of annual assessment for OR nurses to diagnose and to predict such problems by early investigation is caused by inattention of decision makers in hospitals. The results of this study may be helpful or in other meaning, it may be a stimulus to deal with such problem, knowing the causes, prevention and/or management. The determinants of any health problem are considered as indicators for the health of the population considered. Knowing the determinants for this topic are considered as an indicator for the health of our nurses (the hospitals back bone), that if we lose them, then we will lose a golden cell. In other words, this study tackles a modern approach to organizational development and helps to integrate a health of OR nurses, activity and fitness as a daily requirement. In addition, this study highlights the determinants underpinned by causes and management strategies, which will help in developing the nurses especially in OR, and limiting the occurrence of burnout. To the best of my knowledge, there are no previous studies related to this field, the researcher will make his study in Gaza Strip to assert this problem. To the best of my knowledge, this study is the first one to be conducted in Gaza Strip.

1.4 Objectives

- **1.4.1 General objective**

The overall aim of this study is to understand the determinants of LBP among OR nurses in Gaza governmental hospitals.

- **1.4.2 Specific objectives**

1. To determine the most common factors that cause LBP among OR nurses in Gaza governmental hospitals.
2. To describe the characteristics of LBP (severity, duration, radiation and nature).
3. To identify the impact of socio demographic characteristics (age, gender, marital status place of work and years of experience) on the of LBP among OR nurses in Gaza governmental hospitals.
4. To explore the differences in pain distribution related to body mass index (BMI).
5. To assess the level of knowledge about safety measures during working among OR nurses in Gaza governmental hospitals.
6. To suggest recommendations for decision makers to prevent LBP among OR nurses in Gaza governmental hospitals.

1.5 Research questions

2. What are the most common factors that cause LBP among OR nurses in Gaza governmental hospitals ?
3. What is the severity of LBP among OR nurses in Gaza governmental hospitals ?
4. What is the duration of LBP among OR nurses in Gaza governmental hospitals?
5. What is the radiation of LBP among OR nurses in Gaza governmental hospitals ?
6. What is the nature of LBP among OR nurses in Gaza governmental hospitals ?
7. Are there differences in LBP among OR nurses related to gender?
8. Are there differences in LBP among OR nurses related to age?
9. Are there differences in LBP among OR nurses related to the place of work?
10. Are there differences in LBP among OR nurses related to the years of experience?
11. Are there differences in LBP among OR nurses related to marital status?
12. Are there differences in LBP among OR nurses related to the BMI ?
13. What is the level of knowledge about safety measures during work among OR nurses in Gaza governmental hospitals?

1.6 Operational definitions of variables

1.6.1   Determinants of low back pain

Different variables that have influence in the distribution of low back pain among OR nurses such as socio demographic characteristics (age, gender, years of experience, and place of work), physical variables such as body mass index and environmental factors in OR.

1.6.2   Low back pain.

A confirmed case within Gaza governmental hospitals operating room nurses of common symptom of musculoskeletal disorders involving the lumbosacral vertebrae and related soft tissue structures such as muscles, ligaments, nerves and intervertebral discs.

1.6.3   Operating room nurse

An operating room nurse is a healthcare worker who is a professional registered nurse working in any Gaza governmental hospital operating room and assists the surgeon and the surgical team in their tasks. An operating room nurse is responsible for the supply of all of the surgical needs and for keeping of inventory of all of the various items that are used during the operation, and has at least 2 years of experience in this field and has an age between 22-60 years.

1.6.3.1 Scrub nurse

A registered nurse working in operating room in Gaza governmental hospitals who handles the instruments, supplies, and equipment necessary during the surgical procedure. He/she has an understanding of the procedure being performed and anticipates the needs of the surgeon. He/she has the necessary knowledge and ability to ensure quality of patient care during the operative procedure, constantly on vigil for maintenance of the sterile field, has at least 2 years of experience in this field and has an age between 22-60 years.

1.6.3.2 Circulating nurse

A registered nurse working in operating room in Gaza governmental hospital who assists in obtaining additional instruments, supplies, and equipment necessary while the surgical procedure is in progress. He/she monitors conditions in the operating room, assesses the needs of the patient and surgical team, has at least 2 years of experience in this field and has an age between 22-60 years.

1.6.4   Gaza governmental hospital

An institutions that follows the Palestinian Ministry of Health (MOH), located in Gaza strip, in which illnesses, injuries, and disabilities are diagnosed and treated. It contains an operating theatre for surgical procedures, and capable of providing medical services beyond those available in physicians' offices or outpatient facilities.

1.7   Theoretical definition of variables

1.7.1 Determinants

Variables that directly or indirectly influence the frequency of occurrence and/or the distribution of any given disease; they include specific disease agents, host characteristics, and environmental factors. (Medical Dictionary, 2010).

1.7.2   Governmental hospital

Is an institution for health care providing patient treatment by specialized staff and equipment, and often but not always providing for longer-term patient stays, that are funded by the state, by health organizations or health insurances (Medical Dictionary, 2010).

1.7.3 Circulating nurse

A peri-operative nurse who is present during a surgical procedure, is not scrubbed, and is responsible for managing the nursing care of the patient and for coordinating and monitoring other activities during the procedure (Cynthia, 2009).

1.7.4 Scrub nurse

A person who performs a surgical scrub on arms and hands, dons sterile attire, stands within the sterile field, and other items to the surgical team during surgery. The scrub nurse is a member of a the sterile team and either is a nurse or surgical technician/technologist (Cynthia, 2009).

1.8 Context of the study

This study was conducted in Gaza Strip governmental hospitals; therefore, the researcher presents some background information about the geographical context, Palestine population, Palestinian economy, health situation and health care services that influences by them. In addition, some information about the place of the study which include all governmental hospitals in Gaza Strip including: Alshifa, European Gaza, Aqsa Martyrs, Crescent Alamaraty, Al Nasser children's, Specialized children's hospital, Kamal Adwan, Ophthalmic, Abu Yousef Al Najjar, Nasser medical complex, Psychiatric, Beit Hanoun, and Aldorra hospital are presented.

1.8.1 Demography and population

1.8.1.1 Palestine History

Palestine was known in ancient history as the land of Canaan, when Abraham migrated to the land of Canaan it was a well- developed country. The philistines (residents of ancient Palestine) entered the land of Canaan from Crete about 1250 before century (B.C.) and settled in the coastal areas. They were the people who gave Palestine its name, and the land of Canaan since roman

times has been known as Palestine. About 1100 (B. C.) Israelite tribes entered the land of Canaan at Jericho. The Palestinians of today, called Palestinian Arabs, are Muslims and Christians. They are the descendants of all the races and nations which have lived in and conquered Palestine from the times of the Canaanites to the British mandate of Palestine in 1918. Under the ottoman Turks in 1914, Palestine's population composed of 634, 000 Muslim and Christian Arabs and 55, 000 Jews who had emigrated from Europe, mainly from Russia. Immediately after Belfour declaration in 1917, disturbances took place between Jews and Arabs in Palestine. In 1967, Israel launched a war against Egypt, Jordan and Syria and occupied the West bank (WB), Gaza, the Golan Heights and Sinai Peninsula. The entire area of Palestine is about 27, 000 Km^2, El- Hoola lakes and half of the area of Dead Sea. Now, Palestinian territories are comprised of two areas separated geographically, the WB and GS. The total area is 6279 Km^2, with a total population of 3, 762, 500 individuals living in these areas in 2005 (annex 1).

1.8.1.2 Gaza Strip

Gaza strip is a narrow piece of land lying on the coast of the Mediterranean Sea (annex 2). Its position on the crossroads from Africa to Asia made it a target for occupiers and conquerors over the centuries. The last of these was Israel who occupied the GS in 1967. GS is a very crowded place with an area 365 Km^2 and constitutes only 6. 1% of the total area of the Palestinian land. In the year 2005, the total population in GS was 1.416.545, mainly concentrated in the cities, small village, and eight refugee camps that contain two thirds of the population of GS. The Gaza strip has a higher population density in 1997 and in 2007 than the West Bank and it is 4.864 inhabitants/ Km^2 that comprises the following five governorates (Palestinian Central Bureau of Statistics, 2007).

North of Gaza constituted 17% of the total area of GS and 1. 0% of total area of Palestinian territory area with area 61 Km^2. The total number of population living in north Gaza was 265, 932 individuals in 2005. Gaza city constituted 20. 3% of the total areas of GS and 1. 2% of total area of Palestinian territory area with area 74 Km^2. The total number of population living in Gaza City was 487, 904 individuals in 2005. Mid- Zone constituted about 15% of the total area of GS and 1. 0% of total area of Palestinian territory area with area 58 Km^2 the total number of

population living in mid- zone was 201, 112 individuals in 2005. Khanyounis constituted about 30. 5% of the total area of GS and 1. 8% of total area of Palestinian territory area with area 108 Km^2. The total number of population in Khan- Younis was 269, 601 individuals in 2005. Rafah constituted about 16. 2% the total area of GS and 1. 1% of total area of Palestinian territory area with area 64 Km^2 The total number of population in Rafah was 165, 240 individuals in 2005 (UNRWA, 2006).

1.8.1.3 Demography of Palestine

The total population living in the Palestinian territories was estimated at 3.767.126 million at the end of year 2007. About 2.350.583 million live in the West Bank (63. 2%) and 1.416.543 million in Gaza Strip (38. 8%) (Palestinian Central Bureau of Statistics, 2007).

The majority of GS population is refugees (75%) and 40% of them live in the camps. In GS the population density in the refugees' camps is one of the highest in the world (UNRWA, 2006).

In the population pyramid the age group 15- 60 years (the working age) represents about 49. 6%, the annual growth rate of GS was 2. 8%, and life expectancy at birth was 70. 7 years for males and 73. 8 years for females (MOH, 2004).

1.8.2 Socioeconomic status

The Palestinian economy refers to the economy of the Palestinian territory; including GS, WB and East Jerusalem. Current political events have severely damaged the Palestinian economy due to halting the international aid.

MOH (2004) reported that, Gaza Strip is considered one of the lowest incomes in the Middle East area. The majority of the income comes from salary of the employees and security persons, while the agriculture products share by reasonable portion in the economy. The economy nowadays mainly depends on international donors that are suspended. International aids were funding some projects and paid the salaries. The economic situation is usually especially after Al- Aqsa Intifada because of frequent closure and restriction of trade. The deteriorating economic situation, limited income and lack of work opportunities lead to low standard of living and inadequate health facilities. Despite poverty, the Palestinians are eager to learn, adult literacy ratio among those aged 15 years and more is 91%, which is considered among the high

percentage literacy rates of Arab countries (MOH, 2004). In 2007, the unemployment rate among males in Gaza Strip was higher than the unemployment rate among females, while in the West Bank it was higher for females than males. The rate of participation in the labor force in the West bank decreased from 45.2% in 1997 to 41.1% in 2007 and decreased in the Gaza strip from 40.0% in 1997 to 36.6% in 2007 (Palestinian Central Bureau of Statistics, 2007).

1.8.3 Health context

1.8.3.1 Ministry of Health

The MOH owns and operates 25 hospitals (13 in GS and 12 in the WB), furnished with 2,815 beds (1,499 in GS and 1,316 in the WB). Of these hospitals there are the general hospitals with 2,163 beds (1,199 in GS and 964 in WB), two psychiatric hospitals with 319 beds (280 in WB and 39 GS), one ophthalmic hospital in GS with 31 beds and two Pediatric hospitals in GS with 222 beds (MOH, 2006).

1.8.3.2 Gaza Governmental Hospitals

Palestinian Ministry of Health in Gaza Strip owns and manages as many as thirteen hospitals that have reached clinical capacity until 2008; about 1593 bed as in annex (4). Most hospital beds are concentrated in three large hospitals: Al Shifa, Nasser and the European Gaza Hospital. Al Shifa is a medical complex includes three hospitals: the surgery hospital, medical, obstetrics& gyna hospital, the clinical capacity is a total of 500 beds. It is located in the central west of Gaza City, it was built in 1946 on an area of 42000 m^2, and serves the area of coverage of the Gaza province with a population of 496,411 people in particular, and the Gaza Strip in general, has ten operating rooms. Nasser Medical Complex, contain two hospitals: Nasser (medical and surgery) and Mubarak hospital (obstetrics and women, and children), the clinical capacity is a total of 258 beds. The complex is situated in the western area of Khan Younis, which was built in 1958 on an area of 50000 m^2, and serves the area of Khan Younis, with a population of 270,979 inhabitants, has six operating rooms. European Gaza Hospital a hospital in the southern Gaza Strip, located in the south-eastern town of Khan Younis area, which was built in 1987 on an area of 65,000 m^2,

provide medical, surgical, and pediatric services. The total clinical capacity is about 207 beds. The hospital serves the east area of Khan Younis and the northern area of Rafah, has six operating rooms. Dr. Abdel Aziz Rantisi Pediatric hospital provides specialized medical services for children, and the clinical ability of the current operating stage is about 49 bed, located in Nasr district, start working in 2008, there are no operating rooms in it. Aqsa Martyrs Hospital provides medical, surgical, pediatric, and women and obstetrics services, the clinical capacity is about 103bed, located in the middle governorate of Deir Al-Balah, it has been built in 2001 on an area of 4000 m^2, serves the segment of the population living in the central Gaza governorate with a population of 205,535, has two operating rooms. Al Emaraty Crescent hospital is a specialized hospital of gynecology and obstetrics services, the clinical capacity of about 40 beds, located in the Tel Sultan-Rafah, built in the year 2000 on an area of 4000 m^2, and serves the segment of the population living in the Rafah governorate with a population of 173,372, has two operating rooms. Mohamed Al-Durra hospital for Children is, has the capacity of 72 bed, located in Gaza, there are no operating rooms in it.

Nasser pediatric hospital offers pediatric services, and clinical capacity with 151 beds, located in Nasr district, there are no operating rooms in this hospital. Kamal Adwan Hospital is a agencies hospital provides surgical, pediatrics and medical services, with a clinical capacity 73 beds which was built in 2002 on an area of 5000 m^2, and serves the segment of the population living in the northern Gaza Strip with a population of 270,246 people, has two operating rooms. Ophthalmic hospital, located in Nasr district, has two operating rooms. Beit Hanoun hospital provides surgical, pediatric and medical services, the clinical capacity is the total of 36 beds, located in the center of the town of Beit Hanoun, built in 2006 on an area of 2500 m^2, has two operating rooms. Psychiatric Hospital is a hospital specializes in providing psychiatric services located in Gaza, there are no operating rooms in it. Abu Yousef Al Najjar Martyr Hospital is a hospital that provides medical, surgical, and pediatric services, with clinical capacity of 40 beds, located in the district of Rafah, it has been built in 2000 on an area of 4000 m^2, and serves the segment of the population living in the Rafah governorate with a population of 173,372 people, has two operating rooms (MOH, 2009).

Chapter Two

Conceptual Framework and Literature Review

2.1 Conceptual framework

Figure 2.1: Conceptual Framework

Some related variables affect the occurrence of low back pain among OR nurses in Gaza governmental hospitals, include but not limited to demographic variables such as age, gender, years of experience, marital status and body mass index of OR nurse. Occupational factors such as long time awkward posture at work and heavy lifting contribute to the disease and raise the prevalence among OR nurses.

Conceptual frame work consists of four categories, each of them represent a determinant that has been studied in this research. The first one is the demographic variables such as gender (male and female), age, years of experience, marital status, and BMI. The relation between age, gender, marital status, experience years, and the development of low back pain was examined to determine the statistical significance. Body mass index was estimated by a standard formula and was sorted in a questionnaire according to (WHO) standards.

The second category represents the work environment characteristics such as light, ventilation, body posture, overcrowding, awkward movements, noise, heavy lifting and long time standing. This determinant was studied by a direct question to subjects, then the assessment of work environment was done to evaluate the OR is environment suited for work. The third one represents the risk factors of LBP. Some of the relevant risk factors can contribute to the causation of low back pain, such as heavy lifting, long time awkward position, bending and twisting, lifting heavy objects and lifting patients.

The fourth category represents knowledge about risk factors and for good practice to clarify if there is a gap between current position and results.

2.2 Introduction

Nurses play an important role within the health care system, providing and assisting in the provision of primary, secondary and tertiary level health care. Typically, their work is physically demanding. Nurses frequently assist patients to mobilize, transfer between positions and perform other activities of daily living such as toileting and showering. Such activities as long time standing in an operation room, long term posture and handling heavy machines and instruments also occupy an important factor in physical demand . Nurses and related medical workers lead all other occupations for risk of herniated lumbar intervertebral discs requiring hospitalization in women. Furthermore, hospitals and nursing and residential care facilities lead all industries for workplace injury and illness (Bureau of Labour Statistics, 2004). Numerous factors have been found to increase nurses' risk of back pain such as, physical load and work posture play a role, psychosocial factors such as personality and the presence of psychosomatic symptoms. Work task and work organizational factors have been shown to be significant risks in individual studies, though when all trials are considered the evidence is inconsistent. Years in the nursing profession may also be relevant, with a growing body of evidence suggesting that younger nurses are at greatest risk. Back pain and injury has a major impact on the efficiency of the nursing workforce. Registered nurses rank seventh and nursing aides and orderlies are highest ranked across all occupations for back injuries involving days away from work in private industry (Bureau of Labour Statistics, 2004).

Back injuries and resultant workers compensation claims in nurses are expensive. In long term care facilities in the United States, nurses' back injuries are estimated to cost over 6 million dollars in indemnity and medical payments. Nurses' compensation for back injury comprises 56.4% of all indemnity costs and 55.1% of all medical costs. In one Australian state, nurse back injury claims attributed 2.39 million dollars expenditure in one financial year (Dawson, *et al.* 2007). In OR, lifting heavy things such as surgical trays and patients contribute to the development of back pain among OR nurses, also remaining in wanted posture during a long surgery, twisting, assuming some positions can contribute to LBP.

2.3 Historical background

Historically, the OR has been a place full of hazards for both the patient and the care giver. The primary dangers include but are not limited to fire, chemical exposure to anesthetic agents, and direct exposure to biologic material.

2.4 Epidemiological background

Today MSDs, especially back pain are one of the most frequent health problems associated with nursing profession related directly to working conditions. Intensification of work, changes in scheduling and organization of the workplace, rising demands on nurses as well as new technologies lead to situations characterized by additional pressure and stress. As a result, more and more occupational or work-related diseases have appeared, as are musculoskeletal problems, stress, occupational burnout, chronic exhaustion and depression. According to studies carried out by the European Foundation for the Improvement of Living and Working Conditions, poor working conditions, rising demands and strict timetables and deadlines lead to significant changes in the daily lives of members of the workforce, e.g.: sleeping disorders, increased exhaustion, backaches, muscle pain, fractures and cramps (European Foundation for the Improvement of Living and Working Conditions, 2006).

The European Foundation for the Improvement of Living and Working Conditions (in its European Occupational Diseases Statistics-EODS) states that the most significant health problems faced today by the workforce are musculoskeletal disorders, with a percentage of 35%, stress with a percentage of 28% and general exhaustion with a percentage of 23%. Lately, the scientific community has been using the concept of occupational exhaustion syndrome or burnout more and more frequently in order to denote fatigue and depression among members of the workforce. Particularly vulnerable professional groups are deemed to be nurses.

Injuries to the lumbar spine are painful, chronic and in most cases non-reversible conditions, and the individuals suffering from them are unable to attend to their social, occupational and other activities. Pain in the lumbar spine and systematic drug intake become a part of the daily routine of these persons, and usually they will accompany them from the third decade of their lives

onwards. According to the results of studies carried out in the US, LBP is the most frequent reason for temporary disability among the population at large in the age group under 45, and in persons aged 45-56, it is the third most frequent reason leading to the restriction of physical activity of individuals having suffered heart trouble and rheumatic diseases. 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. In 1976 in Sweden, Dehlin, et al. in a study carried out at a geriatric hospital, found that the prevalence of lower back pain in assistant nursing staff in Greece came close to 47%. In 1983, Stubbs et al in the UK were able to prove that over the course of a year, lower back pain afflicted 43.1% of all nursing staff. In 1986, Arad et al. in a study carried out at the Royal North Hospital of Australia amongst 1033 nurses, found an 87% incidence and a 42% prevalence for lower back pain (Roupa *et al*. 2008). The prevalence of musculoskeletal conditions among nursing staff, according to Smith et al. reached 70% in 2004 in main land China, while the percentage for lumbar spine pain was 56.7%. Many researchers, among them Yip et al in 2001, and Smedley J. et al in 2003 and 2004 found that stress in the workplace is one of the most significant factors leading to the occurrence of lower back pain (Roupa, *et al*. 2008).

2.5 Classification of environmental hazards in OR

A. Physical, including back injury, fall, noise pollution, irradiation, electricity and fires.
B. Chemical, including anesthetic gases, toxic fumes from gases and liquids, cytotoxic drugs, and cleaning agents.
C. Biologic, including infectious wounds cuts or needle-stick injuries, surgical plume. sensitivity (Berry and Kohn's, 2004).

2.6 Original top ten occupational hazards by The National Institute for Occupational Safety and Health (NIOSH):

The original top ten occupational hazards by the National Institute for Occupational Safety and Health, (NIOSH) are, occupational lung diseases, musculoskeletal injuries, occupational cancers, amputations, fractures, eye loss, lacerations, traumatic death, cardiovascular diseases,

reproductive disorders, neurotoxic disorders, noise-induced hearing loss, and dermatologic conditions and psychological disorders (NIOSH, 1983).

2.7 Definition of LBP

Low back pain (LBP) is a common complaint-second only to cold and flu as a reason why patients seek care from their family doctor. It may be a limited musculoskeletal symptom or caused by a variety of diseases and disorders that affect or extend from the lumbar spine. Low back pain is sometimes accompanied by sciatica, which is pain that involves the sciatic nerve and is felt in the lower back, the buttocks, the backs and sides of the thighs, and possibly the calves. More serious causes of LBP may be accompanied by fever, night pain that awakens a person from sleep, loss of bladder or bowel control, numbness, burning urination, swelling or sharp pain (http://www.answers.com/topic/lower-back-pain).

2.8 Low Back Pain: An Anatomical Definition

The term low back pain refers to pain in the lumbosacral area of the spine encompassing the distance from the 1st lumbar vertebra to the 1st sacral vertebra. This is the area of the spine where the lordotic curve forms. The most frequent site of low back pain is in the 4th and 5th lumbar segment (Kravitz and Andrews, 1995).

2.9 Anatomy of the low back

The bony lumbar spine is designed so that vertebrae "stacked" together can provide a movable support structure while also protecting the spinal cord (nervous tissue that extends down the spinal column from the brain) from injury. Each vertebrae has a spinous process, a bony prominence behind the spinal cord, which shields the cord's nervous tissue (annex 12). They also have a strong bony "body" in front of the spinal cord to provide a platform suitable for weight bearing of all tissues above the buttocks. The lumbar vertebrae stack immediately atop the sacrum bone in between the buttocks. The spinal cord is composed of nervous tissue that extends down the spinal column from the brain. Each vertebra has a spinous process, a bony prominence

behind the spinal cord (annex 13), which shields the cord's nervous tissue from impact trauma. Vertebrae also have a strong bony "body" (vertebral body) in front of the spinal cord to provide a platform suitable for weight bearing of all tissues above the buttocks. The lumbar vertebrae stack immediately atop the sacrum bone that is situated in between the buttocks. On each side, the sacrum meets the iliac bone of the pelvis to form the sacroiliac joint of the buttocks. The discs are pads that serve as "cushions" between the individual vertebral bodies. They help to minimize the impact of stress forces on the spinal column. Each disc is designed like a jelly donut with a central softer component (nucleus pulposus) and a surrounding outer ring (annulus fibrosus). The central portion of the disc is capable of rupturing (herniating) through the outer ring, causing irritation of adjacent nervous tissue and sciatica as described below. Ligaments are strong fibrous soft tissues that firmly attach bones to bones. Ligaments attach each of the vertebrae to each other and surround each of the discs. The nerves that provide sensation and stimulate the muscles of the low back as well as the lower extremities (the thighs, legs, feet, and toes) exit the lumbar spinal column through bony portals, each of which is called a "foramen" (William and Stoppler, 2010).

2.10 Pathophysiology

The spinal column can be considered as an elastic rod constructed of rigid units (vertebrae) and flexible units (intervertebral disks) held together by complex facet joints, multiple ligaments, and paravertebral muscles. Its unique construction allows for flexibility while providing maximum protection for the spinal cord. The spinal curves absorb vertical shocks from running and jumping. The trunk muscles help to stabilize the spine. The abdominal and thoracic muscles are important in lifting activities. Disuse weakens these supporting structures. Obesity, postural problems, structural problems, and overstretching of the spinal supports may result in back pain. The intervertebral disks change in character as a person ages. A young person's disks are mainly fibrocartilage with a gelatinous matrix. Disk degeneration is a common cause of back pain. The lower lumbar disks, L4–L5 and L5–S1, are subject to the greatest mechanical stress and the greatest degenerative changes. Disk protrusion (herniated nucleus pulposus) or facet joint changes can cause pressure on nerve roots as they leave the spinal canal, which results in pain that radiates along the nerve (Smeltzer & Bare, 2004).

2.11   Clinical manifestations

The patient complains of either acute back pain or chronic back pain (lasting more than 3 months without improvement) and fatigue. The patient may report pain radiating down the leg, which is known as radiculopathy or sciatica and which suggests nerve root involvement. The patient's gait, spinal mobility, reflexes, leg length, leg motor strength, and sensory perception may be altered. Physical examination may disclose paravertebral muscle spasm (greatly increased muscle tone of the back postural muscles) with a loss of the normal lumbar curve and possible spinal deformity (Smeltzer and Bare, 2004).

2.12 Classification of LBP

2.12.1 According to the duration of symptoms

2.12.1.1 Acute low back pain

Called short-term low back pain generally lasts from a few days to a few weeks. Most acute back pain is mechanical in nature, the result of trauma to the lower back or a disorder such as arthritis. Pain from trauma may be caused by a sports injury, work around the house or in the garden, or a sudden jolt such as a car accident or other stress on spinal bones and tissues. Symptoms may range from muscle ache to shooting or stabbing pain, limited flexibility and/or range of motion, or an inability to stand straight. Occasionally, pain felt in one part of the body may "radiate" from a disorder or injury elsewhere in the body. Some acute pain syndromes can become more serious if left untreated (National Institute of Neurological Disorders and Stroke (NINDS), 2010).

2.12.1.2 Recurrent LBP

Episodes of acute low back problems lasting less than 3 months but which recur after an interval free of low back symptoms sufficient to restrict activity or function fairly common, a repeat episode of acute symptoms. Most people have at least one episode of recurrent LBP. Keeping the

abdominal, back, and leg muscles strong helps protect the back from recurring injury and probably best treated in a similar way to acute LBP episodes and leg muscles strong helps protect the back from recurring injury and probably best treated in a similar way to acute LBP episodes (Asher, 2007). Recurrent pain; the pain is present for less than half of the days during a 12-month period (Benjaminsson, *et al.* 2007).

2.12.1.3 Chronic low back pain

Defined as pain that persists longer than 12 weeks and is often attributed to degenerative or traumatic conditions of the spine, a major cause of disability that can leave a person miserable and unemployable. Chronic LBP is very difficult to treat, almost certainly easier to prevent than treat, often associated with psychosocial risk factors and a combination of exercises, pain medication, and developing skills for managing and coping with chronic pain is the recommended treatment for chronic LBP (Wheeler, 2007).

Pain is measured by duration pain that persists for more than 3 months is considered chronic. It is often progressive and the cause can be difficult to determine (NINDS, 2010).

2.12.2 According to the cause

2.12.2.1 Nonspecific LBP

In most cases it is very difficult to identify a single cause for LBP. About 85% of the LBP sufferers no clear pathology can be identified (Asher, 2007).

2.12.2.2 Mechanical LBP

Result from inflammation caused by irritation or injury to the disk, the facet joints, the ligaments, or the muscles of the back. A common cause of mechanical pain is disk degeneration. A typical muscle strain, or lumbar strain, can also be the cause of mechanical type's symptoms. 98% of LBP, sitting produces the highest load on the spine, typically worsens the pain, Lumbar spinal stenosis: spinal stenosis is caused by a narrowed spinal canal, sacroiliac

joint: Pain is worsened by extensive use of the leg, such as walking, Spondylolysis/ spondylolisthesis (Asher, 2007).

2.12.2.3 Compressive or neurogenic pain

A common cause of compressive pain is a herniated disk. The nerve that leave the lower lumbar spine joint to form the sciatic nerve. This nerve provides sensation and controls the muscles of the lower leg Pressure or irritation on the nerve roots of the lumbar spine that come together to form the sciatic nerve can interferes with the normal function of the sciatic nerve. One of the earliest signs of pressure on a nerve root is numbness in the area supplied by the nerve (Sendra, 1996).

2.13 Diagnostic procedures for low back pain

X-ray of the spine may demonstrate a fracture, dislocation, infection, osteoarthritis, or scoliosis, bone scan and blood studies may disclose infections, tumors, and bone marrow abnormalities, computed tomography (C.T. scan) useful in identifying underlying problems, such as obscure soft tissue lesions adjacent o the vertebral column and problems of vertebral disks, magnetic resonance imaging (MRI) permits visualization of the nature and location of spinal pathology, electromyogram (EMG) and nerve conduction studies used to evaluate spinal nerve root disorders (Smeltzer & Bare, 2004).

2.13.1 Plain radiography

X-rays reveal bone and may provide a crude image of some soft tissues; they do not show pain. In patients with acute low back pain, lumbar radiographs are typically normal or show only spondylosis. In the published literature, the incidence of normal radiographs ranges from 21% in medical centre settings to 38% in emergency departments (Reinus *et al.* 1998), and 37% or 43% in primary care . Despite no benefit in outcomes, more than 80% overall said they would choose to have an x-ray; patients in the x-ray group reported being more satisfied with their medical care. (Brooks, 2003).

2.13.2 Computed tomography

Computed tomography (CT) scans are of limited value in the investigation of low back pain of unknown or unsuspected origin as the most frequently seen abnormalities are also common in people with no symptoms (Wiesel, 1986). There is variation in the interpretation of abnormalities among observers (Brooks, 2003).

2.13.3 Magnetic resonance imaging

Because of its high cost, the use of magnetic resonance imaging (MRI) cannot be justified for the screening of acute low back pain. Utilization reviews demonstrate the low yield of serious conditions identified using MRI (Brooks, 2003).

2.14   Causes of LBP

Musculo-ligamentous strain, intervertebral disc prolapsed, infection, trauma, vertebral collapse, haematoma, and spinal stroke (Tjandra, *et al.* 2006).

2.15   Factors that may contribute to LBP

The patient having had back pain in the past, smoking and obesity (Burton, *et al.* 2006). Physical factors such as heavy physical work, frequent bending, twisting, lifting, pulling and pushing, repetitive work, static postures and vibrations (Anderson, 1997).

2.16   Risk factors for developing low back pain

Some of risk factors leading to LBP, uncomfortable position was the most common cause of LBP, the big number of patients treated is the cause of low back pain, prolonged standing, bending, twisting, performing manual therapy techniques and lifting heavy patients (Masoud, 2004).

There are also some of factors include:

2.16.1 Age

The first attack of low back pain typically occurs between the ages of 30 and 40. Back pain becomes more common with age. There is a significant relation between age and low back pain according to Masoud, 2004. Age years between 31–39 are the most common risk factor (Masoud, 2004). Also Sikiru and Hanifa in 2010 showed that the prevalence of LBP increased with age (Sikiru and Hanifa, 2010).

2.16.2 Gender

Men and women have similar risks of LBP up until age 60 years. Thereafter, women are at greater risk, probably because of the development of osteoporosis (Battie, 1990 & Biering, 1982). Also the study of Masoud in 2004 showed that physiotherapist men and women are affected equally (Masoud, 2004). El Astal in 2010 showed that females laboratory technicians are affected more than males. About 74.2% from females were suffering from LBP (Shehab, 2003).

2.16.3 Fitness level

Back pain is more common among people who are not physically fit. Weak back and abdominal muscles may not properly support the spine."Weekend warriors" – people who go out and exercise a lot after being inactive all week – are more likely to suffer painful back injuries than people who make moderate physical activity a daily habit. Studies show that low-impact aerobic exercise is good for the discs that cushion the vertebrae, the individual bones that make up the spine(Battie, 1990 & Biering, 1982).

2.16.4 Diet

A diet high in calories and fat, combined with an inactive lifestyle, can lead to obesity, which can put stress on the back (Battie, 1990 & Biering, 1982).

2.16.5 Heredity

Some causes of back pain, including disc disease, may have a genetic component.

2.16.6 Race

Race can be a factor in back problems. African American women, for example, are two to three times more likely than white women to develop spondylolisthesis, a condition in which a vertebra of the lower spine – also called the lumbar spine– slips out of place (Battie, 1990 and Biering, 1982).

2.16.7 Presence of other diseases

Many diseases can cause or contribute to back pain. These include various forms of arthritis, such as osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis, and cancers elsewhere in the body that may spread to the spine (Battie, 1990 & Biering, 1982).

2.16.8 Occupational risk factors

Having a job that requires heavy lifting, pushing, or pulling, particularly when this involves twisting or vibrating the spine, can lead to injury and back pain. An inactive job or a desk job may also lead to or contribute to pain, especially if the patient have poor posture or sit all day in an uncomfortable chair (Battie, 1990 & Biering, 1982).

2.16.9 Cigarette smoking

Although smoking may not directly cause back pain, it increases the risk of developing low back pain and low back pain with sciatica.(Sciatica is back pain that radiates to the hip or leg due to pressure on a nerve.) For example, smoking may lead to pain by blocking body's ability to deliver nutrients to the discs of the lower back, or repeated coughing due to heavy smoking may cause back pain. It is also possible that smokers are just less physically fit or less healthy than nonsmokers, which increases the likelihood that they will develop back pain. Furthermore, smoking can slow healing, prolonging pain for people who have had back injuries, back surgery, or broken bones (National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS, 2005).

2.17 Conditions associated with low back pain

Conditions that may cause low back pain and require treatment by a physician or other health specialist include:

2.17.1 Bulging disc

Called protruding, herniated, or ruptured disc. The intervertebral discs are under constant pressure. As discs degenerate and weaken, cartilage can bulge or be pushed into the space containing the spinal cord or a nerve root, causing pain. Studies have shown that most herniated discs occur in the lower, lumbar portion of the spinal column. A much more serious complication of a ruptured disc is cauda equina syndrome, which occurs when disc material is pushed into the spinal canal and compresses the bundle of lumbar and sacral nerve roots. Permanent neurological damage may result if this syndrome is left untreated (NINDS, 2010).

2.17.2 Sciatica

Is a condition in which a herniated or ruptured disc presses on the sciatic nerve, the large nerve that extends down the spinal column to its exit point in the pelvis and carries nerve fibers to the

leg. This compression causes shock-like or burning low back pain combined with pain through the buttocks and down one leg to below the knee, occasionally reaching the foot. In the most extreme cases, when the nerve is pinched between the disc and an adjacent bone, the symptoms involve not pain but numbness and some loss of motor control over the leg due to interruption of nerve signaling. The condition may also be caused by a tumor, cyst, metastatic disease, or degeneration of the sciatic nerve root (NINDS, 2010).

2.17.3 Spinal degeneration

From disc wear and tear can lead to a narrowing of the spinal canal. A person with spinal degeneration may experience stiffness in the back upon awakening or may feel pain after walking or standing for a long time (NINDS, 2010).

2.17.4 Spinal stenosis

Related to congenital narrowing of the bony canal predisposes some people to pain related to disc disease (NINDS, 2010).

2.17.5 Osteoporosis

Is a metabolic bone disease marked by progressive decrease in bone density and strength. Fracture of brittle, porous bones in the spine and hips results when the body fails to produce new bone and/or absorbs too much existing bone. Women are four times more likely than men to develop osteoporosis. Caucasian women of northern European heritage are at the highest risk of developing the condition (NINDS, 2010).

2.17.6 Skeletal irregularities

Produce strain on the vertebrae and supporting muscles, tendons, ligaments, and tissues supported by spinal column. These irregularities include scoliosis, a curving of the spine to the side; kyphosis, in which the normal curve of the upper back is severely rounded; lordosis, an

abnormally accentuated arch in the lower back; back extension, a bending backward of the spine; and back flexion, in which the spine bends forward (NINDS, 2010).

2.17.7 Fibromyalgia

Is a chronic disorder characterized by widespread musculoskeletal pain, fatigue, and multiple "tender points," particularly in the neck, spine, shoulders, and hips. Additional symptoms may include sleep disturbances, morning stiffness, and anxiety (NINDS, 2010).

2.17.8 Spondylitis

Refers to chronic back pain and stiffness caused by a severe infection to or inflammation of the spinal joints. Other painful inflammations in the lower back include osteomyelitis (infection in the bones of the spine) and sacroiliitis (inflammation in the sacroiliac joints) (NINDS, 2010).

2.18 Characteristics of low back pain

2.18.1 Quality

Radicular pain tends to be shooting, lancinating or electric in quality, whereas somatic referred pain is typically a dull, deep ache or pressure-like in quality. Distinctive qualitative features of the pain may suggest whether it is somatic in nature, radicular in nature or both. An appreciation of the quality of pain experienced and its topographic distribution guides management of the patient (Brooks, 2003).

2.18.2 Radicular pain (sciatica) and somatic referred pain

Low back pain should not be confused with or regarded as synonymous with radicular pain (sciatica). Whilst back pain and radicular pain may occur together, their causes and mechanisms differ (Bogduk and McGuirk, 2002). The management of radicular pain is outside the scope of this guideline. Radicular pain relates explicitly to pain felt in the lower limb; it is evoked by

stimulation of the nerve roots or dorsal root ganglion of a spinal nerve. Radicular pain should not be confused with somatic referred pain, defined as pain perceived in a region innervated by nerves or branches of nerves other than those that innervate the primary source of pain, where that source lies in one of the tissues or structures of the body wall (soma) or limbs. It has been generally considered that pain radiating below the knee was radicular pain (i.e. representing nerve root pathology). However, a recent study has shown that disc stimulation alone may cause referred pain into the distal extremity. Thus, pain that radiates below the knee cannot be considered to be specific for nerve root pathology. This should be taken into consideration to avoid unnecessary investigation and treatment. A description of burning pain that is often a feature of neuropathic pain (i.e. pain resulting from a disease or injury to a nerve as opposed to pain from musculoskeletal tissues) is difficult to interpret. Deep, burning pain in the absence of any other feature, distribution or quality is not necessarily neuropathic pain. Burning sensations in the skin imply a neuropathic mechanism that may include a radicular or other neuropathic process (Brooks, 2003).

2.18.3 Duration

It is important to establish the duration of pain (i.e. acute, subacute, chronic) as the evidence base for management options varies depending on pain duration. While duration does not carry diagnostic significance, it does have prognostic significance (Brooks, 2003).

2.18.4 Frequency

Low back pain may wax and wane, but does not exhibit periodicity that is of diagnostic significance. Frequency is more likely to be a function of aggravating factors than an index of the cause or mechanism of pain (Brooks, 2003).

2.18.5 Intensity

The severity of low back pain carries little diagnostic or prognostic weight. There are no valid guidelines by which to assess the clinical significance of very severe pain. It is helpful to record

the severity of the pain, at baseline and subsequently, using a quantitative assessment to provide an indication of whether or not the pain is improving or altering in severity over time (Brooks, 2003).

2.18.6 Onset

No particular cause of low back pain has a characteristic time of onset. Morning stiffness is said to be a feature of ankylosing spondylitis, but while this feature has a high to moderate sensitivity, its specificity is moderate to low. A slow onset at less than 30 years of age, male gender, and improvement with exercise are early warning signs. Spontaneous pain of an explosive onset should raise concerns of a spontaneous fracture or an infection. Recent history of penetrating injury in the form of a surgical or dental procedure, catheterization or cannulation, a wound, or self injection constitutes an alerting feature for possible osteomyelitis, epidural abscess or discitis. Sudden onset of low back pain in association with trauma or minor trauma in the elderly or those on corticosteroids should alert the clinician to the possibility of fracture (Brooks, 2003).

2.19   Management of LBP

Most cases of LBP are treated conservatively. If pain persists or worsens, or if other symptoms develop, a more aggressive approach is taken.

2.19.1 Home remedies

Applying ice immediately during the 48 hours after straining a muscle can reduce pain. After spasms and acute pain subside, heat can be applied to loosen tight muscles. (e. g. a hot bath or whirlpool or a heat wrap that stays warm for 4 to 6 hours). Cold therapy (e. g. ice or cold pack application) may be effective at relieving LBP in some cases (Rootberg, 2007).

2.19.2 Bed rest

Two or three days of followed by a gradual return to normal activity is sometimes recommended. A systematic review found nine randomized clinical trials (RCTs) comparing bed rest with other treatments, like exercise therapy, physiotherapy, manipulation and non steroidal anti inflammatory drugs. Either no difference was found, or bed rest resulted in worse outcomes in pain, functional status, recovery and sick leave. Bed rest appeared to be no more or less effective than no treatment or a type of placebo treatment. Two good quality RCTs found no significant differences between seven days and two to three days of bed rest in patients with low back pain of different duration with and without radiating pain. Overall, the review suggests that, at best, bed rest as compared with advice to stay active will have small positive effects, and at worst might have small harmful effects on acute low back pain (Hagen, *et al.* 2000).

2.19.3 Medication

Are often used to treat acute and chronic low back pain. Effective pain relief may involve a combination of prescription drugs and over-the-counter remedies. Patients should always check with a doctor before taking drugs for pain relief. Certain medicines, even those sold over the counter, are unsafe during pregnancy, may conflict with other medications, may cause side effects including drowsiness, or may lead to liver damage (NIAMS, 2010).

2.19.3.1 Over-the-counter analgesics

Including nonsteroidal anti-inflammatory drugs (aspirin, naproxen, and ibuprofen), are taken orally to reduce stiffness, swelling, and inflammation and to ease mild to moderate low back pain. Counter-irritants applied topically to the skin as a cream or spray stimulate the nerve endings in the skin to provide feelings of warmth or cold and dull the sense of pain. Topical analgesics can also reduce inflammation and stimulate blood flow. Many of these compounds contain salicylates, the same ingredient found in oral pain medications containing aspirin (NIAMS, 2010).

2.19.3.2 Anticonvulsants

Drugs primarily used to treat seizures - may be useful in treating certain types of nerve pain and may also be prescribed with analgesics (NIAMS, 2010).

2.19.3.3 Some antidepressants

Particularly tricyclic antidepressants such as amitriptyline and desipramine, have been shown to relieve pain (independent of their effect on depression) and assist with sleep. Antidepressants alter levels of brain chemicals to elevate mood and dull pain signals. Many of the new antidepressants, such as the selective serotonin reuptake inhibitors, are being studied for their effectiveness in pain relief (NIAMS, 2010).

2.19.3.4 Opioids

Such as codeine, oxycodone, hydrocodone, and morphine are often prescribed to manage severe acute and chronic back pain but should be used only for a short period of time and under a physician's supervision. Side effects can include drowsiness, decreased reaction time, impaired judgment, and potential for addiction. Many specialists are convinced that chronic use of these drugs is detrimental to the back pain patient, adding to depression and even increasing pain (NIAMS, 2010).

2.19.4 Physical therapy

The goals of physical therapy in LBP are to decrease pain, increase function, restore normal movement, and prevent recurrences, it can be in the following forms:

2.19.4.1 Massage therapy

May help to increase circulation to the affected area. There are several techniques and devices used in massage therapy. Acupressure or pressure point massage may be more beneficial than classic massage (Hurwitz et al. 2003).

2.19.4.2 Exercise

May be the most effective way to speed recovery from low back pain and help strengthen back and abdominal muscles. Maintaining and building muscle strength is particularly important for persons with skeletal irregularities. Doctors and physical therapists can provide a list of gentle exercises that help keep muscles moving and speed the recovery process. A routine of back-healthy activities may include stretching exercises, swimming, walking, and movement therapy to improve coordination and develop proper posture and muscle balance (NIAMS, 2010).

2.19.4.3 Body Awareness Therapy

An educational system centered on movement, aiming to expand and refine the use of the self through awareness. It is intended for those who wish to improve their movement repertoire (dancers, musicians, artists), as well as those wishing to reduce pain or limitations in movement and many who want to improve their general and personal development well-being (Dionne, 2005).

2.19.4.4 Spinal manipulation

Spinal manipulation refers to procedures in which professionals use their hands to mobilize, adjust, massage, or stimulate the spine or surrounding tissues. This type of therapy is often performed by osteopathic doctors and chiropractors. It tends to be most effective in people with uncomplicated pain and when used with other therapies. Spinal manipulation is not appropriate if the patient have a medical problem such as osteoporosis, spinal cord compression, or

inflammatory arthritis (such as rheumatoid arthritis) or if the patient taking blood-thinning medications such as warfarin (Coumadin) or heparin (Calciparine, Liquaemin) (NIAMS, 2005).

2.19.4.5 Behavioral modification

Developing a healthy attitude and learning to move your body properly while you do daily activities – particularly those involving heavy lifting, pushing, or pulling – are sometimes part of the treatment plan for people with back pain. Other behavior changes that might help pain include adopting healthy habits, such as exercise, relaxation, and regular sleep, and dropping bad habits, such as smoking and eating poorly (NIAMS, 2005).

2.19.5 Surgical treatments

In the most serious cases, when the condition does not respond to other therapies, surgery may relieve pain caused by back problems or serious musculoskeletal injuries. It may be months following surgery before the patient is fully healed, and he or she may suffer permanent loss of flexibility. Since invasive back surgery is not always successful, it should be performed only in patients with progressive neurologic disease or damage to the peripheral nerves. Surgical interventions include, discectomy, foraminotomy, intra discal electrothermal therapy (IDET), nucleoplasty, radiofrequency lesion, spinal fusion, spinal laminectomy (NIAMS, 2010).

2.20 Prevention of low back pain

Low back pain due to muscle strain can be prevented by lifestyle choices, including regular physical exercise and weight control, avoiding smoking, and learning the proper techniques for lifting and moving heavy objects. Exercises designed to strengthen the muscles of the lower back and the opposing abdominals are also recommended. Simple actions can also help prevent low back pain, such as putting a small, firm cushion behind the lower back when sitting for long intervals, using a soft pillow for sleep that supports the lower neck without creating an unnatural angle for head and shoulder rest, using a swiveling desk chair with a postural support or stool that maintains the knees at a higher level than the hips, standing on flexible rubber mats to avoid

the impact of concrete floors at places of employment for example, and wearing supportive, soft soled shoes, avoiding the use of high heels (http://www.answers.com/topic/lower-back-pain).

Recurring back pain resulting from improper body mechanics or other non traumatic causes is often preventable. A combination of exercises that don't jolt or strain the back, maintaining correct posture, and lifting objects properly can help prevent injuries. Many work-related injuries are caused or aggravated by stressors such as heavy lifting, contact stress (repeated or constant contact between soft body tissue and a hard or sharp object, such as resting a wrist against the edge of a hard desk or repeated tasks using a hammering motion), vibration, repetitive motion, and awkward posture. Applying ergonomic principles designing furniture and tools to protect the body from injury at home and in the workplace can greatly reduce the risk of back injury and help maintain a healthy back. More companies and homebuilders are promoting ergonomically designed tools, products, workstations, and living space to reduce the risk of musculoskeletal injury and pain (NIAMS, 2010).

The use of wide elastic belts that can be tightened to "pull in" lumbar and abdominal muscles to prevent low back pain remains controversial. A landmark study of the use of lumbar support or abdominal support belts worn by persons who lift or move merchandise found no evidence that the belts reduce back injury or back pain. The 2-year study, reported by (NIOSH) in December 2000, found no statistically significant difference in either the incidence of workers' compensation claims for job-related back injuries or the incidence of self-reported pain among workers who reported they wore back belts daily compared to those workers who reported never using back belts or reported using them only once or twice a month (NIAMS, 2010).

2.21 Work related back pain

Work related back pain is often a patient's first experience with serious spinal symptoms. Our vocations often put stress on our backs, either through physical demands or emotional strain. Back pain related to a person's job costs companies billions of dollars every year in lost man hours, insurance claims and poor worker performance. Back pain is the first reason for an employee to miss a day of work (cure back pain.org, 2010).

2.22 Work related back pain types

There is no particular pattern of work related pain that is universal. Workers in many varied professions can suffer terrible pain or injury caused by their jobs (cure back pain.org, 2010).

2.22.1 Repetitive stress back pain

Is a common result of jobs that involve repetitive movements. Using the same muscles over and over can put an uneven load on the skeleton, as well as the muscles themselves (cure back pain.org, 2010).

2.22.2 Manual labor back pain

Is mostly due to overexertion of the back muscles. People with jobs involving heavy manual labor must be very careful with their spines. Workers that perform vigorous and strenuous labor as a regular part of their job description are at higher risk for every type of back pain (cure back pain.org, 2010).

2.22.3 Sitting back pain

Is the bane of office workers worldwide. People that are confined to a chair for much of their work day can suffer muscular, skeletal, and posture related pain syndromes (cure back pain.org, 2010).

2.22.4 Driving back pain

Is similar to sitting back pain, but worse. Not only are drivers confined to a chair for their work day, but they must also operate foot pedals and vehicular controls while keeping a constant eye on the road. This condition is often a combination of muscular, postural and emotional stress related symptoms, all rolled into one lovely package (cure back pain.org, 2010).

2.22.5 Psychological work related back pain

Many workers feel emotional or psychological stress at work. This emotional stress causes a distinct physical reaction in the body. The muscles get very tight, tense, and prone to injury. Work related psychological back pain is one of the most common forms of all job related pain. The worker might experience this pain directly from issues at work, or from personal issues that provide feelings of fear, anger, or insecurity concerning one's career (cure back pain.org, 2010).

2.23 Sickness absence among workers

Sickness absence is used in occupational medicine as an important indicator of morbidity. As healthy functioning is a mixture of social, mental and physical status, sickness absence may be used as an integrated measure of healthy functioning and coping in working populations. MSDs represent an important cause of morbidity and disability. Currently 40% of worldwide work-related health costs are attributed to MSDs . In Norway, MSDs have been the dominant cause of sickness certification by a doctor, whether measured by incidence, duration of single episodes or number of days of work lost. A study of sickness certification concluded that more than one third of the health problems causing sickness certification were potentially preventable. The potential for prevention was assessed to be highest when the diagnosis underlying sickness certification was MSDs. Many episodes of sickness absence have a multi factorial background and many are not, or only marginally, related to the work environment. At the occupational level, several factors influence sickness absence from MSDs, such as the physical and psychosocial environment, job title , and the absenteeism culture at and outside work. At the individual level, age, gender and diagnosis have been associated with sickness absence from MSDs (Morken, *et al.* 2003). About 30.8% among physiotherapy professionals in Gaza Stip have got a sick leave due to LBP (Masoud, 2004).

The rates of sickness absence and being awarded a disability pension from MSD vary in different occupations and tend to be higher among blue-collar workers than among white-collar workers. The high sickness absence rates in certain occupations might be caused both by socio-economic difference and by high occupation-specific morbidity. Factors associated with the varying effects of disease include difficulties in meeting requirements for physical fitness, lack of control over

the work situation and opportunities to cope. However, little is known about the relative impact of pain from various body parts, psychosocial work environment and individual factors on sickness absence from MSD. The prevalence of MSD in the aluminum industry is high, and there is a considerable work-related fraction. More knowledge about the predictors of sickness absence from MSD in this industry will be valuable in determining strategies for prevention (Morken, *et al.* 2003).

Short- and long-term sickness absences are often distinguished. It is generally accepted that subjective factors play a larger role in short-term absence than in long-term absence. Individuals' short-term sickness absence might be regarded as a coping mechanism that prevent serious illness in the longer term rather than as directly expressing poor health. In Norway, employees may be absent from work from sickness 12 days per year without needing certification by a physician. Long-term absence has a greater impact on social expenditure than does self-certified absence, and the predictors for short- and long-term absence might therefore differ (Morken, *et al.* 2003). In addition there was a strong association between occupational gender segregation and musculoskeletal-related sickness absence (Leijon, *et al.* 2004) .

2.24 Low back pain among nurses

The Bureau of Labor Statistics in 1998, said that nursing easily tops the list of occupation as most associated with work-related musculoskeletal disorders. In all industries combined, 1998 injury data show that nearly 12 out of 100 nurses in hospitals, and 17.3 out of 100 nurses working in nursing homes report work-related musculoskeletal injuries, including back injuries (annex 4), which is about double the rate for all industries combined (Hedge, 2000).

2.25 Risk factors for low back pain among nurses

There are two main risk factors for back pain among nurses: lifting and transferring patients, and bed- making. During a typical shift, on average a hospital staff nurse will lift 20 patients into bed, and transfer 5-10 patients from bed to a chair. Patients typically weight in excess of 100 lbs, which puts this load well above the weight that would be considered 'safe' for industrial workers for this frequency of lifting. As with many hospitality workers, bed- making also increases the

risks of back injury because of the bending and stretching involved in putting sheets onto a bed (Hedge, 2000).

2.25.1 Environmental and physical risk factors

In addition to the heavy lifting and physical demands associated with manually lifting patients, the forward bending, twisting, and reaching required when feeding, bathing, and dressing patients are also associated with an increased risk of musculoskeletal injury. The height of the bed has an important influence on the working posture and handling capacity of nurses. Simple nursing tasks such as measuring blood pressure and giving injections at the bedside can generate high static loads on the musculoskeletal system of nurses. Lifting and moving patients manually has been identified as a highrisk activity. Moving or lifting a patient in bed was perceived to have precipitated 61% of the low-back pain episodes and 60% of the lost workdays (Nelson, 2006).

2.26 Lifting and moving as a hazard for back pain among OR nurses

Back injuries are listed as the second most common reason for absenteeism in the work force, following the common cold. Health care workers experience 4.5 more overexertion injuries than any other classification of workers (Cynthia spry, 2009, p 335).

2.27 Factors that influence the number of back injuries include the following

Aging workforce, Stuffing shortage, Obesity of both patients and stuff, and Sicker, less mobile patients. Lifting and moving heavy pieces of equipment and patients can cause injury when the operating room nurse exceeds his or her capacity to lift safely and puts excess force on the spine. Lifting and moving surgical instrument sets, and patients causes many work-place injuries. Instrument sets often contain multiple, heavy, stainless-steel instruments that must be transported from place to place at different levels. Injuries include sprains and strains, acute or chronic lower back pain, and shoulder and neck injuries from lifting heavy instruments sets (Cynthia spry, 2009, p 335).

Factors contribute to lifting injuries are height from which the item is lifted, the location and size of the item, and the gender, age, and training of the person doing the lifting. Operating room nurses sometimes lift heavy articles and twist to the side when moving them from place to place. In an effort to save time, OR nurses attempt to lift items, such as instrument sets, that are stored above shoulder level rather than use a ladder. Other factors contribute to low back pain among OR nurses include, pushing and pulling a stretcher, bed, or other equipment; transferring a patient to and from a stretcher to an operating room bed; positioning a patient; holding an extremity during a prep procedure; long periods of standing in one spot coupled with poor posture can cause back pain. When scrubbed, bad posture also contribute (Cynthia spry, 2009, p 335).

2.28 Female's low back pain

Women's back pain is a growing problem for the women all over the world. Society expects more from women now than ever before and the increased stress and repressed emotional anger is a main contributor to the epidemic of back pain and the increasing incidence of fibromyalgia among women. Back pain in women has become one of the most common health complaints, especially in women aged 30 to 50 (cure back pain.org, 2010).

2.29 Female's back pain contributors

Some of the contributors are valid and others are unjustly blamed. There are some definite contributors to physical back pain: such as menstrual cycle and pregnancy. Luckily, these conditions usually do not cause severe or lasting back pain. In the case of chronic unresolved back pain, the actual cause may be psychosomatic (http://www.cure-back-pain.org/womens-back-pain.html).

2.30 Psychological female's back pain

There are also a variety of reasons often blamed for back pain, when in reality, the cause is often psychosomatic. Innocent activities like these are often triggers for psychosomatic back pain to

begin. Medical science does not find a definitive cause for idiopathic symptoms and often uses one of these scapegoats as a possible explanation for the pain. The reality of most of these pain syndromes is that the cause is emotional. Psychological back pain is the most common type of chronic back pain in the world. It is the result of repressed and painful emotions that create the need for physical symptoms. These physical symptoms serve the purpose of distracting the patient from the emotionally charged subconscious issues. These issues are often very subtle and are usually related to the activity that produces the symptoms (http://www.cure-back-pain.org/womens-back-pain.html).

2.31 Recommendation on women's back pain

Women are expected to cater to family, meet the needs of their mate, raise children, get an advanced education, earn a good living, take care of a home and generally run all aspects of life. This seems like a crushing burden, but most women do it with a beautiful smile on their face. This seeming acceptance of the great pressure and societal expectation might be accepted consciously, but it also enrages a woman subconsciously. It is no wonder why women have a high incidence of psychological pain syndromes, including back pain. The solution is not in some pill or treatment. The answer to the pain is in the simple knowledge of accepting the interaction of the mind and body. Knowledge therapy can make the majority of these seemingly physical pain conditions disappear. It worked for me. It has worked for millions around the globe (Eric and Stanley, 2010)

2.32 Obesity and LBP

It is widely noted that the economic cost of obesity and its related disorders are staggering, with lifestyle related conditions such as diabetes mellitus and coronary heart disease placing a large economic burden on the health care system. However, low back pain also has a significant socioeconomic impact. Cost estimates range from 20 to 50 billion dollars annually, with 10% of the patients accounting for 85 to 90% of the costs. In Australia, Walker, *et al.* (2003) estimated the cost of low back pain in 2001 alone to be 9.17 billion Australian dollars.

One question, which arises from the discussion concerning obesity, is whether obesity is a risk factor for low back pain. Along with low back pain, the conventional wisdom is that overweight persons are at risk of osteoarthritis in weight-bearing joints such as the knee, the hips, and feet. To date, literature reviews have given conflicting views based on the available data and method of data retrieval. The purpose of this review is to establish, from recent research, if there is a causal link between obesity and the affliction of low back pain. A secondary purpose of this review is to present the concepts of evidence-based practice to aid the chiropractor or osteopath in looking for health-related evidence for their patients who present with obesity. Interest in the association between obesity and low back pain has piqued researcher's interest for many years. Intuitively, a burgeoning waistline and an increased lordotic lumbar spine led researchers to conclude that overweight people would be more prone to low back pain. Historically, it has been found that the prevalence of disk degeneration with obesity was not significant. However, it was not until the mid-1970's when several studies observed a possible association. Obesity was found to increase the prevalence of disk degeneration significantly in a study by Magora and Schwartz in 1976 . In a review of 144 cases, it has been found that 70% of those who complained of low back pain had been classified as being overweight. This basic research appeared to conclude what was already intuitively thought about low back pain and increased weight (Mirtz and Green, 2005). There were no statistical significant differences between prevalence of LBP and weight, also there were no statistical significant differences between prevalence of LBP and BMI among physiotherapy professionals in Gaza strip (Masoud, 2004).

2.33 Prognosis

Acute LBP is usually self- limiting (90% of people recover within 6 weeks), although 2 to 7% develop chronic pain. One study found that recurrent pain accounted for 75% to 85% of absenteeism from work (Frymoyer, 1988). Systematic reviews and additional primary studies were used to develop this section, however the studies included in the systematic reviews have not been individually assessed (Brooks, 2003).

2.34 The costs of LBP

The National Health Service spends per year more than 10 billion dollars on LBP related costs, this includes:

The Health and Safety Executive estimates that musculoskeletal disorders, which includes LBP costs UK employers between 590 and 624 million dollars per year (Her majesty's stationery office (HMSO), 1997). The total cost of LBP corresponds to between 1% and 2% of Gross National Product (GNP) (Norlund & Waddell, 2000). In USA the costs are estimated to range from 20 billion dollars to 50 billion dollars annually (Skinner, 1996). Employers pay over 30 billion dollars in worker compensation costs for musculoskeletal disorders each year (Cynthia spry, 2009, p 335). Direct costs associated with occupational back injuries of health care providers average 37,000 dollars. In addition, there are other (indirect) costs (Cynthia spry, 2009, p 335).

2.35 Ergonomics can change injury risks

Throughout the 90s there has been a steady decline in the incidence of non-fatal injuries among nursing professionals, and much of this probably can be attributed to better training and better equipment. Using proper body mechanics when lifting heavy instrument sets can reduce the incidence of neck, shoulder, and back injuries. Safe lifting requires engineering designs to ensure that the physical conditions are safe for lifting; employee training in the correct lifting mechanics; and review of injury reports to identify common causes that need work redesign (Hedge, 2000).

2.36 The occupational safety and health administration (OSHA) has identified the elements for a program to prevent back injuries

Wheels and other heavy devices to move heavy equipment, mechanical devices for patient lifting, adequate stuffing to prevent stuff from lifting patients alone, training for new and experienced stuff, addressing avoidance of back injuries, supervision of newly trained employees to validate learning , and evaluation of workers prior to employment to identify preexisting back

disorders (OSHA, 1999). The health care facility should first assess the current inventory of patient transfer equipment based on the patient population. It must decide what types of equipment will bee needed and determine how frequently the equipment will be used. Thus the facility can ensure that adequate numbers of devices are available (Cynthia spry, 2009, p 336).

2.37 Ways to reduce injury risks among nurses

There are several ways that hospitals, care facilities and nursing professionals can reduce injury risks. These include:

Using lifting assistance devices - a variety of devices is available to help lift and move patients from bed to seat, such as gait belt; a specialized belt that fits snugly around the patient's waist and has hand straps for the nurse or caregiver to grasp while assisting during transfers or walking. Walkers; lightweight metal frame devices with rails that can be gripped by the patient to help to support their body weight during transfer and rising from sitting. Rails; wooden or metal rails that are fixed to walls or equipment, such as beds, to allow the patient to help to support their body weight during transfer.

Hoyer lifts; a hydraulic lift that consists of a metal frame and a heavy canvas swing. It is capable of lifting and suspending a patient for transfer. Sliding boards; a smooth board with tapered ends made of either wood or plastic that is used to help someone get from one sitting surface to another. Draw/ lift sheets; a regular flat sheet placed under a person in bed can be used to move them. If the sheet is strong enough it can also be used to lift and transfer the patient (Hedge, 2000).

Using appropriate equipment - there is a choice of powered equipment available to reduce patient handling activities, such as powered beds to change a patient's posture, height adjustable chairs, and powered wheelchairs. Use appropriate beds - the height of the bed determines how much bending and reaching a nurse has to do. Nurses are different heights, so a simple-to-operate, height-adjustable bed is important to allow bed height to be appropriately adjusted to the nurse. Use back belts - the general use of back belts in the distribution industry has been questioned. However, in a study of 47 employees over a 6-month period, the use of back belts significantly reduced injury risks. The test group with back belts worked 22,243 hours and had no injuries,

whereas the control group worked 23,109 hours and lost 80 hours due to back injuries. Implement regular equipment maintenance procedures, equipment must be kept in good working order. Ergonomic design of workplaces, use architectural and design features, such as rails or ramps, to minimize awkward movements. Providing better ergonomics training to train nurses and health aides in good work postures and ways of minimizing twisting, bending and/or lifting items from the floor. Also train them in safe lifting practices, and in the correct use of appropriate equipment. Provide ways of refreshing and reinforcing the training. Provide adequate staffing - injury risks can be reduced by increasing the number of people available to assist with lifting patients. (Hedge, 2000).

2.38 Recent research on back injuries in nursing

A Dutch questionnaire survey of back pain prevalence and physical work demands compared nurses working in institutional care with nurses working in patient's private homes, where there was more frequent and heavy lifting and transferring of patients, plus more static workloads. Results showed that back pain prevalence was relatively high among these community nurses, as compared to rates among nurses in other health care sectors. Community nurses with back pain, who continued to work, reported providing less efficient home care work. Total sick leave incidence due to musculoskeletal disorders, other than back pain, exceeded that due to back pain alone among these community nurses. Similar results have been reported in an Australian retrospective questionnaire survey of manual handling activities and associated injuries among 269 nursing professionals working at a large teaching and referral medical center in Melbourne, Australia. Overall, 40.1% reported an injury associated with manual handling activity, of which 75.9% (82) were back injuries. The prevalence of all manual handling and back injuries was lower among the 108 full- time nurses, 20.6% and 15.7% respectively. Direct patient care activities accounted for about two-thirds (67.6%) of all manual handling injuries. Lifting patients accounted for one half of all direct patient care activity associated injuries, and approximately one-third (34.3%) of all injuries. Similar results were found for manual handling practices and injuries among Intensive Care Units (ICU) nurses working in a large tertiary referral medical center in Australia where the rate of manual handling and back injuries among ICU nurses was high (52.2% and 71.4% respectively) (Hedge, 2000).

A retrospective case-control study at the Istituti Ortopedici Rizzoli in Bologna (Italy) investigated the risk factors for low-back pain in hospital workers. Compared with a control group of hospital staff, the risks of low-back pain were significantly higher in nursing and health aides (OR= 21.67), in nurses (OR: 20.21), in therapists (OR: 16.36) and in X-ray technicians (OR: 13.64). The risk of occupational back injury was highest in the orthopedic wards, in the plaster-rooms, in the operating blocks and in the sterilization plants. Increased risk of back pain was strongly associated with specific manual handling. Non- occupational factors(cigarette smoking, previous trauma leading to hospital admission, and for women, number of children), showed only weak associations (Hedge, 2000).

A cross-sectional, epidemiological analysis of MSD on musculoskeletal disorders among hospital nurses in rural Japan conducted, a self-reporting survey was used as diagnostic tool. An initial group of 329 nurses was recruited from three affiliated, rural locations in Yamanashi prefecture, central Japan; 247 usabie replies were obtained (final response rate: 75.1 %). They showed that the 12-month period-prevalence of self-reported MSD at anybody site was 91.9% (95% Cl 87.8-94.7). Low back pain (LBP) was the most commonly reported MSD with a prevalence of 82.6% (95% Cl 77.4-86.8). Next most reported were shoulder (61.1%,95% Cl 54.9-67.0), neck (36.8%,95% Cl 31.1-43.0), upper back (29.1%,95% Cl 23.8-35.1), knee (23.5%,95% Cl 18.6-29.1) and upper leg MSD (19.4%,95% Cl 15.0-24.8). MSD ofthe wrist (14.2%,95% Cl 10.4-19.1), upper arm (13.0%,95% Cl 9.3 -17.7) and lower arm (11.7% 95% Cl 8.3-16.4) were less common. Logistic regression indicated that nurses who were regularly involved in the manual handling of patients had an increased LBP risk of 16.7 (OR 16.7, 95% Cl 1.3-412.7, p = 0.0340) when compared with nurses who were not involved in manual handling of patients (smith, *et al.* 2003).

A cross-sectional survey of (WRMSDs), associated job risk factors and coping strategies was employed using a self administered questionnaire among nurses from selected hospitals in Ibadan, South-west Nigeria. A total of 160 questionnaires were distributed to nurses in the different hospitals but 128 questionnaires were returned yielding an 80% response rate.

The results showed that eighty-four point four percent of the nurses have had WRMSDs once or more in their occupational lives. The 12-months period and point prevalence rate of WRMSDs at

anybody region was 78% and 66.1% respectively. WRMSDs occurred mostly in low back (44.1%), neck (28.0%), and knees (22.4%). 30.3% treated themselves or had visited other health practitioners for care. Nurses with > 20 years of clinical experience are about 4 times more likely to develop WRMSDs (OR 3.81; CI 1.08-13.4) than those with 11-20 years experience. Working in the same positions for long periods (55.1%), lifting or transferring dependent patients (50.8%) and treating an excessive number of patients in one day (44.9%) were the most perceived job risk factors for WMSDs. Getting help in handling heavy patients (50.4%), modification of nursing procedures in order to avoid re-injury (45.4%), and modifying patient's nurse position (40.3%) were the top three coping strategies (Tinubu, et al. 2010).

A cross-sectional study was designed to determine the prevalence and risk factors for LBP among nurses in Murtala Mohammad Specialist Hospital, Kano, North-West Nigeria. A department-to-department enquiry was conducted using a self structured valid and reliable questionnaire. The result showed that the 12 month prevalence of LBP was 300 (73.53%). LBP was more prevalent among female nurses (68%) than the male nurses (32%). It was also associated with occupational hazard and poor knowledge of back care ergonomics. The prevalence of LBP is comparable to levels recorded abroad. However, in this study LBP did not feature as a major cause of sickness absence in the work place. When determining the causes of LBP; 200 (66.67%) of the LBP cases believed that their LBP was related to their work, while 40 (13.33%) and 60 (20.00%) associated their back pain with domestic and previous trauma respectively. There was significant association between activities (causative factors) and incident of LBP at P-value < 0.05. Regarding back care ergonomics; all respondents (100%) with no LBP had previous knowledge of back care hygiene. 80 (26.67%) of nurses with LBP had knowledge of back care hygiene while 220 (73.33%) LBP respondents had no knowledge of back care hygiene. Regarding severity of LBP one hundred and thirty 130(43.34%) nurses indicated that their pain was mild and that it did not disturb their daily activities; 116 (38.66%) reported that it was moderate and 54(18%) was severe. Out of the 116 nurses with moderate LBP, 53 reported that it prevented from going to work while the remaining 63 only reported restriction in daily activities. 54 (18%) thought it was severe, preventing them from going to work (Sikiru and Hanifa, 2010).

2.39 Summary of literature review

Low-back pain (LBP) is common in the general population, affecting different ages, has multiple risk factors, and it has been shown that it represents higher prevalence than other MSDs types (annexes from 5 – 11). Lifetime prevalence has been estimated at nearly 70% for industrialized countries; sciatic conditions may occur in one quarter of those experiencing back problems Studies of workers' compensation data in the united states have suggested that LBP represents a significant portion of morbidity in working populations: data from a national insurer indicate that back claims account for 16% of all workers' compensation claims and 33% of total claims costs around the world .

There are many conditions in the low back which may cause back pain, including muscular or ligamentous strain, facet joint arthritis, or disc pressure on the annulus fibrosis, vertebral end-plate, or nerve roots. Numerous factors have been found to increase nurses' risk of back pain. Physical load and work posture play a role, as do psychosocial factors such as personality and the presence of psychosomatic symptoms. Work task and work organizational factors have been shown to be significant risks in individual studies, though when all trials are considered the evidence is inconsistent. Nursing qualifications are important, with nursing assistants at greater risk for back pain than registered nurses. Years in the nursing profession may also be relevant, with a growing body of evidence suggesting that younger nurses are at greatest risk. Identification of individual physical predictors of back pain is more elusive. Prospective studies find predominantly non-significant relationships or inconsistent results. However, reduced lateral bending of the spine has been identified as risk factor in two studies. Back pain and injury has a major impact on the efficiency of the nursing workforce. Registered nurses rank seventh and nursing aides and orderlies are highest ranked across all occupations for back injuries involving days away from work in private industry. Back injuries and resultant workers compensation claims in nurses are expensive. In long term care facilities in the United States, nurses' back injuries are estimated to cost over 6 million dollars in indemnity and medical payments. Nurses' compensation for back injury comprises 56.4% of all indemnity costs and 55.1% of all medical costs. In one Australian state, nurse back injury claims attributed 2.39 million dollars expenditure in one financial year.

Chapter Three

Methodology

3.1 Introduction

The aim of this study is to understand the determinants of LBP among OR nurses in Gaza governmental hospitals. This chapter will address issues related to methodologies used to answer the research questions. The chapter commences with study design, study population, study setting, period of the study, sample size, and sampling. It presents construction of the questionnaire, piloting, ethical consideration, data collection and data analysis.

3.2 Study design

The design of this study is a quantitative descriptive, analytical cross-sectional. This type of design is useful for describing the study construct. It's suitable in term of time, people, money, resources and it is relatively practical and manageable. This design was chosen because it is the useful design and it is less expensive and enables the researcher to meet the study objectives in a short time.

3.3 Study population

The target population consists of all OR nurses who are currently working in operating departments in Gaza governmental hospitals. The total number of OR nurses in Gaza governmental hospitals is 167 nurses, 159 of them were eligible in the study, and 8 were excluded (7 pregnant and 1 have LBP before getting the job).

3.4 Sample size and sampling process

The sample of this study consisted of the whole population (census) 159 nurses, who were working in OR at governmental hospitals in Gaza Strip after excluding seven pregnants and one having a history of LBP 10 years ago.

3.5 Selection criteria

3.5.1   Inclusion criteria

Operating room nurses who met the following criteria were included in the study:
- Working at Gaza governmental hospitals in operating room (Males and Females)
- A registered nurse.
- Age from 22- 60 years old.
- At least 2 years experience in this current job.
- Having LBP since he/she received the job.

3.5.2   Exclusion criteria

Operating room nurses were excluded from the study:
- Working in Non-governmental hospitals, Military and police Medical Services.
- Working in another field different from OR.
- Any individuals who have a history of LBP (have LBP before getting this job)
- Unregistered nurse.
- Have an experience less than 2 years
- Age below 22 or more than 60 years old.
- Pregnant nurses.

3.6 Study Setting

This study was carried out at Gaza governmental hospitals including:

Al-shifa hospital, European Gaza hospital, Aqsa Martyrs Hospital, Crescent Alamaraty Hospital, Kamal Adwan hospital, Ophthalmic hospital, Abu Yousef Al Najjar hospital, Nasser medical complex, , and Beit Hanoun hospital.

3.7 Period of the study

The study was conducted during the period from May 2010 to October 2010.

3.8 Ethical Consideration and procedures

The researcher was committed to all ethical considerations required to conduct a research. First, ethical approval was obtained from the school of public health (Al-Quds University), Helsinki Committee to carry out the study (annex15), an approval letter was obtained from general director of the hospitals at Gaza strip to visit the hospital and meet the staff. (annex 16) .

3.9 Instrument of the study

A structured self-administered questionnaire was distributed to 159 operating room nurses who are currently working in governmental hospitals in Gaza Strip during the time of the study.

3.9.1   Questionnaire

A structured self-administered questionnaire was distributed to (159) OR nurses who were working in governmental OR . The data was collected by the researcher himself to avoid any possible bias.

3.9.2 Questionnaire design

- The questionnaire was designed in English language (annex 18).Then translated to Arabic language (annex 19). Both were revised by those experienced people in Arabic, English language and expert in back pain.
- In each questionnaire, an explanatory letter was attached to facilitate questionnaire filling.
- Questionnaire was developed with closed- ended questions (yes or no).
- A four point likert scale also used (1= Seldom, 2= Quite often, 3= Very often, and 4= Always).
- The questionnaire consisted of seven parts as follows:
- The first part represented personal and demographic data
- The second part contained characteristics of low back pain,
- The third part represented nature, severity, duration and radiation of LBP
- The fourth part represented determinant factors or causes of LBP.
- The fifth part contained questions regarding work environment characteristics.
- The sixth part represented questions regarding knowledge safety measures to avoid LBP during working.
- The seventh part represented suggestions or recommendations to reduce pain.
- Explanation was given to avoid mistakes in wording of the questions to the subjects during data collection, so that the subjects would clearly understand the questions.

3.10 Response rate

The number of respondents was 143 out of 159 (response rate was 90.0%), seven pregnant women were excluded, one participant who had LBP before getting OR job.

3.11 Data entry and statistical analysis

The following steps were used in data entry
- The data entry was done after over-viewing of the filled data abstract sheets.

- Designing data entry model using the computer statistical package for social sciences (SPSS) and EXCEL software.
- The variables of abstracts sheets were coded then entered onto the computer by the researcher.
- Data was cleaned to ensure correct entry.

3.12 Pilot Study

A pilot study for the questionnaire was conducted before collecting the results of the sample. It provided a trial run for the questionnaire, which involved testing the wordings of the questions, identifying ambiguous questions, testing the techniques used to collect data, and measuring the effectiveness of standard invitation to respondents. The researcher conducted a pilot study on a sample of 30 participants, selected randomly from different OR in the hospitals. No modification was done in the questionnaire after piloting and the pilot participants were included in the study.

3.13 Validity and reliability

3.13.1 Validity of the research

We can define the validity of an instrument as a determination of the extent to which the instrument actually reflects the abstract construct being examined. "Validity refers to the degree to which an instrument measures what it is supposed to be measuring". High validity is the absence of systematic errors in the measuring instrument. When an instrument is valid; it truly reflects the concept it is supposed to measure. Achieving good validity requires the care in the research design and sample selection . The amended questionnaire was reviewed by the supervisor and three experts in the tendering and bidding environments to evaluate the procedure of questions and the method of analyzing the results. The experts agreed that the questionnaire was valid and suitable enough to measure the purpose that the questionnaire designed for.

3.13.2 Content validity of the questionnaire

Content validity test was conducted by consulting two groups of experts. The first was requested to evaluate and identify whether the questions agreed with the scope of the items and the extent to which these items reflect the concept of the research problem. The other was requested to evaluate that the instrument used was statistically valid and that the questionnaire was designed well enough to provide relations and examined variables. The two groups of experts did agree that the questionnaire was valid and suitable enough to measure the concept of interest with some amendments.

3.13.3 Statistical validity of the questionnaire

To insure the validity of the questionnaire, two statistical tests were applied. The first test is Criterion-related validity (Spearman test) which measures the correlation coefficient between each item in the field and the whole field. The second test is structure validity (Spearman test) that was used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of similar scale.

3.14   Criterion related validity :

3.14.1 Internal consistency

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of thirty questionnaires, through measuring the correlation coefficients between each paragraph in one field and the whole filed. Tables No. (3.1) below shows the correlation coefficient and P-value for each field items. As shown in the table the P-Values are less than 0.01,so the correlation coefficients of this field are significant at $\alpha = 0.01$, so it can be said that the paragraphs of this field are consistent and valid to measure what it was set for.

Part B: Characteristics of low back pain (LBP)

Table 3.1: The Correlation Coefficient Between Each Paragraph in the Field and the Whole Field

No.	Statement	Pearson coefficient	p-value
1	Complaining of alteration in gait	0.691	0.003
2	Complaining of alteration in spinal mobility	0.777	0.000
3	Complaining of alteration in sensation in lower extremities (parasthesia)	0.571	0.011
4	Complaining of alteration in leg length (limping)	0.502	0.040
5	Complaining of muscles spasm in the back	0.677	0.001
6	Low Back Pain starts during working hours	0.655	0.002
7	Onset of LBP is sudden	0.675	0.004
8	Did you got sick leave due to LBP	0.497	0.030

Part D: Risk factors of LBP

Table 3.2: The Correlation Coefficient Between Each Paragraph in the Field and the Whole Field

No.	Statement	Pearson coefficient	P-value
1	Sustained trauma during work	0.569	0.011
2	Uncomfortable chairs	0.643	0.001
3	Prolonged time sitting in surgery that need sitting	0.567	0.005
4	Prolonged time standing	0.601	0.002
5	Sudden movements	0.449	0.032
6	Bending and twisting	0.800	0.000
7	Lifting heavy objects	0.535	0.012
8	Work overload	0.546	0.007

No.	Statement	Pearson coefficient	p-value
9	Wearing high heel shoes during work	0.654	0.002
10	Unsuitable posture during work	0.563	0.019
11	Working environment (light, ventilation, heat, noise and crowded)	0.653	0.002
12	Lifting and transferring patients	0.662	0.001
13	Positioning a patient	0.514	0.012
14	Holding an extremity during a prep procedure	0.593	0.003

Part E: Work environment characteristics

Table 3.3: The Correlation Coefficient Between Each Paragraph in the Field and the Whole Field

No.	Statement	Pearson coefficient	*p*-value
1	Is there enough lighting in your work place?	0.393	0.029
2	Is there good ventilation in your work place?	0.649	0.000
3	Is there good air conditioning to maintain proper operating room temperature in your work place?	0.596	0.000
4	Are the chairs comfortable chairs ?	0.518	0.003
5	Is the floor sloppy ?	0.510	0.003
6	Is there much furniture that restricts your free movement?	0.637	0.000
7	Are there wheels and other heavy devices to move heavy equipment?	0.472	0.007
8	The height of working operating tables, disks, machines, instruments sets are comfortable for you.	0.475	0.040
9	Is your work place crowded?	0.659	0.002
10	Are there mechanical devices for patient lifting?	0.371	0.043
11	Are there Adequate stuffing?	0.792	0.000
12	Are there rails ramps to minimize awkward movements?	0.372	0.039
13	Is your work place noisy?	0.590	0.000

Part F: Knowledge regarding safety measures to avoid LBP during work

Table 3.4: The Correlation Coefficient Between Each Paragraph in the Field and the Whole Field

No.	Statement	Pearson coefficient	p-value
1	Sitting properly on chair will reduce pain	0.424	0.020
2	Handling instruments / equipments properly will reduce pain	0.472	0.007
3	Sitting in one place for long time may increase your pain	0.504	0.004
4	Bending for long time may increase your pain	0.497	0.004
5	Stretching your body intermittently may decrease your pain	0.635	0.000
6	Sudden movements may increase your pain	0.409	0.022
7	Wearing high heel shoes during work may increase your pain	0.505	0.004
8	Fluctuating room temperature may increase your pain	0.560	0.001
9	Noise and crowed at work place may increase your pain	0.525	0.002
10	Presence of wheels and other heavy devices to move heavy equipment and patients will reduce LBP	0.377	0.040
11	Ergonomic design of operating room will decrease the pain such as rails or ramps.	0.511	0.003

3.15 Reliability of the instrument

Reliability of an instrument is the degree of consistency with which it measures the attribute it is supposed to be measuring . The test is repeated to the same sample of people on two occasions

and then compares the scores obtained by computing a reliability coefficient. For the most purposes reliability coefficient above 0.7 are considered satisfactory. Period of two weeks to a month is recommended between two tests due to complicated conditions that the contractors is facing at the time being, it was too difficult to ask them to responds to our questionnaire twice within short period. The statistician's explained that, overcoming the distribution of the questionnaire twice to measure the reliability can be achieved by using Cronbach's Alpha coefficient and Split Half Method through the SPSS software.

3.15.1 Split Half method

This method depends on finding Pearson correlation coefficient between the means of odd rank questions and even rank questions of each field of the questionnaire. Then, correcting the Pearson correlation coefficients can be done by using Spearman Brown correlation coefficient of correction. The corrected correlation coefficient (consistency coefficient) is computed according to the following equation :

Consistency coefficient = $2r/(r+1)$, where r is the Pearson correlation coefficient. The normal range of corrected correlation coefficient $2r/(r+1)$ is between 0.0 and + 1.0. As shown in table (3.5), all the corrected correlation coefficients values are between 0.719 and 0.812 and the general reliability for all items equal 0.812, and the significant (α) is less than 0.05 so all the corrected correlation coefficients are significance at $\alpha = 0.05$. It can be said that according to the Half Split method, the dispute causes group are reliable.

Table 3.5: Split-Half coefficient method

Part	section	Person-correlation	Spearman-Brown Coefficient	Sig. (2-(Tailed
Part 2	characteristics of low back pain (LBP)	0.683	0.812	0.000
Part 4	Risk factors of LBP	0.680	0.810	0.000
Part 5	Work environment characteristics	0.564	0.721	0.000

Part	section	Person-correlation	Spearman-Brown Coefficient	Sig. (2-(Tailed
Part 6	Knowledge regarding safety measures to avoid LBP during work	0.5617	0.719	0.000
Part 7	Suggestions/recommendations to reduce pain	0.6254	0.770	0.000
	Total	**0.683**	**0.812**	**0.000**

3.15.2 Cronbach's coefficient alpha

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. As shown in table (3.6) the cronbach's alpha coefficient was calculated for the first field of the causes of claims, the second field of common procedures and the third field of the particular claims. The results were in the range from 0.742 and 0.773, and the general reliability for all items equal 0.763. This range is considered high; the result ensures the reliability of the questionnaire.

Table 3.6: Cronbach's Alpha for reliability

Part	Section	No. of Items	Cronbach's Alpha
Part 2	Characteristics of low back pain (LBP)	8	0.742
Part 4	Risk factors of LBP	14	0.773
Part 5	Work environment characteristics	13	0.752
Part 6	Knowledge regarding safety measures to avoid LBP during work	11	0.743
	Total	**46**	**0.763**

3.16 Statistical management

To achieve the goal of the study, the researcher used the statistical package for the Social Science (SPSS) for Manipulating and analyzing the data.

3.17 Statistical methods are as follows:

1. Frequencies and Percentile
2. Alpha- cronbach test for measuring reliability of the items of the questionnaires
3. Person correlation coefficients for measuring validity of the items of the questionnaires.
4. Spearman –Brown Coefficient
5. Cross tabulation
6. chi-square test
7. Mean

3.18 Limitations of the Study
- Limited time
- Financial costs
- Transportation
- Frequent electricity cut off.

Chapter Four

Results and Discussion

4.1 Introduction

This chapter illustrates the results of statistical analysis of the data, including descriptive analysis that presents the socio -demographic characteristics of the study sample and answers to the study questions. The researcher used simple statistics including frequencies, means and percentages, also advanced statistical procedures were used such as Chi square.

4.2 Demographic characteristics

The study population consisted of 143 operating room nurses, 110 (76.9) were males and 33 (23.1%) were females, their age ranged between 22 to 58 years, mean age was 33.73 and standard deviation was 9.59. The highest age group was between 22 – 30 years and represented (51.0%), there were twenty five of the study samples with age from 31 – 40 years (17.5 %). Twenty nine from 41 - 47 years (20.3%), sixteen were from 48 - 58 years and represented 11.2% (table 4.1).

Table 4.1: Distribution of Study Population According to Age, Gender, Marital Status, Level of Education and Experience in Operating Room.

Variables		Number (No.)	Percentage (%)
Age (Years)	22 - 30	73	51.0
	31 – 40	25	17.5
	41 – 47	29	20.3
	48 – 58	16	11.2
	Total	143	100.0
Gender	Male	110	76.9
	Female	33	23.1
	Total	143	100.0
Marital status	Single	30	21.0
	Married	110	76.9
	Divorced	3	2.1
	Total	143	100.0
Levels of education	Diploma	89	62.2
	Bachelor	51	35.7
	Post graduate	3	2.1
	Total	143	100.0

4.3 Distribution of study population according to place of work

Table 4.2: Distribution of Study Population According to Place of Work

Hospital name	Target population	Percentage (%)	Respondents
Al-shifa hospital	56	35.7	51
Nasser medical complex	21	14.7	21
European Gaza hospital	21	11.9	17
Aqsa Martyrs Hospital	14	9.8	14
Kamal Adwan hospital	9	6.3	9
Abu Yousef Al Najjar	12	5.6	8
Beit Hanoun hospital	10	7.0	10
Ophthalmic hospital	7	4.2	6
Crescent Alemaraty	9	4.9	7
Total	**159**	**100.0**	**143**

Table (4.2) shows that the total target population was composed of 159 OR nurses, actual respondents were 143 (seven pregnant women and one having a history of LBP before getting in to this job were excluded from actual study) as illustrated in table 4.1 (Nursing Unit, 2010).

4.4 Distribution of participants according to job characteristics (N= 143)

Table 4.3: Illustrates Participants Job Characteristics, Including Years of Employment, Overtime Work Hours, and Additional Job.

Variables	Category	Frequency	Percentage (%)
Experience years in OR	2 – 8 years	97	67.8 %
	9 – 15 years	26	18.2 %
	16 – 22 years	13	9.1 %
	23-36 years	7	4.9 %
	Total	**143**	**100.0**
Over time per weak	No over time	77	53.8
	1 - 10 hours	55	38.5
	More than 10 hours	11	7.7
	Total	**143**	**100.0**
Additional working after formal job	No	111	77.6
	Yes	29	20.3
	Missing	3	2.1
	Total	**143**	**100.0**

From the above table (4.3) the results revealed that the majority (67.8%) of the participants have a work experience in operating room for 2 – 8 years, 18.2% have been experienced for 9 – 15 years, 9.1% for 16 -22 years and 4.9% of the participants have been employed for 23 – 36 years.

More than half of the participants 78 (53.8%) don't work overtime, among those who work over time, 38.5% work from 1 – 10 overtime hours and 7.7% work more than 10 hours. The majority of the participants 111 (77.6%) don't have additional job and 29 (20.3%) work after formal job.

4.5 Distribution of the study sample according to physical variables

4.5.1 Distribution of study population according to height, weight and BMI

Table 4.4: Distribution of Study Population According to Height, Weight and BMI(N= 143)

Variables	Category	Frequency	Percentage (%)	Mean
Height (cm)	166cm and less than	41	28.7	172.24 cm
	167 – 176 cm	56	39.2	
	177 – 186 cm	40	28.0	
	187cm and above	6	4.2	
	Total	143	100.0	
Weight (kg)	67kg and less than	32	22.4	78.27 kg
	68-78 kg	39	27.3	
	79-89 kg	41	28.7	
	90 kg and above	31	21.7	
	Total	143	100.0	
Body Mass Index (BMI)	18.5 and Less than (Underweight)	1	0.7	26.63 kg
	18.5-24.9 (Normal)	54	37.8	
	25-29.9 (Pre-obese)	63	44.1	
	30-34.9 (Obese class I)	17	11.9	
	35-39.9 (Obese class II)	7	4.9	
	40 and more (Obese class III)	1	0.7	
	Total	143	100.0	

As shown in table (4.4) above, the mean of height of the study sample was 172.24 cm with a standard deviation 9.4, forty one (28.7%) of the study sample had a height of 166 cm and less, 56 (39.2%) were 167-176 cm, 40 (28.0%) were 177-186 cm and 6 (4.2%) were 187 and above.

The mean of weight of the study sample was 78.27 kg with a standard deviation 12.38. Thirty two (22.4%) of the study sample had a weight of 67 kg and less, 39 (27.3%) were 68-78 kg, 41 (28.7%) were from (79-89 kg) and 31 (21.7%) were 90 kg and above.

The mean of body mass index (BMI) of the study sample was 26.63 kg with a standard deviation of 4.54. The highest group represents a pre obese group (25 – 29.9) and it represents 63 (44.1%) of the study population, 54 (37.8%) were from 18.5-24.9 (Normal), and 1 (0.7%) were more than 40. This classification is according to WHO classification of BMI.

4.6 Low back pain

4.6.1 Prevalence of low back pain

Figure 4.1: Prevalence of Low Back Pain

As shown in figure (4.1), there are 101 (70.6%) of the study population of operating room nurses were complaining of LBP, 42 (29.4%) were not complaining of LBP. This result is consistent

with El Astal, (2010) who showed that the prevalence of MSP was 68.7% among laboratory technicians, also, this result is higher than the results of Masoud, (2004) who showed that the prevalence of LBP among physiotherapists were between 56.2% and 56.9%. In contrast, the current study results are consistent with the results of Maul, *et al.* (2003) which showed that the prevalence among nurses varied from 73% to 76%. In addition, the result of this study agree with Sikiru and Hanifa, (2010) showed that the prevalence of low back pain within the last 12 months was (73.53%) among nurses in a typical Nigerian Hospital.

Also this result is higher than the results of Ozguler , *et al*. (2000) which showed that the prevalence of low back pain varied from 8% to 45%. The high prevalence of this study among OR nurses could be attributed to the needed effort from OR nurses during their work like bending، twisting, lifting and long standing that lead to increased risk of LBP. The similarity in prevalence with other countries could be attributed to the same work overload and needed efforts done by the nurses in different regions in the world.

4.6.2 Distribution of LBP according to gender

Table 4.5: Gender and LBP (N = 143)

Gender	(N) Yes		(N) No		Total	
	Frequency	% Within gender	Frequency	% Within gender	Frequency	%
Male	75	68.2	35	31.8	110	100.0
Female	26	78.8	7	21.2	33	100.0
Total	101	70.6	42	29.4	143	100.0
	Chi square = 1.37			*P*-value = 0.241 //		

N= total number of participants   // not significant

Table (4.5) showed that, 101 (70.6%) of total participants were complaining of LBP. Males accounted for 75 (68.2%) and females accounted for 26 (78.8%), which mean that the prevalence

of LBP is higher among female participants. There were no statistical significant differences between gender and LBP among OR nurses, as Chi square value = 1.37 and p value = 0.241.

This result is inconsistent with the results of the National Health Interview Survey, (2002), which showed that females workers are affected by LBP more than males. This result is consistent with Josephson, (1998) who showed that there were no significant differences in prevalence between women and men. In contrast, this result is inconsistent with Helliovaara, *et al.* (1989) who showed that males and females are affected equally. Also, this result was in consistent with the results of El Astal, (2010) which showed that females are affected more than males. In addition, this result is inconsistent with Abdul Samad, *et al.* (2010) showed that the prevalence of low back pain among school teachers was 39.6% among men and 48.1% among women in Klang Valley. This could be attributed to fact that this study was conducted in places (hospitals operating rooms), where employees of both sexes have to deal with the same work as well as the same load and efforts,

4.6.3 Age and LBP

Table 4.6: Age and LBP (N = 143)

Age group in years	Complain of LBP				Total	
	(N) Yes		(N) No			
	Frequency	%	Frequency	%		
22-30	47	64.4%	26	35.6%	73	100.0%
31-40	21	84.0%	4	16.0%	25	100.0%
41-47	21	72.4%	8	27.6%	29	100.0%
48-58	12	75.0%	4	25.0%	16	100.0%
Total	101	70.6 %	42	29.4 %	143	100.0 %
Chi square = 3.71			*P*-value = 0.293 //			

N = number of participants   // not significant

Table (4.6) shows that the highest complain of LBP was among age group 31 - 40 years old which represented (84.0%), followed by age group 48 - 58 years (75.0%), where as 21 of study population (72.4%) complaining of LBP aged between 41 - 47 years and the lowest group represents 47 (64.4%) was aged between 22 - 30 years old which. There were no statistical significant differences between age and LBP among OR nurses, as Chi square value = 3.71 and *p* value = 0.293. This result is consistent with the results of Masoud, (2004) where his results showed that LBP was more common in age group 31 – 39 years. Also this result is consistent with Maul *et al.* (2003) who that there were no significant association between age and LBP. It has been reported that the mean age of nurses with current back pain was slightly but significantly greater than those without. Conversely it has been found that LBP decreased with age, whereas others suggested that it was not related to LBP (Venning, *et al.* 1987). Also these results were inconsistent with the results of Sikiru and Hanifa, (2010) which showed that the prevalence of LBP increased with age; age group < 35, 36–45 and > 46 reported LBP of 19 (6.3%), 81 (27%) and 200 (66.7%) respectively. This is could be attributed to the years of experience, work type in different areas and others.

4.6.4 Years of experience and LBP (N = 143)

Table 4.7: Distribution of LBP in Regard to Years of Experience

Years of experience	Complain of LBP				Total	
	(N) Yes		(N) No			
	Frequency	% within group	Frequency	% within group	Frequency	%
2-8 years	63	64.9%	34	35.1%	97	100.0
9-15 years	22	84.6%	4	15.4%	26	100.0
16-22 years	9	69.2%	4	30.8%	13	100.0
23-36 years	7	100.0	0	0.00	7	100.0
Total	101	70.6	42	29.4	143	100.0
Chi square = 6.88			**P- value = 0.076 //**			

N = number of participants   // not significant

Table (4.7) shows that, the highest experience group complaining of LBP was the group who have been employed for (23 – 36 years) and it represents 100.0% within group, followed by experience group from 9 – 15 years which represented 84.6%,whereas 69.2% from experience group (16 – 22 years), are complaining of LBP. while 64.9 % from the group 2 – 8 years are complaining of LBP and it was the lowest one. There was no statistical significant difference between years of experience and LBP as Chi square = 6.88, *P* value = 0.076. This result is inconsistent with the results of June and Cho, (2010) who showed that nurses with 2 - 4 years of working experience in intensive care units had the greatest probability of back pain. This result is inconsistent with Tinubu, *et al.* (2010) who showed that Nurses with > 20 years of clinical experience are about 4 times more likely to develop WRMSDs.

4.6.5 LBP and work place

Table 4.8: Distribution of LBP in Regard to Work Place

| | Complain of LBP | | | | Total | |
| | Have LBP | | Don't have LBP | | | |
Hospital Name	Frequency	% within hospital	Frequency	% within hospital	Frequency	%
Al-shifa	43	84.3 %	8	15.7%	51	100.0 %
Nasser	15	71.4 %	6	28.6%	21	100.0 %
EGH	10	58.8 %	7	41.2%	17	100.0 %
Aqsa Martyrs	8	57.1 %	6	42.9%	14	100.0 %
Kamal Adwan	6	66.7 %	3	33.3%	9	100.0 %
Al Najjar	1	12.5 %	7	87.5%	8	100.0 %
Beit Hanoun	6	60.0 %	4	40.0%	10	100.0 %
Ophthalmic	5	83.3 %	1	16.7%	6	100.0 %
Alemaraty	7	100.0 %	0	0.00	7	100.0 %
Total	101	70.6 %	42	29.4%	143	100.0 %
Chi square = 24.00			*P*-value = 0.002 **			

** significant at 0.01

Table (4.8) shows that, the highest percentage (100.0%) of OR nurses working in Alemaraty crescent hospital complaining of LBP, followed by Alshifa medical complex (84.3%), ophthalmic hospital (83.3%), Nasser medical complex (71.4%), Kamal Edwan hospital (66.7%), Beit Hanoun (60.0%), European Gaza Hospital (58.8%), Aqsa Martyrs (57.1%), and Alnajjar hospital (12.5%). The highest percentage of LBP in Alemaraty crescent hospital could be attributed to the working gender, where most (85.7%) of OR nurses in Alemaraty crescent hospital are female, so it is not strange for this percentage of LBP as the women complain of back pain in daily life and daily work because they were engaged in multi life stations as pregnancy, delivery. The high percentage among OR nurses at Al shifa hospital could be attributed to the work overload in operation room as it is a central hospital in Gaza strip and the major operation with multi types are engaged in it. Also the OR nurses working in operation room of the ophthalmic hospital assume some positions during surgery to adapt working with microscopic surgery; this is why the ophthalmic hospital had 83.3% of LBP among its nurses. There are statistical significant differences between work place and LBP as Chi square = 24.00, P value = 0.002. This result is inconsistent with Masoud, (2004) who showed that there were no significant differences between prevalence of LBP and Place of work among physiotherapy professionals; it could be attributed to the work overload in the hospital itself.

4.6.6 LBP and marital status

Table 4.9: Distribution of LBP in Regard to Marital Status

Marital status	Complain of LBP				Total	
	(N) Yes		(N) No			
	Frequency	% within group	Frequency	% within group	Frequency	%
single	22	73.3%	8	26.7%	30	100.0
Married	77	70.0%	33	30.0%	110	100.0
Divorced	2	66.7%	1	33.3%	3	100.0
Total	101	70.6	42	29.4	143	100.0
Chi square = 0.149				**_P_-value = 0.928 //**		

N = number of participants   // not significant

Table (4.9) shows that 22 (73.3%) of single participants complaining of Low Back Pain, significantly higher than 77 who are married (70.0%). There were no statistically significant differences between marital status and LBP as Chi square = 0.149, *P*-value = 0.928. This result is inconsistent with the results of Leigh and Sheetz, (1989) which showed that subjects who never get married have the highest prevalence of back pain, whereas widowers (male and female) report the lowest in the marital status category among fulltime United States workers. Also this result is inconsistent with the results of Francoise, *et al.* (1992), which showed that the prevalence of low-back pain seems to be higher for people living alone. However, they did not find the association between marital status and LBP among commercial travelers.

4.6.7 Distribution of participants complaining of LBP in relation to BMI

Table 4.10: Distribution of Participants Complaining of LBP in Relation to BMI (N = 143)

BMI category	Complain of LBP				Total	
	(N) Yes		(N) No			
	Frequency	% within group	Frequency	% within group	Frequency	%
Less than 25	40	72.7%	15	27.3%	55	100.0%
25 – 29.5	37	62.7%	22	37.3%	59	100.0%
30 and more	24	82.8%	5	17.2%	29	100.0%
Total	101	29.4	42	70.6	143	100.0%
Chi square = 3.95				*P*-value = 0.138 //		

N = number of participants   // not significant

Table (4.10) above shows that mostly (82.8%) of those having BMI (30 and more) complaining of LBP, about 72.7% had a BMI less than 25 and 62.7% had a BMI from (25 – 29.5).

There is no statistical significant difference between BMI in relation to LBP, as Chi square = 3.95, *P*-value = 0.138. This study is consistent with the study of Masoud, (2004) which his results showed that there were no significant differences between prevalence of LBP and Body mass index among physiotherapy professionals. Also this result is consistent with result of

Noorloos, et al.. (2007) which their results showed that there was no significant increased risk was found for the onset of LBP with the increase of BMI. In contrast, this result is inconsistent with the results of Halalsheh, *et al.* (2000) which showed that the differences were statistically significant for the BMI of the female and male complaining of LBP and the obese patient is of a higher risk of developing low back pain.

It seems that obesity worsens the symptoms of an existing low back pain. This fact was clearly demonstrated by McGoey, *et al.* (1990) who found that among the morbidly obese, 88% had on most days of the month chronic musculoskeletal pain which was severe enough to interfere with the daily activities. There are preliminary studies which suggest that weight reduction may have favorable effects on low back pain, so, patients with affected weight bearing joints should not only be encouraged to lose weight, but be given the means to do so by dietary instructions and monitoring of their progress.

4.6.8 Distribution of participants complaining of LBP according to whom taking sick leaves

Figure 4.2: Sick Leaves Due to LBP

Figure (4.2) shows that more than half 52.4% of OR nurses complaining of LBP, are seldom getting sick leaves due to LBP, 14.7 % of OR nurses complaining of LBP often get sick leaves, while only 3.5 % always get of sick leaves due to LBP. This result is consistent with El Astal,

(2010) who showed that only (17.9%) of participants got sick leave due to MSP, while 82.1% didn't get sick leave.

4.7 Characteristics of low back pain

4.7.1 Severity of pain

Figure 4.3: Distribution of Pain Severity

Figure (4.3) shows that 14.7% complained of mild pain, 35.4% complained of moderate pain, 19.6% complained of acute pain, while 1.4% of participants complained of very acute pain.

4.7.2 Pain radiation

Figure 4.4: Distribution of Pain Radiation

Figure (4.4) shows that 20.9% of the participants complained of pain radiated to both legs, 14.6% to the left leg,8.3% radiated to the right leg and 26.5% of participants complained of non radiated pain.

4.7.3 Pain duration

Figure 4.5: Distribution of Pain Duration

Figure (4.5) shows that about half (45.4%) of the participants who complain of LBP have intermittent pain, 11.8% complain of pain continues for hours, while 6.9% complain of continuous pain, 3.4% complain of pain continues for months or more, and only 2.7% participants who complain of LBP continues for weeks.

4.7.4 Nature of pain

Table 4.11: Pain Nature (N = 101)

Nature of pain	Freq.	%	Nature of pain	Freq.	%
Burning	2	1.9%	Numbness and tingling	4	3.9%
Numbness, burning and tingling	3	2.9%	Tingling and stiffness	1	0.9%
Numbness, tingling and stiffness	4	3.9%	Burning, tingling and stiffness	2	1.9%
Burning and stiffness	3	2.9%	Numbness and burning	1	0.9%
Numbness	18	17.8%	Burning and tingling	1	0.9%
Stiffness	26	25.7%	Numbness and stiffness	2	1.9%
Tingling	14	13.8%	Numbness, burning, tingling and stiffness	1	0.9%
Burning and tingling	1	0.9%	Stiffness and not clear	1	0.9%
Not clear	17	16.8%			
Total frequency = 101			**Total percent = 100.0 %**		

Table (4.11) shows that 25.7% of the participants complaining of stiffness pain, 17.8% complain of numbness, 16.8% have not clear pain. 3.9% complain of numbness and tingling pain, also 3.9% complain of numbness, and tingling, stiffness pain, while 2.9% complain of a mixed sensation of numbness, burning and tingling pain, and also 2.9% have a sensation of burning and stiffness pain.

Only 0.9% of the participants complaining of pain have a mixed of four pain sensation nature (numbness, burning, tingling and stiffness). This result have some consistency with the results

of Al Astal, (2010) which showed that 61.0% of participants complained of spasm, 0.8% of participants complained of (numbness, tingling, burning and spasm), 3.2% complained of numbness and tingling. Also these results are inconsistent with the results of Masoud, (2004) which his results showed that 11.5% of physiotherapists complained of LBP had a sensation of burning pain, 9.25 complained of numbness, 12.3% complained of electric pain.

These differences in pain are attributed to the level of pain and severity among OR nurses during work, also, this differentiation due to the operation duration and nurse perspective about description of pain.

4.8 Differences in pain severity regarding socio-demographic variables

4.8.1 Differences in severity of pain between males and females

Table 4.12: Differences in Severity of Pain Between Males and Females

Gender	Severity of pain									
	No complain		Mild		Moderate		Severe		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Male	35	31.8%	19	17.3%	37	33.6%	19	17.3%	110	100.0
Female	7	21.2%	2	6.1%	13	39.4%	11	33.3%	33	100.0%
Total	42	29.4%	21	14.6%	50	34.9%	30	20.9%	143	100.0%
Chi square = 6.50					**P-value = 0.089 //**					

// = not significant

Table (4.12) shows that the majority (39.4%) of females participants were complaining of moderate pain, in comparison with (33.6%) of males. Eleven (33.3%) of females participants were complaining of severe pain, in comparison with (17.3%) of males participants. The higher severity percentage among females could be attributed to the fact that females have an intensity in pain and cannot tolerate it.

The above results showed that, there was no statistically significant difference between gender and severity of pain, as Chi square = 6.50 and *P*-value = 0.089. These results are inconsistent with the results of Masoud, (2004) who showed that 6.9% complained of severe low back pain, 36.2% complained of mild pain, while 20.8% complained of moderate pain. This result could be attributed to the fact that males and females being exposed to the same work overload.

4.8.2 Differences in severity of pain between age groups

Table 4.13: Differences in Severity of Pain Between Age Groups (N = 143)

Age group	Pain severity									
	No complain		Mild		Moderate		Severe		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq.	%
22-30yrs	26	35.6	11	15.1	24	32.9	12	16.4	73	100.0
31-40yrs	4	16.0	2	8.0	11	44.0	8	32.0	25	100.0
41-47yrs	8	27.6	4	13.8	10	34.5	7	24.1	29	100.0
48-58yrs	4	25.0	4	25.0	5	31.3	3	18.75	16	100.0
Total	42	29.4	21	14.6	50	34.9	30	20.9	143	100.0
Total										
Chi square = 7.65					*P*-value = 0.570 //					

// = not significant

Table (4.13) shows that, the majority of participants 11 (44.0%) from age group (31 - 40 years) were complaining of moderate pain, 24 (32.9%) from age group (22 - 30 years). In contrast, there are 8 (32.0%) from age group (31 – 40 years) were complaining of severe pain. In addition there are 11 (15.1%) from age group (22 – 30 years) were complaining of mild pain.

Table (4.13) shows that, there are no statistically significant differences between age and severity of pain as Chi square = 7.65 and *P*-value = 0.570. This result is inconsistent with Smith, *et al.* (2003) which showed that there was a correlation between age and LBP severity.

4.8.3 Differences in severity of pain between work places

Table 4.14: Differences in Severity of Pain Between Work Places

Hospital	Pain severity									
	No complain		Mild		Moderate		Severe		Total	
	Freq	%	Freq	%	Freq	%	Freq.	%	Freq.	%
Al-shifa	8	15.7	9	17.6	21	41.2	13	25.5	51	100.0
Nasser	6	28.6	2	9.5	8	38.1	5	23.8	21	100.0
EGH	7	41.2	2	11.8	6	35.3	2	11.8	17	100.0
Aqsa	6	42.9	2	14.3	1	7.1	5	35.7	14	100.0
Kamal Adwan	3	33.3	4	44.4	2	22.2	0	0.00	9	100.0
Al Najjar	7	87.5	1	12.5	0	0.00	0	0.00	8	100.0
Beit Hanoun	4	40.0	1	10.0	4	40.0	1	10.0	10	100.0
Ophthalmic	1	16.7	0	0.00	5	83.3	0	0.00	6	100.0
Alemaraty	0	0.00	0	0.00	3	42.9	4	57.1	7	100.0
Total	42	29.4	21	14.7	50	35.0	30	21.0	143	100.0
Chi square = 48.87					*P*-value = 0.002 **					

** significant at 0.01

Table (4.14) showed that the highest percentage (57.1%) of severe pain was among Alemaraty hospital participants, followed by Aqsa (35.7%), Alshifa (25.5%). The highest percentage (83.3%) of moderate pain was among Ophthalmic hospital, followed by Alemaraty (42.9%), Al Shifa (41.2%). In addition, there the table showed that there are 44.4% of OR nurses working in Kamal Edwan hospital having mild pain, 17.6% in Alshifa hospital, 14.3% in Aqsa hospital.

As shown in table (4.14), there are statistically significant differences in severity of pain and work places as Chi square = 48.87, *P*-value was 0.002. It is clear that all work places having the different level of severity of pain. This could be attributed to the different work effort needed in different hospitals because the difference in operations type and time length.

4.8.4 Differences in severity of pain between years of experience

Table 4.15: Differences in Severity of Pain Between Years of Experience

Experience years	Pain severity									
	No complain		Mild		Moderate		Severe		Total	
	Freq	%	Freq	%	Freq	%	Freq.	%	Freq.	%
2-8 years	34	35.1	14	14.4	32	33.0	17	17.5	97	100.0
9-15years	4	15.4	1	3.8	13	50.0	8	30.8	26	100.0
16-22years	4	30.8	4	30.8	2	15.4	3	23.1	13	100.0
23-36years	0	0.00	2	28.6	3	42.9	2	28.6	7	100.0
Total	42	29.4	21	14.6	50	35.0	30	21.0	143	143
Chi square = 15.45					*P*-value = 0.079 //					

// not significant

Table (4.15) shows that 50.0% of OR nurses who have years of experience from 9 – 15 years were complaining of moderate pain, 42.9 % with years of experience from 16 - 22 were complaining of mild of moderate pain, 30.8% of OR nurses with years of experience from 16 – 22 were complaining of mild pain,. In contrast, 30.8% of OR nurses who have years of experience from 9 – 15 years were complaining of severe. pain, while 28.6 % of OR nurses have an experience years from 23 – 36 years have a severe pain. This is consistent with realistic position of working in operation room in Gaza hospital, as age increase the severity of pain increases.

There are no statistically significant differences in severity of pain and years of experience, as Chi square = 15.45, and *P*-value = 0.079. This result were consistent with Smith, *et al.* (2003) which showed that correlation between age and LBP or duration of employment and LBP were not found during statistical analysis.

4.8.5 Differences in pain severity in relation to marital status

Table 4.16: Differences in Severity of Pain Related to Marital Status (N = 143)

Marital status	Pain severity									
	No complain		Mild		Moderate		Severe		Total	
	Freq	%	Freq	%	Freq	%	Freq.	%	Freq.	%
Single	8	26.7	7	23.3	13	43.3	2	6.7	30	100.0
Married	33	30.0	14	12.7	37	33.6	26	23.6	110	100.0
Divorced	1	33.3	0	0.00	0	0.00	2	66.7	3	100.0
Total	42	29.4	21	14.7	50	35.0	30	21.0	143	100.0
Chi square = 10.35					*P*-value = 0.111 //					

// not significant

Table (4.16) shows that the highest percentage of severe pain (66.7%) was among divorced participants, followed by (23.6%) was among married participants. Also there are 43.3% from single participants complained of moderate pain, while 33.6% from married group complained of moderate pain. This highest parentage among divorced could be attributed to the association between the psychological state, (depression, anxiety) and LBP as it was mentioned in many studies.

There is no statistical significant difference in severity of pain related to marital status, as Chi square = 10.35, *P*-value = 0.111.

4.9 Risk factors of LBP among OR nurses

Figure 4.6: Risk Factors of LBP among OR Nurses

Figure (4.6) shows that there are multiple risk factors lead to low back pain. Prolonged time standing during surgery is the main risk factor leading to low back pain and it represents (67.1%), followed by work overload (65%), then lifting and transferring patients 62.9%, bending and twisting (58.7%), while the least cause is sustained trauma during work (16.1%) followed by Wearing high heel shoes during work (23.1%) and uncomfortable chairs (32.9%).

The results are consistent with the current position in operating departments, where the long standing in surgery constitutes the major cause. Most of surgeries require prolonged time for standing with surgical team to concentrate during surgery and to be alert when assisting and giving the surgeons the surgical instruments. Also the work overload share in the development of

LBP, and the increasing of the number of hours the person stands, the most likely to produce back pain. Other cause, lifting and transferring patients also constitute a big problem, some patients have a heavy weight, some of them have a problem in some area in their body that require lifting them in a special way, in our hospitals there are no mechanical devices for transferring patients from bed to operating table and vice versa, hence it obligate the nurses within surgical team to transfer patients.

These results are supported by some previous studies. The study of Tsauo, *et al.* (1998) showed that inappropriate posture during work during transfer of patients and moving of equipments are the most important risk factors of nurses to get LBP. Also these results are consistent with the results of Sikiru and Hanifa, (2010) which showed that 66.67% of the LBP cases believed that their LBP was related to their work, while 40 (13.33%) and 60 (20.00%) associated their back pain with domestic and previous trauma respectively. There was significant association between activities (causative factors) and incident of LBP at p< 0.05.

Also these results are supported by the results of Sikiru and Shmaila, (2009) which their results showed that duty stress and unavailability of lifting equipments are the major predisposing factors of LBP among nurses in Africa.

The study of Smith, *et al.* (2003) showed that lifting, moving or transferring patients was identified as significant LBP risk factors with a high adjusted odd ratio. In contrast, the study of Tinubu, *et al.* (2010) showed that working in the same positions for long periods constitute about 55.1%, lifting or transferring dependent patients (50.8%) and treating an excessive number of patients in one day (44.9%) were the most perceived job risk factors for WRMSDs among nurses in Ibadan, South-west Nigeria, a cross-sectional survey. Study of Marras, (2000) showed that the studies have investigated the risk contribution of: (1) heavy physical work, (2) lifting and forceful movements, (3) bending and twisting, (4) whole body vibration and (5) static work postures can contribute to the risk factors for low back disorder. Psychosocial factors contribute also to the development of LBP, and it had gained recognition over the past decade .

The study of Masoud, (2004) showed that uncomfortable position was the most common cause of LBP (52.3%) among physical therapy professionals in Gaza Strip, followed by the big number of patients treated of the cause of low back pain 46.1%. In addition, 43.1% of the study sample

reported prolonged standing is the cause of low back pain, but 29.2% reported that bending, twisting, performing manual therapy techniques and lifting heavy patients were equally is the cause of low back pain, and 28 (21.5%) of the study sample reported that longtime hours weekly is the cause of low back pain.

These results also have some variability with the results of Abdul Samad, *et al.* (2010) which showed that the main task reported to contribute to low back pain in schools teachers in the Klang Valley، Malaysia were lifting loads (28.0%), prolonged sitting was the second contributing factor to the low back pain (25.2%), followed by prolonged standing (23.4%). Marking exam, assignments and work books resulted in prolonged sitting. Activities during physical education sessions and walking up and down the stairs were the fourth contributing factor to low back pain (13.5%). And working with computer was the fifth contributing factor (6.3%). These differences could be attributed to the differentiation in the nature of work, coping mechanism and presence of lifting machines.

4.10 Work environment characteristics

Table 4.17: Work Environment Characteristics

Statement	Response	Percentage
The height of working operating tables, disks, machines, instruments sets are comfortable	Yes	79.7%
Presence of adequate stuffing	Yes	76.2%
Enough lighting in work place	Yes	61.5%
The floor is sloppy	Yes	58.0%
Good air conditioning to maintain proper operating room temperature in work place	Yes	50.3%
Presence of much furniture that restricts free movement	Yes	44.8%
Good ventilation in work place	Yes	39.5%
Presence of wheels and other heavy devices to move heavy equipment	Yes	39.2%
Crowded work place	Yes	38.5%
Noisy work place	Yes	29.4%
Presence of Comfortable chairs	Yes	28.0%
Presence of mechanical devices for patient lifting	Yes	25.2%
Presence of rails, ramps to minimize awkward movements	Yes	14.7%

Table (4.17) shows the work environmental characteristics in operating departments in Gaza governmental hospitals. About 61.5% of the participants reported that there is enough lighting in work place, only 39.5% of participants reported that there is a good ventilation in the work place. Half of them (50.3%) reported that there is a good air conditioning in operating room, 58.0% reported that the floor is sloppy. Regarding chairs, 72.0% of participants reported that it is not comfortable. In contrast, 79.7% reported that the height of working operating tables, disks, machines, instruments sets are comfortable.

Moreover, only 39.2% of participants reported that the wheels and other heavy devices to move heavy equipment are present, only 25.2% of them reported that there are mechanical devices for patient lifting and 14.7% reported that the rails and ramps to minimize awkward movements are not available, while 76.2% of them reported that the stuff is adequate.

There are some differences in these results compared to the results of El Astal, (2010) which her results revealed that (86.6%) of participants reported that there was enough lighting in the work place, 49.7% stated that the work place was noisy, 41.9% reported there were a high back chairs. Also these results are not consistent with the results of El Keshawi, (2008) about work environment characteristics of Islamic university of Gaza which showed that 77.5% of the participants have good ventilation on their offices, 92.2% of the participants reported enough lighting and 85.3% of the participants sit on low back chairs, 12.7% sit on a high back chair, and 2.0% sit on a plastic chair.

When looking at the above results, we conclude that the work environment of the operating room is bad and the necessary devices and equipment that reduce the burden of LBP are not available in comparison other countries. Hence it is necessary to develop the work environment to the accepted level and the need for environmental modification according to the occupational health and safety such as the need for comfortable chairs, bringing on mechanical devices for patient lifting and wheels to move heavy equipment. Also the ventilation in the OR needs some modification. However, the study of Smedley, *et al.* (2004) reported that the use of nursing assistance tools such as, hoists, transfer belts and sliding sheets, and other study for Grag, *et al.* (1992) who used walking belts and hoists; both studies reported that low back pain was not improved through the use of these nursing assistance tools

4.11 Knowledge regarding safety measures to avoid LBP during work

Table 4.18: Knowledge Regarding Safety Measures to Avoid LBP During Work

Statement	Response	Freq.	%
Sitting properly on chair will reduce pain	**Yes**	134	93.7
Bending for long time may increase pain	**Yes**	134	93.7
Presence of wheels and other heavy devices to move heavy equipment and patients will reduce LBP	**Yes**	131	91.6
Wearing a high heel shoes during work may increase pain	**Yes**	127	88.8
Handling instruments / equipments properly will reduce pain	**Yes**	125	87.4
Sudden movements may increase pain	**Yes**	124	86.7
Sitting in one place for long time may increase pain	**Yes**	123	86.0
Ergonomic design of operating room will decrease the pain such as rails or ramps.	**Yes**	123	86.0
Fluctuating room temperature may increase pain	**Yes**	109	76.2
Stretching body intermittently may decrease pain	**Yes**	108	75.5
Noise and crowed at work place may increase pain	**Yes**	107	74.8
N = 143 **Mean score 20.40**			

Table (4.18) shows that the knowledge regarding safety measures for LBP during work as followed, 93.7% of the participants reported that they have enough knowledge that sitting properly on chair will reduce pain, 87.4% have enough knowledge about handling instruments or equipments properly will reduce pain, 86.0% know that the sitting in one place for long time may increase pain, 93.7% know that bending for long time may increase pain. Also the above results shows that 75.5% of the participants know that stretching the body intermittently may decrease pain, 91.6% know that the presence of wheels and other heavy devices to move heavy equipment and patients will reduce LBP and 86.0% of them know that the ergonomic design of operating room will decrease the pain.

The mean score of knowledge regarding safety measures to avoid LBP during work is 20.40, it is a very good mean. The study result about the prevalence of LBP was 70.6%., when comparing this result with the level of participants knowledge, we conclude that there is a gap between knowledge and practice to apply these knowledge in the work place about safety measures. On the other hand, some devices and some ergonomic design in the operating departments are not available.

These results have much agreements with the study results of El Astal, (2010) where her results revealed that there was a gap between knowledge of participants regarding safety measures to avoid MSD during work and applying this knowledge in the work place among laboratory technicians.

4.12 Suggestions and recommendations to reduce LBP

Table 4.19: Suggestions and Recommendations to Reduce LBP

Rank	Suggestion / recommendation	Mean score
1.	Provide adequate staffing in OR	8.50
2.	Take rest breaks during work	7.27
3.	Reduce number of operations per day	7.09
4.	Reduce working hours	6.36
5.	Wear comfortable shoes / clothes during work	6.24
6.	Using lifting assistance devices to help lift and move patients from bed to operating table and vice versa, also to help lift heavy surgical instruments sets and heavy equipments	5.88
7.	Avoid sudden movements	5.45
8.	Afford comfortable and suitable chairs for OR nurses	5.41
9.	Change work position frequently	4.93
10	Stop working when pain starts	4.76
11.	Practice some exercises during work	4.11

Table (4.19) shows that the first priority suggestion to be taken to reduce LBP, providing adequate staffing in operation room which took the highest priority with mean score of 8.50, followed by taking rest breaks during work with mean score of 7.27, reduce number of operations per day (7.09), reduce working hours (6.36), wearing comfortable shoes / clothes during work (6.24), using lifting assistance devices to help lift and move patients from bed to operating table and vice versa, help lift heavy surgical instruments sets and heavy equipments (5.88), avoiding sudden movements (5.45), affording comfortable and suitable chairs for OR nurses (5.41), changing work position frequently (4.93), stop working when pain starts (4.76) and practicing some exercises during work took the least priority with mean score (4.11). Providing adequate staff in OR is considered a very important step to be taken, some activities

require special staff such as dealing with instruments sterilization, machines lifting, instruments handling, also the pressure during work and the crowded number of operations often press nurses not to have enough rest between operations. The number of operations per day should be minimized to suit the number of nurses.

These results have some variability with the results of El Astal, (2010) where her suggestions showed that work and task rotation had the first priority with mean score of (6.55) followed by practicing exercise during free time (6.47), avoiding sudden movements (6.24) Stop working when pain starts (6.06), work exactly by weekly working hours (5.65), changing work position frequently (5.75), needing for advice and training to maintain body safety (5.41), wearing comfortable shoes during work (4.50), affording comfortable chairs (4.32) and taking rest time during work took the least priority with mean score (4.10).

There are an agreement between this study and El Astal results in many aspects such as, practicing exercise during work, avoiding sudden movement, stop working when pain starts, changing work position frequently, wearing comfortable shoes , affording comfortable chairs, and taking rest during work. Also there is an agreement between these results and Masoud, (2004) who showed that, wearing comfortable shoes during work; avoid heavy lifting (97.7%), using comfortable and suitable beds, tools and lifter and also practicing sports daily (96.2%), take more rest breaks or pauses during the workday (94.6%), wearing comfortable clothes during work (78.5%), reducing the working hours (75.4%) and finally avoiding manual techniques (55.4%). These agreements between results make an important implication for applying the suggestions and generalizing it among different health workers.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

This study aimed to identify the determinants of low back pain among operating room nurses in Gaza governmental hospitals. A descriptive cross-sectional study was undertaken to all operating room nurses working in Gaza governmental hospitals . The target population of this study consisted of 159 participants; response rate to questionnaire was 90%. The overall prevalence of LBP was 70.6% at the time of getting the job . LBP was 68.2% among male operating room nurses and 78.8% among female operating room nurses .

The highest percentage (84.0%), among those having age group between (31 – 40 years) were complaining of LBP, 75.0% within the age group (48 – 58 years), 72.4% within the age group (41 – 47 years), and 64.4% was among the age group (22 – 30 years).

Seventy three percent of single participants were complaining of LBP. LBP was 100.0% among the participants who have working experience 23-36 years. In addition, it was 100.0% among the participants who are working in Crescent Al Emaraty hospital and the least was Al Najjar (12.5%). Thirty five percent of the participants complaining of LBP had a moderate pain, 21.0 % had severe pain, while 14.7% had a mild pain. Twenty six percent of the participants complains of non radiated pain, 20.9% complains of pain radiated to both legs, 14.6% complains of pain radiated to the left leg while only 8.3% of them complains of pain radiated to the right leg. Among those who complained of LBP, 45.4% has an intermittent pain, 11.8% complains of pain lasting for hours, and 6.9% has a continuous pain.

Among those who complain of LBP, 25.7% described pain as a stiffness nature, 17.8% described it as a numbness, 16.8% reported a non clear pain, 13.8% tingling, 1.95 burning, 3.9% described pain as a mixture of numbness, tingling and stiffness, and 0.9% complained of numbness, burning, tingling and stiffness pain. About 14.7% of those who complained of LBP often got sick

leaves, only 3.5% always got sick leaves while the majority (52.4%) of them seldom got sick leaves. The study revealed that there are statistically significant differences among places of work regarding LBP distribution. But it revealed that there are no significant differences between (gender, age, marital status, and years of experience) and LBP. The study revealed that there are statistically significant differences between place of work and years of experience regarding severity of pain.

Regarding BMI and LBP, the study revealed that 82.8 % participants having a BMI (30 and more) complaining of LBP, but there are no statistically significant differences between them. Sixty seven of the participants reported that prolonged time standing was the dominant risk factor in the work place, followed by work overload, lifting and transferring patients, lifting heavy objects bending and twisting, 16.1% of participants reported that sustained trauma during work was the lowest risk factor followed by wearing high heel shoes and using of uncomfortable chairs.

The majority of the participants reported that the necessary equipments such as wheels, mechanical devices for patient lifting, rails, ramps to minimize awkward movements are not present. Also they reported that the floor is sloppy and there are no adequate staff in the operation room, so it is clear that operating departments in Gaza hospitals need some modification to suit the health of the OR nurses such as availability of mechanical lifting devices for patient lifting, repair of floors, availability of wheels to move heavy equipments, presence of good ventilation, removing unnecessary furniture and minimizing the crowding in the work place. The study showed that the majority of the participants has enough and good knowledge regarding safety measures to avoid LBP during work and there is a gap between knowledge and practice.

Regarding suggested ranking: participants ranked providing adequate staff in OR as a first priority, followed by taking rest breaks during work, reduce number of operations per day, reduce working hours. They reported practicing some exercises during work as the least priority followed by stopping working when pain starts and changing work position frequently.

5.2 Recommendations

- Providing operation departments with equipments and devices necessary to facilitate lifting patients and heavy machines, comfortable chairs, rails, ramps to minimize awkward movements and minimizing the level of noise in the work place.

- Supplying the operating rooms with adequate staff to sort the effort on more than one, and supplying it with workers for taking upon themselves the tasks that are not part of the nursing staff job.

- Encouraging the day care surgeries units about its role in allocation of operations overload to minimize the workload on the operating departments, also allocation of long operations list between shifts.

- Modify the operation departments according to the National Institute for Occupational Safety and Health (NIOSH).

- Periodic and regular assessment by ministry of health of operation departments and the factors causing low back pain especially causes of LBP due to different work places

- Conducting team site visit for ergonomic assessment. This site evaluation serves to recognize many direct and indirect factors that may contribute to risk potential and, to identify potential solutions that will serve to minimize risk of injury to the caregivers and patients.

- Organizing a health education program to promote correct back care and avoid back injury.

- Supporting the scope of environmental and occupational health and encouragement of further researches and studies in regard to workers health.

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Annexes

Annex (1): Map of Palestine

Annex (2): Map of Gaza Strip

The Gaza Strip 2007

Mediterranean Sea

PASSIA

Limit according to Oslo II Agreement (1995)
(20 nautical miles = 37.04 km)

Limit according to 2002 Bertini Agreement
(12 nautical miles= 22.22 km)

18 nautical miles

Fishing Limit Enforced by IDF since October 2006
(6 nautical miles= 11.1 km)

Prohibited fishing area

Prohibited fishing area

Primary crossing for Palestinian workers and humanitarian personel

Beit Lahia

Erez Industrial Zone

Erez Crossing

Sderot

Gaza Wharf
Lincensed boats: 417
Fishermen: 1375

Jabalia Beit Hanoun

Future Seaport

Gaza

Nahal Oz
Entry Point for Liquid fuels

Karni / Muntar Crossing

Primary import and export crossing

Netivot

Deir al Balah Wharf
Lincensed boats: 76
Fishermen: 500

Nusseirat
Bureij RC

Maghazi

Deir Al-Balah

Mawasi Khan Yunis Wharf
Lincensed boats: 97
Fishermen: 655

double wire fence with watch towers

Mawasi Rafah Wharf
Lincensed boats: 67
Fishermen: 418

Khan Younis

Rafah

Rafah Terminal Int. Crossing
Cross point for people

Airport

Sufa / Matar Crossing
Entry Point predominantly for aggregates and building materials

EYGPT

Kerem Shalom Int. Cargo Crossing
Entry Point for Goods from Eygpt

	Palestinian Localities
	Former Israeli Settlement Blocs
	Palestinian Coastal Strip Cultivation (Al-Mawasi)
	Greenhouse zone
	Industry Area
- - - - -	Philadelphia Corridor
	Palestinian Road
	Israeli Road Link
⊖	Major Crossing Points
⊖	Minor Crossing Points
- · - · -	Double Wire Fence with Watch Tower
	500 Metre Buffer Zone
	150 metre Buffer Zone and Northern No-Go Zone
	10 km

Buffer Zone
150 to 500m buffer imposed by the Israeli Forces.
Movement is restricted by frequent army warning fire.
Northern No-Go Zone
Covering the disengaged northern settlement bloc, movement in this area is restricted to residents and International organisations since 28th December 2005.

Annex (3): Hospitals bed capacity till 2008

Hospital	Clinical capacity(beds number)
Al-Shifa	500
Naser	260
EGH	207
Aqsa	103
Al-Nasser	130
Ophthalmic	40
Psychiatric	39
Al-Dorra	76
Beit Hanoun	36
Emaraity	40
Alnajjar	40
Kamal Edwan	73
Rantisi Pediatric	49
Total	1593 bed

(MOH, 2009)

Annex (4): Annual back injury incidence rate (in 1,000s) among nursing professions from 1992 - 1998

(Source: Bureau of Labour Statistics, 1998).

Annex (5): Muscoloskeltal injuries by age

PERCENT OF MUSCULOSKELETAL INJURIES BY AGE

Bureau of Labor Statistics, 2001

Source: Bureau of Labor Statistics, (2001)

Annex (6): Liklihood of having MSD by age

LIKELIHOOD OF HAVING A DISABILITY

U.S. Census Bureau Americans with Disabilities, 2005

Source: Census Bureau American with Disabilities, (2005)

Annex (7): Number of back injury cases involving days away from work in private industry, 1992-2001

The annual number of back injury cases involving days away from work declined 43% during this 10-year period-from 653,385 cases in 1992 to 372,683 in 2001. (NIOSH)

Sources: Bureau of Labor Statistics (BLS), (2003a,b)

Annex (8): Annual rates of back injury cases involving days away from work in private industry, 1992-2001

The annual rate of back injury cases involving days away from work declined 52% during this 10-year period-from 85.4 per 10,000 full-time workers in 1992 to 41.0 in 2001.

Sources: Bureau of Labor Statistics (BLS), (2003a,b)

Annex (9): Distribution of back injury cases and all nonfatal injury and illness cases involving days away from work in private industry by age, (2001).
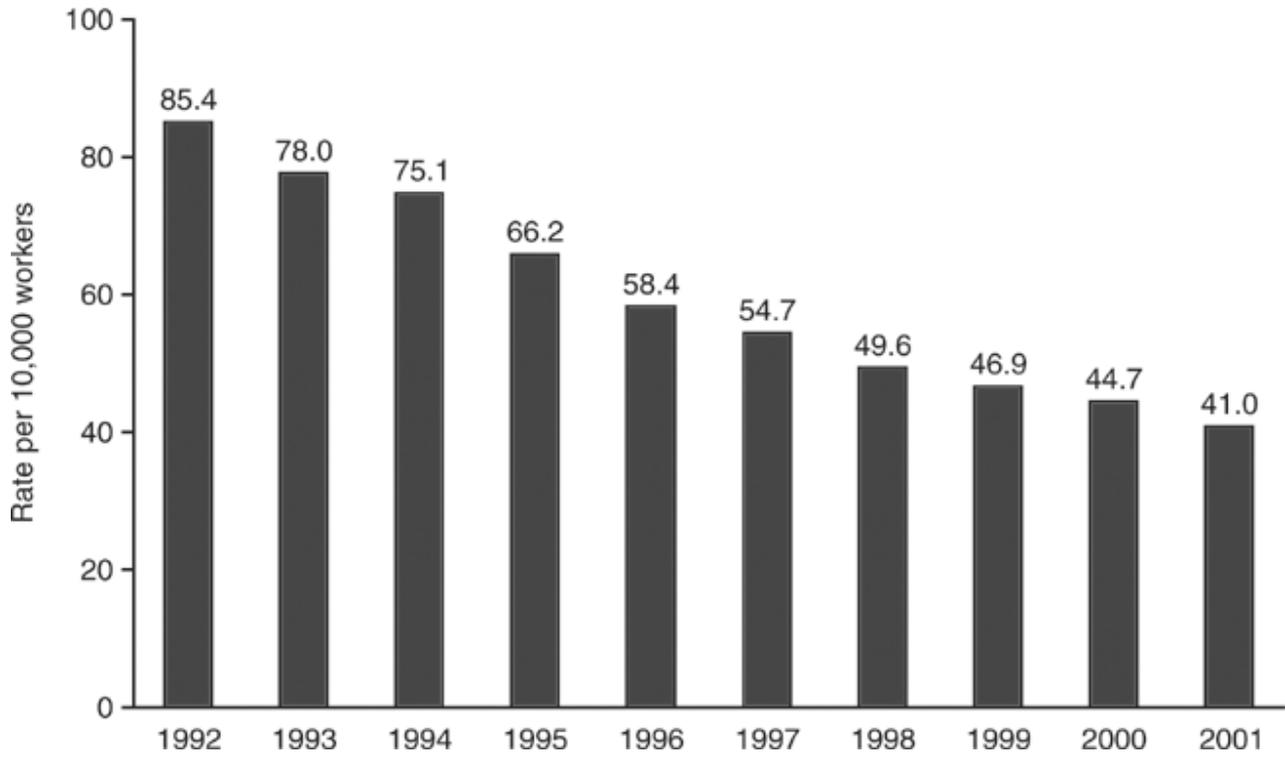

Age data are available for 369,351 of the 372,683 BLS-estimated back injury cases involving days away from work in 2001. Overall, three age groups (25-34, 35-44, and 45-54) accounted for 78.5% of back injury cases, slightly more than the 75.2% reported for all nonfatal injury and illness cases.

Sources: Bureau of Labor Statistics (BLS), (2003a,b)

Annex (10): Distribution of back injury cases and all nonfatal injury and illness cases involving days away from work in private industry by gender, 2001

Male workers accounted for 64.3% of back injury cases in 2001, slightly less than the 66.1% reported for all nonfatal injury and illness cases. Female workers accounted for a slightly greater percentage of back injury cases (35.7%) than all nonfatal injury and illness cases (33.9%).
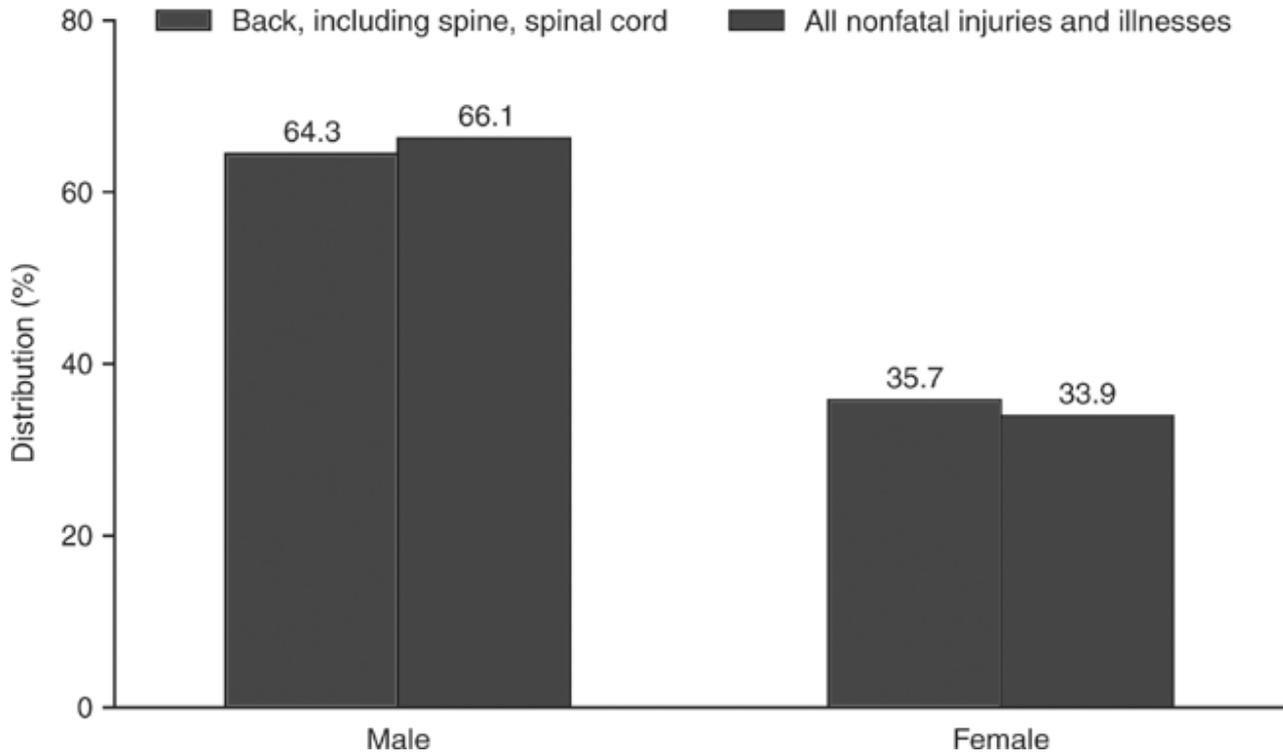
Sources: Bureau of Labor Statistics (BLS), (2003a,b)

Annex (11): Distribution of back injury cases and all nonfatal injury and illness cases involving days away from work in private industry by days away from work, 2001

Back injury cases tended to involve higher percentages of short-term disability than all nonfatal injury and illness cases in 2001: 22.4% of workers with back injuries reported 3-5 days away from work, and 13.7% reported 6-10 days away from work. Workers with back injuries had a median of 6 days away from work in 2001-as did workers with all nonfatal injuries and illnesses.

Sources: Bureau of Labor Statistics (BLS), (2003a)

Annex (12): Normal vertabra

Source, NIAMS, (2005)

Annex (13): Side view of spine

Side View of Spine

Cervical (7)

Thoracic (12)

Lumbar (5)

Cauda equina

Vertebra

Intervertebral disc

Sacrum

Coccyx

Source: NIAMS, (2005)

Annex (14): Request for approval from Helsinki committee

بسم الله الرحمن الرحيم

السيد / د...................................المحترم

رئيس لجنة هلسنكي للبحث الصحي –محافظات غزة   حفظه الله ،،،

تحية طيبة وبعد ،،،

الموضوع: طلب الموافقة على إجراء دراسة بعنوان:

Determinants of Low Back Pain Among Operating Room Nurses In Gaza Governmental Hospitals

أنا الموقع أدناه/ سامر خضر عبدالله النواجحة - طالب في جامعة القدس، كلية الصحة العامة، برنامج الدراسات العليا، تخصص صحة البيئة.

أرغب في إجراء دراسة حول الموضوع المذكور أعلاه ابتداء من شهر مايو 2010.

حيث تعتبر هذه الدراسة متطلب رئيس من متطلبات التخرج للحصول على درجة الماجستير.

أرجو من سيادتكم التكرم بالموافقة على منحي الفرصة لإجراء هذه الدراسة .

وتفضلوا بقبول فائق التقدير و الاحترام ،،،

مقدمه

سامر خضر النواجحة

Annex (15): Approval from Helsinki committee

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

التاريخ7/6/2010

Name:

الاسم: سامر خضر النواجحة

I would like to inform you that the committee
has discussed your application about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم
حول:-

**Determinants of low back pain among
operating room nurses in Gaza Governmental
hospitals.**

In its meeting on June 2010
and decided the Following:-
To approve the above mention research study.

و ذلك في جلستها المنعقدة لشهر 6 2010

و قد قررت ما يلي:-

الموافقة على البحث المذكور عاليه.

Signature
توقيع

Member   Member   Chairperson

عضو   عضو

Conditions:-
❖ Valid for 2 years from the date of approval to start.
❖ It is necessary to notify the committee in any change in the admitted study protocol.
❖ The committee appreciate receiving one copy of your final research when it is
completed.

Annex (16): Request for approval from MOH

بسم الله الرحمن الرحيم

السيد/ مدير عام المستشفيات – وزارة الصحة

د. محمد الكاشف .. حفظه الله

تحية طيبة وبعد،

<u>**الموضوع /طلب الموافقة على إجراء دراسة بعنوان**</u>

Determinants of Low Back Pain Among Operating Room Nurses In Gaza Governmental Hospitals

أنا الموقع أدناه / سامر خضر عبدالله النواجحة – طالب في جامعة القدس، كلية الصحة العامة، تخصص صحة البيئة.

أرغب في إجراء دراسة حول الموضوع المذكور أعلاه ابتداء من شهر مايو 2010 في أقسام عمليات مستشفيات قطاع غزة التابعة لوزارتكم الموقرة.

حيث تعتبر هذه الدراسة متطلب رئيس من متطلبات التخرج للحصول على درجة الماجستير.

أرجو من سيادتكم التكرم بالموافقة على إجراء هذه الدراسة .

وتقبلوا فائق التحية والاحترام ،،،

مقدمه

سامر خضر النواجحة

Annex (17): Approval from MOH

Palestinian National Authority
Ministry Of Health
Hospitals General Administration

السلطة الوطنية الفلسطينية
وزارة الصحة
الإدارة العامة للمستشفيات

الرقم: علم

التاريخ: ....

الأخوة / مدراء المستشفيات   حفظهم الله

السلام عليكم ورحمة الله وبركاته

الموضوع / إجراء بحث

بالإشارة لكتاب السيد مدير عام تنمية القوى البشرية بخصوص الموضوع أعلاه يرجى تسهيل مهمة الحكيم/سامر خضر النواجحة والذي يعمل مشرف تمريض في مجمع ناصر الطبي وملتحق ببرنامج ماجستير الصحة العامة – صحة بيئية – جامعة القدس لإجراء بحث بعنوان.

"Determinants of Low Back Pain among Operating Room Nurses in Gaza Governmental Hospitals "

حيث سيقوم الباحث بتعبئة استبانه من طاقم التمريض الذين يعملون في قسم العمليات بمستشفيات وزارة الصحة وذلك بما لا يتعارض من مصلحة العمل وضمن ضوابط وأخلاقيات البحث العلمي، دون تحمل الوزارة أي أعباء.

ولا مانع لدينا من إجراء الاستبيان.

آملين حسن تعاونكم،،،،

د.محمد النخالة

مدير عام للمستشفيات

صورة/ السيد مدير عام تنمية القوى البشرية
صورة/ السادة مدراء مستشفيات غمعية

المحترم
شاكرين

فندق الأمل – وزارة الصحة

تليفاكس : ٢٨٢٠٧٣٤

- 120 -

Annex (18): Questionnaire (English version)

Serial number: ………….

Questionnaire for Low Back Pain (LBP) among Operating Room (OR) Nurses

<u>Part A</u>: Personal & Demographic data:

§   Gender ☐ Male ☐ Female

§   If you are female: Pregnant ☐ Yes ☐ No

§   Age in years ………………………

§   Marital status ☐ Single ☐ Married ☐ Divorced ☐
Widow

§   Qualification: ☐ Diploma(2 years) ☐ Diploma(3 years)
☐ Bachelor ☐ Post graduate

§   Years of experience in operation room ……………………

§   Do you work overtime hours in this hospital? ☐ Yes ☐ No

§   If yes, how many hours per week ……………

§   Do you have another job after your formal work? ☐ Yes ☐ No

§   If yes, describe ……………………………………………………….

§   Height ……………… cm.

§   Weight ……………… kg.

§   Number of operations you involved with per day …………………

§   Place of work (hospital name) ………………………..

Do you complain of Low Back Pain (LBP)? ☐ **Yes** ☐ **No**

- Ø **If the answer is Yes, how long …………**
- Ø **If the answer is Yes, please go to part (B) and continue.**
- Ø **If the answer is No, please skip to part (E) and continue.**

Part B: characteristics of Low Back Pain (LBP):

No	Statement	Seldom	Quite often	Very often	Always
1.	Complaining of alteration in gait				
2.	Complaining of alteration in spinal mobility				
3.	Complaining of alteration in sensation in lower extremities (parasthesia)				
4.	Complaining of alteration in leg length (limping)				
5.	Complaining of muscles spasm in the back				
6.	Low Back Pain starts during working hours				
7.	Onset of LBP is sudden				
8.	Did you got sick leave due to LBP				

Part C: 9. Severity of pain :

The severity of pain is described as			
Mild	Moderate	Severe	Very severe

10.Pain radiation

Complaining of pain radiating/radiated down to			
Rt. Leg	Lt. Leg	Both legs	Not radiate

11. Nature of pain

The pain is/was described as: (<u>you can choose more than one</u>)				
Numbness	**Burning**	**Tingling**	**Stiffness**	**Not clear**

12. Duration of pain :

The duration of pain is/was described as:				
Continuous	**Intermittent**	**Hours**	**Weeks**	**Months or more**

Part D: Risk factors of LBP: (In your case, which of the following factors caused your pain?) *please mark the ones suits you.*

No	Risk factor / cause	Yes	No
13	Sustained trauma during work		
14	Uncomfortable chairs		
15	Prolonged time sitting in surgery that need sitting		
16	Prolonged time standing		
17	Sudden movements		
18	Bending and twisting		
19	Lifting heavy objects		
20	Work overload		
21	Wearing high heel shoes during work		
22	Unsuitable posture during work		
23	Working environment (light, ventilation, heat, noise and crowed)		
24	Lifting and transferring patients		
25	Positioning a patient		
26	Holding an extremity during a prep procedure		

Part E: Work environment characteristics:

No	Statement	Yes	No
27	Is there enough lighting in your work place?		
28	Is there good ventilation in your work place?		
29	Is there good air conditioning to maintain proper operating room temperature in your work place?		
30	Are the chairs comfortable chairs ?		
31	Is the floor sloppy ?		
32	Is there much furniture that restricts your free movement?		
33	Are there wheels and other heavy devices to move heavy equipment?		
34	The height of working operating tables, disks, machines, instruments sets are comfortable for you?		
35	Is your work place crowded?		
36	Are there mechanical devices for patient lifting?		
37	Are there Adequate staffing?		
38	Are there rails ramps to minimize awkward movements?		
39	Is your work place noisy?		

Part F: Knowledge regarding safety measures to avoid LBP during work:

No	Statement	Yes	No
40	Sitting properly on chair will reduce pain		
41	Handling instruments / equipments properly will reduce pain		
42	Sitting in one place for long time may increase your pain		
43	Bending for long time may increase your pain		
44	Stretching your body intermittently may decrease your pain		
45	Sudden movements may increase your pain		
46	Wearing high heel shoes during work may increase your pain		
47	Fluctuating room temperature may increase your pain		
48	Noise and crowed at work place may increase your pain		
49	Presence of wheels and other heavy devices to move heavy equipment and patients will reduce LBP		
50	Ergonomic design of operating room will decrease the pain such as rails or ramps.		

Part G: Suggestions / recommendations to reduce pain (rank the following suggestions according to priority from No. 1 to 12)

Suggestion / recommendation	Rank
Reduce working hours	
Reduce number of operations per day	
Take rest breaks during work	
Practice some exercises during work	
Wear comfortable shoes / clothes during work	
Avoid sudden movements	
Change work position frequently	
Stop working when pain starts	
Provide adequate staffing in OR	
Afford comfortable and suitable chairs for OR nurses	
Using lifting assistance devices to help lift and move patients from bed to operating table and vice versa, also to help lift heavy surgical instruments sets and heavy equipments	

Researcher

Samer Khader AlNawajha

Annex (19): Questionnaire (Arabic version)

<div dir="rtl">

بسم الله الرحمن الرحيم

الرقم المسلسل : ....

زميلي/زميلتي   العزيز/ة   **حفظك/ي الله**

السلام عليكم ورحمة الله وبركاته

يقوم الباحث بإعداد رسالة ماجستير بعنوان

</div>

Determinants of Low Back Pain Among Operating Room Nurses In Gaza Governmental Hospitals

<div dir="rtl">

'' محددات انتشار آلام الظهر بين الممرضين العاملين في أقسام عمليات مستشفيات قطاع غزة الحكومية''

إن هذا البحث يشكل جزء ضروري من دراستي للحصول على درجة الماجستير في الصحة العامة مسار صحة البيئة – كلية الصحة العامة بجامعة القدس- القدس (أبوديس).

وقد تم اختياركم ضمن مجموعة العاملين في قسم العمليات للإجابة على العبارات الواردة فيها.

إذا كنت توافق على المشاركة في هذه الدراسة، يرجى التكرم بقراءة العبارات التالية بدّقة والإجابة عنها بموضوعية لما في ذلك من أثر كبير على صحة النتائج والنصائح التي سوف يتوصل إليها الباحث. مع التأكيد بأن هذه البيانات سوف تستخدم لأغراض البحث العلمي فقط، وسيتم التعامل معها بسرية تامة.

☐ **أوافق**   ☐ **لا أوافق**

ملاحظة / الوقت اللازم لتعبئة الإستبانة كاملة لا يستغرق أكثر من 20 دقيقة.

أشكركم على حسن تعاونكم معي

الباحث/

سامر خضر النواجحة

snawajha@hotmail.com

</div>

"استبانة محددات انتشار آلام الظهر بين الممرضين العاملين في أقسام عمليات مستشفيات قطاع غزة الحكومية"

<u>الجزء الأول</u>

البيانات الشخصية:

§ الجنس ☐ ذكر ☐ أنثى

§ حامل ☐ نعم ☐ لا عدد الولادات ....

§ العمر بالسنين ....

§ الحالة الاجتماعية ☐ أعزب /عزباء ☐ متزوج/ة ☐ مطلق/ة ☐ أرمل/ة

§ الطول .... سم

§ الوزن .... كجم

§ المؤهل العلمي ☐ دبلوم سنتين ☐ دبلوم (3) سنوات ☐ بكالوريوس ☐ دراسات عليا

§ مكان العمل "اسم المستشفى " ....

§ عدد سنوات الخبرة في قسم العمليات ....

§ هل تعمل ساعات إضافية بالمستشفى ☐ نعم ☐ لا

§ إذا كانت الإجابة "نعم" ، كم ساعة إضافية تعمل أسبوعياً ....

§ هل تعمل في وظيفة إضافية خارج نطاق العمل الرسمي بالمستشفى ☐ نعم ☐ لا

§ إذا كانت الإجابة "نعم" ، أوصف العمل الإضافي ....

§ عدد العمليات الجراحية التي تشارك فيها يوميا ....

§ عدد ساعات الوقوف في العمليات الجراحية يوميا ....

Ø **هل تعاني/ين من آلام أسفل الظهر ☐ نعم ☐ لا**

Ø **إذا كانت الإجابة "بنعم" ، منذ متى عانيت/ي بالشهور ....**

Ø **إذا كانت الإجابة " بنعم''، انتقل/ي للجزء الثاني مباشرة وأكمل/ي تعبئة الاستبانة**

Ø **إذا كانت الإجابة '' لا'' ، انتقل/ي للجزء الخامس وأكمل/ي تعبئة الاستبانة**

الجزء الثاني:

1. خصائص آلام أسفل الظهر

م.	العبارة	نادراً	غالباً	في كثير من الأحيان	دائماً
1.	أشكو من تغير في هيئة المشية				
2.	أشكو من تغير في حركة العمود الفقري				
3.	أشكو من تغير في الإحساس بالأطراف السفلية (أشعر بالوخز)				
4.	أشكو من تغير في طول الساق				
5.	أشكو من تشنج عضلات الظهر				
6.	يبدأ الألم خلال ساعات العمل الرسمي				
7.	يبدأ ألم الظهر فجأة				
8.	هل حصلت على إجازة مرضية نتيجة ألام في أسفل الظهر				

9. وصف شدة الألم

كيف توصف/ين شدة الألم			
خفيفة	متوسطة	حادة	حادة جداً

10.امتداد الألم :

يمتد الألم إلى			
لا يمتد	الساقين	الساق الأيسر	الساق الأيمن

الجزء الثالث :

11.بيانات عن طبيعة الألم (خصائص أو مواصفات)

حدد/ي مواصفات الألم الذي تعاني/ين منها الآن أو التي عانيت/ي منها (تستطيع أن تختار أكثر من إجابة)				
غير واضح	تصلب	وخز	حرقان	خذلان

12.بيانات عن مدة الألم

حدد/ي مدة الألم الذي تعاني/ين منه الآن أو عانيت/ي منه				
شهر أو أكثر	أسابيع	ساعات	متقطع	مستمر(دائم)

الجزء الرابع:

العوامل المسببة لآلام أسفل الظهر

اختر/اختاري العوامل التي ترى/ن أنها قد سببت لك/ي آلام أسفل الظهر في العمل (من الممكن أن تختار/ي أكثر من إجابة)

لا	نعم	العامل / العوامل المسببة	م.
		تعرضت لإصابة ثابتة أثناء العمل	13
		استخدام كراسي غير مريحة	14
		الجلوس لفترة طويلة في العمليات التي تحتاج الجلوس	15
		الوقوف لفترة طويلة أثناء العملية الجراحية	16

		العبارة	م
		الحركات المفاجئة أثناء العمل	17
		الانحناء والالتفاف	18
		حمل الأشياء الثقيلة	19
		ضغط العمل الشديد	20
		ارتداء أحذية عالية الكعب أثناء العمل	21
		أكون في وضعية غير مناسبة أثناء العمل	22
		بيئة العمل مثل (الإضاءة، التهوية، الحرارة، الضوضاء والازدحام أثناء العمل)	23
		حمل ونقل المرضى خلال العمل	24
		جعل المريض في وضعية مناسبة قبل البدء بإجراء العملية الجراحية	25
		حمل أطراف وأجزاء من المريض يدوياً قبل البدء بالعملية لتعقيمها وتحضيرها	26

الجزء الخامس:

خصائص بيئة العمل

لا	نعم	العبارة	م.
		هل يوجد إضاءة كافية في العمل؟	27
		هل يوجد تهوية جيدة في العمل؟	28
		هل يوجد تكييف هواء جيد للحفاظ على درجة الحرارة أثناء العمل؟	29
		هل الكراسي المستخدمة للجلوس أثناء بعض العمليات الجراحية مريحة؟	30
		هل أرضية القسم جيدة؟	31
		هل يوجد هناك أثاث كثير في القسم وغرفة العمليات يحد من حركتك أثناء العمل؟	32
		هل يوجد عجلات أو ناقلات لحمل الأجهزة والمعدات والأدوات الثقيلة خلال العمل؟	33
		هل ارتفاع طاولة العمليات والأجهزة ومكان الأدوات الجراحية مناسب بالنسبة لك؟	34
		هل يوجد ازدحام خلال العمل؟	35
		هل هناك أجهزة ميكانيكية لرفع المريض؟	36
		هل يوجد عدد كافٍ من التمريض العاملين بالقسم؟	37
		هل هناك سلالم لتقليل من الحركة الصعبة أثناء العمل؟	38
		هل يوجد ضوضاء خلال العمل؟	39

الجزء السادس :

درجة معرفة ووعي التمريض العاملين بأقسام عمليات مستشفيات القطاع الحكومية فيما يتعلق بتدابير السلامة والأمان لتجنب حدوث آلام أسفل الظهر

لا	نعم	العبارة	م.
		الجلوس بوضعية مناسبة أثناء العمل يقلل من حدوث الألم	40
		حمل الأدوات الجراحية والأجهزة بشكل مناسب يقلل من حدوث الألم	41
		الجلوس في مكان واحد لفترة طويلة من الممكن أن يزيد حدوث الألم	42
		الانحناء لفترة طويلة من الوقت يزيد من حدوث الألم	43
		تمدد جسمك بشكل متقطع أثناء العمل يقلل من الألم	44
		الحركات المفاجئة أثناء العمل تزيد من حدوث الألم	45
		ارتداء أحذية عالية الكعب خلال العمل يزيد من حدوث الألم	46
		تقلب درجة حرارة الغرفة من الممكن أن يزيد حدوث الألم	47
		الضوضاء والازدحام خلال العمل من الممكن أن تزيد الألم	48
		توفر العجلات أو الناقلات لحمل الأجهزة والأدوات الثقيلة وحمل المرضى يقلل من حدوث الألم	49
		تصميم غرفة العمليات بشكل صحي مهني يتناسب مع مبادئ الصحة المهنية مثل وجود سلالم أو قضبان يقلل من حدوث الألم	50

الجزء السابع :

الاقتراحات والتوصيات التي يجب أخذها بعين الاعتبار لتقليل حدوث آلام أسفل الظهر

من فضلك رتب/ي المقترحات أو التوصيات التالية التي تراها/ترينها مناسبة لتقليل حدوث آلام أسفل الظهر

حسب الأولوية من 1 إلى 11

الترتيب	المقترحات / التوصيات	
	تقليص عدد ساعات العمل اليومية	
	تقليل عدد العمليات الجراحية يومياً	
	أخذ قسط كاف من الراحة بين العمليات الجراحية	
	ممارسة بعض التمارين الرياضية بعد انتهاء العملية	
	ارتداء حذاء وملابس مريحة أثناء العمل	
	تجنب الحركات المفاجئة	
	تغيير وضعية جسمك أثناء العمل من وقت لآخر	
	التوقف عن العمل عند حدوث الألم	
	تزويد غرفة العمليات بطاقم تمريضي كافٍ	
	تزويد غرفة العمليات بالكراسي المريحة للظهر	
	توفر واستخدام آلات حمل مساعدة لحمل ونقل المرضى من السرير إلى طاولة العمليات والعكس وكذلك حمل الأجهزة والأدوات الثقيلة أثناء العمل	

مع خالص تمنياتي للجميع بالتوفيق من الله لما فيه الخير

الباحث/

سامر خضر النواجحة

Annex (20): Experts panel

Experts Panel

1. Dr. Bassam Abu Hamad   Al-Quds University
2. Dr. Yehia Abed   Al-Quds University
3. Dr. Yousef Abu Safia   Al-Quds University
4. Dr. Fadel Naeem   Islamic University
5. Dr. Khamis Elessy   Islamic University
6. Mr. Khalil Shaqfa   Nursing Unit - MOH
7. Mr. Khalil abu Shoaeb   Palestine College of Nursing
8. Dr. Moatasem Salah   Palestine College of Nursing
9. Mr. Abdalraheem Shaqoura   European Gaza Hospital
10. Mr. Bassam Msalam   Nasser Medical Complex

ملخص الدراسة

هذه الدراسة بعنوان " محددات انتشار ألم أسفل الظهر بين الممرضين العاملين في أقسام عمليات مستشفيات قطاع غزة الحكومية"

هدفت هذه الدراسة إلى معرفة محددات انتشار ألم أسفل الظهر، مدى انتشاره، حدته، خصائصه، وصف الألم، وعلاقته ببعض المتغيرات مثل الجنس، العمر، سنوات العمل والحالة الاجتماعية. استخدم الباحث دراسة وصفية مقطعية، وقد تكون مجتمع الدراسة من جميع الممرضين العاملين بأقسام عمليات مستشفيات قطاع غزة الحكومية. تكون مجتمع الدراسة من 143 فردا منهم 110 ذكور و 33 إناث، تكونت أداة الدراسة من استبانة تم إعدادها لقياس متغيرات الدراسة، لقد تم توزيع 159 استبانه على الممرضين العاملين في أقسام العمليات وقد استجاب منهم 143 موظفاً أي ما نسبته 90.0% .

وقد كانت نسبة استجابتهم لاستبانة الدراسة 90%، وقد قام الباحث بإجراء اختبارات الصدق والثبات للاستبانة من خلال عينة استطلاعية تكونت من 30 فرد. وقد قام الباحث باستخدام المعالجات الإحصائية للحصول على نتائج سليمة مثل : التكرار، النسب المئوية، المتوسط الحسابي، ومربع كاي.

أظهرت نتائج الدراسة انتشار ألم أسفل الظهر بنسبة 70.6% بين ممرضي العمليات وبلغت النسبة 68.2% بين الذكور و78.8% بين الإناث، وكان أفراد الفئة العمرية من (31-40عام) الأكثر شكوى من ألم أسفل الظهر حيث بلغت نسبتهم 84.0% يليها أفراد الفئة العمرية من (48- 58عام) وبلغت نسبتهم 75.0%، وقد كان مستشفى الهلال الإماراتي الأكثر شكوى من ألم أسفل الظهر حيث بلغت نسبة الشكوى 100.0% يليه مجمع الشفاء الطبي بنسبة 84.3%.

كانت نسبة الذين يشكون من ألم أسفل الظهر من غير المتزوجين 73.3% وقد كانت أعلى نسبة مقارنةً بالفئات الأخرى، إلى جانب أنه كانت نسبة الألم بين الذين لديهم مؤشر كتلة الجسم من (30 فأكثر) 82.8%، كما أظهرت نتائج الدراسة أن 35.0% من أفراد عينة الدراسة يعانون من ألم معتدل، 21.0% يعانون من ألم حاد، 14.7% ألم خفيف، وقد وصف 25.7% من أفراد العينة الألم على شكل تصلب و17.8% وصفوه على شكل نمنمة، 16.8% وصفوه بأنه غير واضح،

1.9% وصفوه على شكل حرقان. كما أظهرت نتائج الدراسة أن 45.4% من أفراد عينة الدراسة اشتكوا من ألم متقطع و6.9% اشتكوا من ألم مستمر، كما تبين أن 52.4% من الذين اشتكوا نادراً ما يأخذا إجازة مرضية، وأن 14.7% غالباً ما يأخذوا إجازة مرضية، بينما أظهرت النتائج بأن 3.5% دائما يأخذون إجازة مرضية بسبب ألم أسفل الظهر. أظهرت النتائج عدم وجود فروق ذات دلالة إحصائية بين انتشار الألم وبين متغيرات (الجنس، العمر، الحالة الاجتماعية وعدد سنوات العمل). وقد أظهرت نتائج الدراسة فروق ذات دلالة إحصائية بين حدة الألم وبين متغيرات (عدد سنوات العمل ومكان العمل).

بالنسبة لمحددات الألم وعوامله فقد رأى 67.1% من أفراد عينة الدراسة بأن الوقوف لفترة طويلة كان أكثر محددات الألم يليه ضغط العمل الشديد بنسبة 65.0%، حمل ونقل المرضى (62.9%)، حمل الأدوات والأجهزة الثقيلة وانحناء الظهر بنسبة 58.7%.

أظهرت نتائج الدراسة بأن هناك حاجة لإدخال بعض التعديلات على بيئة أقسام العمليات في المستشفيات مثل تزويد أقسام العمليات بطاقم تمريضي كافٍ، توفير كراسي مريحة، إصلاح أرضيات بعض الأقسام، توفير أجهزة متحركة لحمل المرضى ونقل الأجهزة الثقيلة والتقليل من الضوضاء. كما وأظهرت النتائج بان غالبية ممرضي أقسام العمليات لديهم معرفة جيدة وكافية حول تدابير ومعايير السلامة في مكان العمل. أما بالنسبة للاقتراحات فقد أظهرت نتائج الدراسة بأن توفير طاقم تمريضي كافٍ يشكل المرتبة الأولى من المقترحات يليه أخذ قسط كافٍ من الراحة بين العمليات الجراحية وتقليل عدد العمليات في اليوم.