

**Deanship of Graduate Studies  
Al- Quds University**



**Determinants of Musculoskeletal Pain among Governmental  
Hospitals Laboratory Technicians in Gaza Governorates**

**Eman Ali El Astal**

**MPH Thesis**

**Jerusalem- Palestine**

**1431 / 2010**

**Determinants of Musculoskeletal Pain among  
Governmental Hospital Laboratory Technicians in  
Gaza Governorates**

Prepared By:  
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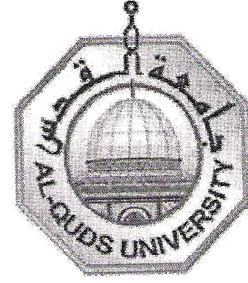
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A Thesis Submitted in Partial Fulfillment of  
Requirements for the Degree of Master of Public Health  
Al- Quds University

1431 / 2010

**Deanship of Graduate Studies  
Al- Quds University  
School of Public Health**



## **Thesis Approval**




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**Jerusalem- Palestine**

**1431 / 2010**

## **Dedication**

*I would like to express my appreciation and gratitude to my family, particularly my husband Nedal Without his understanding, support and encouragement the thesis would not have been completed.*

*I would like to thank my sons, Mohammed, Iyad and my daughter Raghed for their patience.*

*Lot of thanks and love to my parents &my mother in law who never stopped encouraging me, to my sisters and brothers who believed in me..*

*To everyone who contributed to get this study a reality, thank you.*

*Eman Ali El-Astal*

## **Acknowledgements**

First of all, praise be to Allah, the lord of the world, and peace and blessings of Allah be upon the noblest of all Prophets and messengers, our prophet Muhammad, all thanks for Allah who granted me the help and capability to complete this thesis.

I would like to express my deepest appreciation and gratitude to all people that have contributed to the completion of this thesis. I had the great fortune to study under the supervision of Dr. Zakaria El-Astal. I am very grateful for his guidance and encouragement and his friendly support and enthusiasm. Thank you.

Special thanks and appreciation to my friends and colleagues at the School of Public Health. It was a wonderful time spent with you.

I would like to thank all academic and administrative staff of School of Public Health, Al-Quds University for their guidance and support.

I would like to convey my warm thanks to Mr. Abed El-Raheem Shagora for the high quality of knowledge and facilities provided.

Many thanks to all who participate and respond to this study at governmental hospitals laboratories.

Eman El-Astal

January, 2010

***Declaration***

*I declare that this research is my own work and that no part of it has been copied from any other previous works on the subject, except in such instances where acknowledgment has been duly made.*

***Signature:***

*Eman*

*Eman Ali El-Astal*

*January, 2010*

## **Abstract**

*This study aimed to identify prevalence and determinants of musculoskeletal pain among laboratory technicians working at governmental hospitals' medical laboratories in Gaza Governorates. The design of this study is a quantitative, descriptive, analytical cross-sectional one. The sample of this study consisted of 179 technicians (110 male and 69 female). The researcher used constructed self-administered questionnaire for data collection. Different statistical procedures used for data analysis including cross tabulation, percentage, mean, chi square and t. test. The results showed that the overall prevalence of MSP among participants was 68.7%; of them 64.5% were males and 75.4% females. The highest complain of MSP was among the age group (50 years and more) and it was 75.0% within the group and the lowest complain was among age group (40 – 49 years) and it was 66.7% within the group. 21.1% of participants suffered from back pain, 14.6% lower extremities, 5.7% neck, 4.0% shoulders and 0.8% upper extremities. 61.0% described pain as spasm, 6.5% tingling, 6.5% tenderness, 5.7% burning and 1.6% numbness. Pain was severe among 14.6%. There were no significant differences between male and female technicians in severity of pain. Among those who complain of pain, 78.9% seek medical advice. High concentration / attention were the dominant risk factor for MSP (89.43%), work overload (85.3%), unsuitable posture (84.5%), repetition of same movements (83.7%), psychological pressure (82.9%) and computer work was the least risk factor (26.01%). Work environment needs some modifications including decrease level of noise, control crowd, afford comfortable chairs and remove unnecessary furniture. The majority of technicians have enough knowledge regarding safety measures during work.*

*The study concluded that work related MSP was high among laboratory technicians with its subsequences on quality of work, productivity, cost and quality of life. MSP affects all body sites with different characteristics including nature of pain, severity, onset and duration. The results of this study highlights the need for adopting proper ergonomics when designing work place to fit for persons and tasks to be performed. Priority suggestions to avoid MSP were task rotation followed by practicing exercise during free time and avoid sudden movements during work.*

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## List of Abbreviations

<b>CMI</b>	Chronic Multi-Symptom Illness
<b>CTS</b>	Carpal Tunnel Syndrome
<b>GS</b>	Gaza Strip
<b>LBP</b>	Low Back Pain
<b>MOH</b>	Ministry Of Health
<b>MSDs</b>	Musculoskeletal Disorders
<b>MSP</b>	Musculoskeletal Pain
<b>NGOs</b>	Non Governmental Organization
<b>NRC</b>	National Research Center
<b>No.</b>	Number
<b>NOISH</b>	National Institute for Occupational Safety & Health
<b>OSHA</b>	Occupational Safety & Health Administration
<b>OR</b>	Odds Ratio
<b>PCBS</b>	Palestinian Center Bureau of Statistics
<b>PHC</b>	Primary Health Center
<b>PR</b>	Prevalence Ratio
<b>SPSS</b>	Statistical Package for Social Sciences
<b>UEMSDs</b>	Upper-Extremity Musculoskeletal Disorders
<b>UEP</b>	Upper Extremity Problems
<b>UWMSDs</b>	Upper-Limb Work-Related Musculoskeletal Disorders
<b>UNRWA</b>	United Nations Relief and Works Agency
<b>US</b>	United States
<b>WHP</b>	Workplace Health Promotion
<b>WHO</b>	World Health Organization
<b>WRMSDs</b>	Work Related Musculoskeletal Disorders
<b>WRULDs</b>	Work-Related Upper Limb Disorders

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# **Chapter One**

## **Introduction**

## **Background**

## **Chapter One**

### **Introduction**

#### **1.1 Background**

Work-related musculoskeletal disorders (WRMSDs) are a leading cause of pain, suffering and disability in workplaces that reported in occupational safety and health administration (OSHA, 1997 and Baldwin, 2004). Concerning prevalence of chronic health problems, long-term disabilities and consultations among health professionals, Musculoskeletal Disorders (MSDs) are considered the first cause, followed by restricted activity days (Badley *et al.*, 1994). MSDs include a wide range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves and supporting blood vessels. Body regions most commonly involved are the low back, neck, shoulder, forearm and hand; although the lower extremity has received more attention (Mani & Gerr, 2000 and Salter, 2004). MSDs are widespread in many countries, with substantial costs and impact on quality of life. Although not uniquely caused by work, they constitute a major proportion of all registered and/or compensable work-related diseases in many countries (NRC, 1998 and Punnet, & Wegman, 2004). Accurate data on the incidence and prevalence of MSDs are difficult to obtain and official statistics are difficult to compare across countries. Nevertheless, MSDs are the single largest category of work-related illness, representing around 30% of all registered occupational diseases in United States (US), the Nordic countries and Japan (NRC, 2001). Numerous surveys of working populations reported upper extremity symptoms prevalence of 20 to 30% or even higher (Picavet, 2003). It was found that MSDs cause more work absenteeism or disability than any other group of diseases (NRC/IOM, 2001).

In the Middle Eastern countries such as Kuwait, a study was conducted by Landry *et al.*, (2008) showed that health professionals are exposed to occupational risk factors that predispose them to developing low back pain (LBP), lifetime prevalence was 70.9% and point prevalence was 21.5 %. A study was carried out locally on different health institutions in Gaza Strip (GS) showed that the more years in work, the higher the chance of LBP development among physiotherapy professionals (Masoud, 2004). Another study was conducted by El Keshawi (2008) among administrative and academic staff of the Islamic University of Gaza reported that muscle spasm was the most dominant type of pain located around neck and both shoulders among 94% of study participants. (NIOSH, 1997) issued a report evaluating the scientific basis for the relationship of workplace stressors (e.g., physical, organizational, psychosocial, individual and sociocultural) to MSDs. The report concludes that such a relationship exists for many ergonomic stressors.

Regarding medical laboratories, some studies focused on specific tasks; Kevin, (2004) reported that laboratory personnel used pipettes several hours daily experienced fatigue and discomfort in the upper extremities, with time and repetition muscles, tendons, ligaments, nerves and blood vessels can be damaged, resulting in injuries known as MSDs.

Fredriksson, (1995) and Buckle, (1997) mentioned an increase of pain in the thumb associated with the time spent on work with automatic pipettes; a higher number of complaints concerning hands and elbows (Paris, 2006).

Preventive measures such as good workplace layout, tool and equipment design and proper work practices should be considered. Early recognition of MSDs is very important because medical treatments are unlikely to be effective once these injuries become longstanding. Preventive and control measures, in order to be truly effective, require significant

involvement on the part of the workers and manager to improve occupational health and safety (Oshaweb, 2009).

This study was conducted at governmental hospitals' medical laboratories in Gaza Governorates. Within the researcher's knowledge, this study could be the first one that investigated musculoskeletal pain (MSP) among laboratory technicians locally, aiming to determine its prevalence and the associated determinant / risk factors that may cause pain.

## **1.2 Research problem**

MSDs are a serious health problem that causes pain, suffering and disability at workplace. This problem did not have much concern from decision-makers or researchers locally. According to the researcher knowledge, very few studies concerning musculoskeletal complains related to work were carried out. One study was carried out on different health institutions in GS determined prevalence and risk factors of low back pain among physiotherapy professionals (Masoud, 2008). An other study was performed by El Keshawi, (2008) investigated neck pain and work-related factors among administrative and academic staff of the Islamic University of Gaza. A study conducted by Abu Rayya (1999) examined the prevalence of low back pain (LBP) among laboratory technicians working at UNRWA health centers revealed that 75% of medical laboratory technicians suffered from LBP during work.

In this study the magnitude of this problem will be explored among medical laboratory technicians working in governmental hospitals; the determinant factors related to MSP, to ensure that the largest possible number of employers and employees in the medical laboratories become aware of this problem and ways of preventing or reducing work-related MSP .

Through proper preventive measures, the pain and disability of musculoskeletal system can be reduced, workers' compensation costs can be cut as well as productivity and employee satisfaction can be improved.

### **1.3 Justification of the study**

From the researcher's experience in working at medical laboratory field for nine years, she noticed that some laboratory technicians and other team members at European Gaza Hospital were frequently referred to the out-patient physiotherapy clinic by their physicians for treatment of low back, neck and shoulders pain. She conducted this study to identify the determinant / risk factors for developing MSP of the neck, shoulders, upper extremities, lower extremities and back among laboratory technicians.

The results of this study will highlight the musculoskeletal symptoms among laboratory technicians and its related factors. The study results will also highlight the need for implementing modifications to some physical and psychosocial factors to reduce the risk of developing MSP and its accompanied symptoms and complaints at different body sites. To be effective, interventions should include employee involvement, employer commitment and the development of integrated programs that address equipment design, work procedures and organizational characteristics.

### **1.4 Main objective of the study**

The overall objective of this study is to identify the determinant factors of musculoskeletal pain among governmental hospitals' laboratory technicians in Gaza Governorates.

### **1.5 Specific objectives**

- To determine the prevalence of MSP among medical laboratory technicians in governmental hospitals.
- To identify site and nature of MSP among medical laboratory technicians who reported pain.
- To find out the relationship between MSP and personal, demographic variables (age, gender, years of work) and work environment among medical laboratory technicians who reported pain.
- To assess medical laboratory technicians knowledge regarding safety measures to avoid MSP during work.
- To conclude recommendations that could help to adopt strategies to reduce MSP.

This study could help to introduce preventive and control measures to improve occupational health and safety in hospital laboratories.

### **1.6 Research questions**

- What are the main factors that lead to MSP among medical laboratory technicians working in governmental hospitals in GS?
- What is the prevalence of MSP among medical laboratory technicians in governmental hospitals in GS?
- What are the body sites of MSP among medical laboratory technicians who reported pain?
- What is the nature of MSP among medical laboratory technicians who reported pain?

- Are there significant differences in severity of pain among laboratory technicians related to gender?
- How do laboratory Technicians perceive their work environment?
- What is the level of knowledge regarding safety measures to avoid MSP among laboratory technicians?
- How do laboratory Technicians rank risk factors at work place?

## **1.7 Context of the study**

This study was conducted in GS; therefore, the researcher presented some background information about Palestinian population, geographical, demographical, socio-economical and political situation. Health situation and health care services that influenced by them, in addition some information about place of the study that presented governmental laboratory hospitals in Gaza Governorates.

### **1.7.1. Demographic context**

Palestine (historical Palestine) is a small country, its area about 26,323 sq. km. Now Palestinian National Authority controls partially two areas separated geographically, the West Bank (WB) and GS (annex 1), with total area of 6,020 sq. km (PCBS, 2007). GS is a narrow band of land located on the south of Palestine, constituting the coastal zone of the Palestinian territory along the Mediterranean Sea between Egypt and Israel (annex 2). It is 45 Kilometres long and 6-12 Kilometres wide with an area of 365 sq. km (PASSIA, 2008). The strategic position of it, is being at the cross road of Africa, Asia and Europe made it target for and conquerors over the centuries. According to the Palestinian Centre Bureau of Statistics (PCBS) which has been carried out in 2007, the total population in the West

Bank and GS is 3,761,646, of them 1,416,543 (67.9% are refugees) were living in GS concentrated mainly in 7 towns, 10 small villages and 8 refugee camps (PCBS, 2009).

The Palestinian society is considered a young population, age structure in the GS is similar to that in many developing countries with 49.3% of people aged less than 14 years and sex ratio is 103 males per 100 females (PCBS, 2009).

According to the last available statistics, the percentage of illiteracy in GS is 5.5% of the population more than 10 years old, compared with 11.3% in 1997 for the same group of population (PCBS, 2009).

### **1.7.2. Socio-political contexts**

West Bank and GS have been occupied by Israel after the Six Day War in 1967. GS was run by Egypt between 1948 and 1967 after the partition of the British Mandate of Palestine and the declaration of what is called "Israel". Afterwards, Israel built further settlements in the occupied land (Bhat, 2008). The implementation of the partial autonomy in 1994 and the establishment of the Palestinian Authority (PA) had its impacts on the society after the many devastating wars and the long years of occupation and dispersion over the globe (Hamad, 2009). However, Israel still holds overall sovereignty over the GS. It has the upper hand over borders, movement of goods and travellers in and out of GS, particularly the Palestinians themselves. It also controls trade, the commercial market, water, the main sources of energy, the means of communications and the overall security. Hence, it still has a hold over the Palestinian economy (Hamad, 2009).

Since 2000, there has been a chronic down turn in wage income from Israel due to the security closure of the borders between GS and Israel till it reached the zero level now. This has been complicated by the massive contraction of employment opportunities inside GS due to the current collapse of economy due to production factors such as lack of raw

materials, fuel and electricity as well as to market failure resulting from closure, lack of transportations and widely prevailing poverty.

### **1.7.3. Socio-economic contexts**

Economic crisis has been caused by restriction on the movement of people and goods. The Palestinian recession is among the worst in the modern history; average personal incomes have been declined by more than a third since 2000, and nearly a half of Palestinian now live below the poverty line, 43% still live below the poverty average (World Bank, 2004). According to the PCBS, the subsistence poverty was 23% and that 56% of all households in the occupied Palestinian territory are living below the poverty line (80% in 2006 – versus 63% in 2005 – in the GS, and 43% in the West Bank), and that means that over two million people are attempting to subsist on less than \$ 2 / person / day (PCBS, 2006). According to World Bank approximately 3 out of 5 Palestinians live under the income poverty line and one third of the Palestinians live under the consumption poverty (MOSAP, 2006).

### **1.7.4. Health care context**

Palestine experience in health care system is rather unique and complicated. The several years of occupation and the following unilateral withdrawal of the Israeli government did strongly influence the health care system in Palestine. The consequences of closures and separation formed a great challenge for the ministry of health (MOH) as it created obstacles regarding the accessibility to health care services and affects the unity of the health care system in all Palestinian governorates (MOH, 2004).

Health care services in Palestine are provided by five sectors, which are MOH, UNRWA, Medical Military Services, Non-Governmental Organizations (NGOs) and private sector.

MOH is the main health care provider; it provides primary, secondary services and purchases some services from private providers domestically and abroad (MOH, 2006). MOH plays the main role in providing and controlling immunizations scheme, public health activities, licensing and registration of health facilities. Health care financing is mainly provided through the government, apart from the out-of-pocket health financing which is the first source of health financing in Palestine (MOH, 2006). Additionally, external donations constitute a considerable source for health funding. UNRWA mainly provides primary health care services to the refugee population through 20 PHC centres (WHO, 2009). The Medical Military Services provide preventive and curative services for policemen, general security persons and their families, in addition to the general population. The NGOs sector is extensive: from missionary hospitals, to facilities supported by international organizations, to community health centers. The NGOs sector operates about 50 centers. The private for-profit health sector also provides the three levels of care through wide range of practices (WHO, 2009).

#### **1.7.4.1. MOH hospitals**

The MOH owns and operates 23 hospitals (11 in GS and 12 in the WB) furnished with 2,815 beds "1,499 in GS and 1,316 in the West Bank (MOH, 2006).

### **1.8 Medical laboratories**

#### **1.8.1. Definition and sections of medical laboratory:**

A medical laboratory or clinical laboratory is a [laboratory](#) where tests are done on clinical specimens in order to get information about the [health](#) of a [patient](#) as pertaining to the diagnosis, treatment and prevention of disease. Laboratory medicine is generally divided

into four sections and each of which is further divided into a number of units(Farr and Laurence, 2004). These four sections are:

- Anatomic Pathology: Units are included here, namely histopathology, cytopathology and electron microscopy.
- Clinical Microbiology: This is the largest section in laboratory medicine; as it encompasses five different units. These include bacteriology, virology, parasitology, immunology, and mycology.
- Clinical Biochemistry: Units under this section are instrumental analysis, enzymology, toxicology and endocrinology.
- Haematology: This section consists of three units, which are coagulation, blood bank and hematology.

### **1.8.2. Laboratory services at MOH:**

The laboratory services at MOH are offered to Palestinians at three categories: Central, Intermediate and Peripheral. The total number of laboratories in MOH is 140 (117 peripheral, 19 intermediate and 4 central), compared with the year 2000 (61 labs), which shows an increase of 130%, with an annual average increase of 26% in the years (2001-2005). In west bank there are 67 laboratories in PHC governorates clinics and 18 laboratories of NGOs facilities with MOH is contracted (MOH, 2006).

### **1.8.3. Nature of work in medical laboratory:**

Medical laboratory testing plays a crucial role in the detection, diagnosis, and treatment of many diseases. Medical laboratory technologists referred to as clinical laboratory scientists or medical technologists-and clinical laboratory technicians, also known as medical technicians or medical laboratory technicians, perform most of these tests. Clinical

laboratory personnel examine and analyze body fluids and cells. They look for bacteria, parasites and other microorganisms, analyze the chemical content of fluids, match blood for transfusions and test for drug levels in the blood that show how a patient is responding to treatment. Technologists also prepare specimens for examination, count cells, and look for abnormal cells in blood and body fluids. They use microscopes, cell counters and other sophisticated laboratory equipment. They also use automated equipment and computerized instruments capable of performing a number of tests simultaneously. After testing and examining a specimen, they analyze the results and relay them to physicians (Boncato, 2009).

With increasing automation and the use of computer technology, the work of technologists and technicians has become less hands-on and more analytical. The complexity of tests performed, the level of judgment needed and the amount of responsibility workers assume depend largely on the amount of education and experience they have. Sample processing will usually start with a set of samples and a request form. Typically a set of [vacutainer](#) tubes containing blood, or any other specimen, arrived to the laboratory in a small plastic bag, along with the form. The form and the specimens are given a laboratory number. The specimens usually all received the same number, often as a sticker that placed on the tubes and form. Entry of requests onto a laboratory management system involves typing in the laboratory number and entering the patient identification, as well as any tests requested. This allows laboratory machines, computers and staff to know what tests are pending and also gives a place (such as a hospital department, doctor or other customer) for results to go (Farr & Laurence, 2004). For biochemistry samples, blood is usually centrifuged and serum is separated. If the serum needs to go on more than one machine, it can be divided into separate tubes. Many specimens end up in one or more sophisticated [automated analyzers](#), that process a fraction of the sample and return one or more results. Some

laboratories use robotic sample handlers ([laboratory automation](#)) to optimize the workflow and reduce contamination risk and sample handling of the staff. The work flow in a lab is usually heavy. Nurses and doctors generally have their patients tested at least once a day with general complete blood counts and chemistry profiles. These orders are then drawn during a morning run by [lab](#). Technician or a nurse for results to be available in the patient's charts for the attending physicians to consult during their morning rounds (Farr and Laurence, 2004).

#### **1.8.4. Laboratory work environment**

Medical laboratory personnel are trained to work with infectious specimens. When proper methods of infection control and sterilization are followed, few hazards exist. Protective masks, gloves and goggles often are necessary to ensure the safety of laboratory personnel. Working conditions vary with the size and type of employment setting. Laboratories usually are well lighted and clean; however, specimens, solutions and reagents used in the laboratory sometimes produce fumes. Laboratory workers may spend a great deal of time on their feet. Working hours of clinical laboratory technologists and technicians vary with the size and type of employment setting. In large hospitals laboratories that operate continuously, personnel usually work the day, evening, or night shift and may work weekends and holidays. Laboratory personnel in small facilities may work on rotating shifts, rather than on a regular shift. In some facilities, laboratory personnel are on call several nights a week or on weekends, in case of an emergency (USA, Occupational Outlook Handbook, 2008-09).

## 1.9 Operational definitions of terms

**Musculoskeletal pain:** Pain that affects the muscles, ligaments and tendons, along with the bones (Chris, *et al.*, 2002).

**Work related musculoskeletal disorders:** Injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disc due to physical work activities or workplace (NIOSH, 1997).

**Pain:** An unpleasant sensation occurring in varying degrees of severity as a consequence of injury, disease, or emotional disorder (Merskey & Bogduk, 1994).

**Risk factors:** Any characteristic of a person (such as age), a situation (such as the severity of a traumatic event), or a person's environment (such as family life) that increases the likelihood that that person will eventually develop a disorder (Matthew, T. 2008)

**Governmental hospital:** A hospital that is controlled and run under the authority of Palestinian National Authority – Ministry of Health in Gaza Governorates and West Bank.

**Medical laboratory or Clinical laboratory:** A laboratory where tests are done on clinical specimens in order to get information about the health of a patient as pertaining to the diagnosis, treatment, and prevention of disease (Wikipedia, 2009).

**Laboratory technician:** Any person who is licensed to work in medical laboratory and currently works at a governmental hospital.

## **Chapter Two**

### **Conceptual Framework**

### **Literature Review**

## Chapter Two

### Literature Review

#### 2.1 Conceptual Framework

The conceptual frame work was designed by the researcher based on the review of the available literature, which is the map that guides the design and the implementation of the study and its effect mechanism for illustration and summarizing the whole study variables.

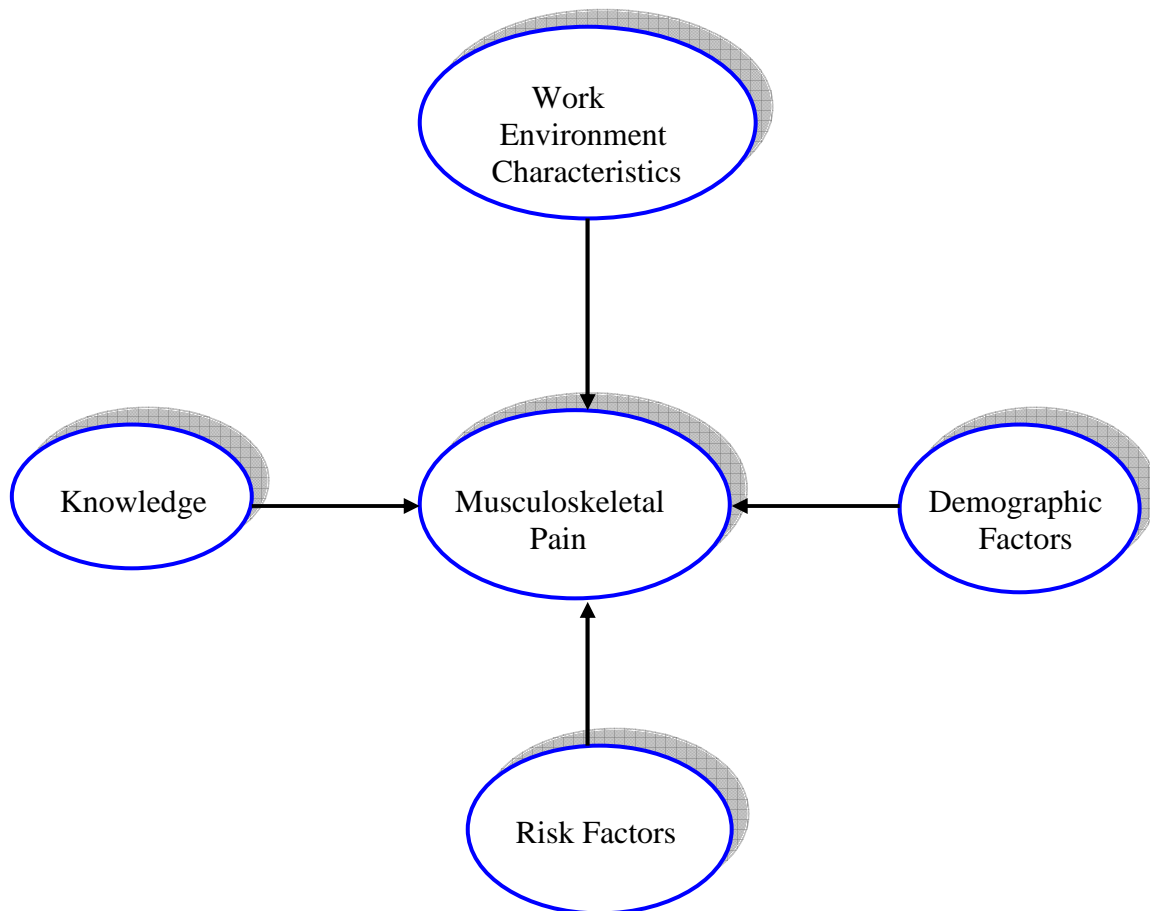


Figure 2.1 Conceptual framework diagram

The above conceptual framework is used to guide and direct the research process to make research findings meaningful and applicable.

The diagram denotes that the occurrence of MSP is related to different factors including work environment characteristics, demographic factors, risk factors and knowledge. These factors play an important role in determining the causes of MSP that laboratory medical technicians may suffer from which in turn guide the researcher regarding how MSP could be prevented.

## **2.2 Musculoskeletal System**

### **2.2.1 Anatomy review of musculoskeletal system**

The human musculoskeletal system is an organ system that gives humans the ability to move using the muscular and skeletal systems. The musculoskeletal system provides form, stability and movement to the human body (Mooar, 2007). It is made up of the body's bones "the skeleton", muscles, cartilage, tendons, ligaments, joints and other connective tissue "the tissue that supports and binds tissues and organs together". The musculoskeletal system's primary functions include supporting the body, allowing motion and protecting vital organs. The skeletal portion of the system serves as the main storage system for calcium and phosphorus and contains critical components of the haematopoietic system. This system describes how bones are connected to other bones and muscle fibers via connective tissue such as tendons and ligaments. The bones provide the stability to a body in analogy to iron rods in concrete construction. Muscles keep bones in place and also play a role in movement of the bones Kahn and Scott, (2008).

There are however, diseases and disorders that may adversely affect the function and overall effectiveness of the system. These diseases can be difficult to diagnose due to the

close relation of the musculoskeletal system to other internal systems. The musculoskeletal system refers to the system having its muscles attached to an internal skeletal system and is necessary for humans to move to a more favourable position.

## **2.3 Musculo-skeletal disorders (MSDs)**

### **2.3.1 Definition:**

A musculoskeletal disorder is a condition where a part of musculoskeletal system is injured over time. The disorder occurs when the body part is called on to work harder, stretch further, impact more directly or otherwise functions at a greater level than it is prepared for. The immediate impact may be minute, but when it occurs repeatedly the constant trauma cause damage (ergonomics.about.com).

## **2.4 Work Related Musculo-Skeletal Disorders (WRMSDs)**

### **2.4.1: Definition of WRMSDs:**

WRMSD is defined as an injury or an illness of muscles, tendons, ligaments, peripheral nerves, joints, cartilage (including in-vertebral discs), bones and supporting blood vessels in the upper or lower extremities or back, it is caused by exposure to risk factors in work place and is not the result of acute or instantaneous events. These disorders are characterized by pain and discomfort that develop gradually (NIOSH, 1997). It is a group of painful disorders of muscles, tendons, and nerves caused by work activities which are frequent and repetitive, or activities with awkward postures (CCOHS, 2005).

#### **2.4.2. Background of WRMSDs:**

Work Related Musculo-Skeletal Disease (WRMSDs) is neither a recent medical discovery, nor is it even newly described in the medical literature. Researchers in the field credit Bernardino Ramazzini, an Italian physician and the father of occupational medicine, the first to describe how our health is likely affected by our work. He believed that injuries were caused by repeated use of the hand , a constrained sitting position and excessive mental labor in his first book in 1700 (as cited in Cavo, 1999).

WRMSD has been debated since 1985 when Occupational Safety and Health Administration (OSHA) accepted that there were "traumatogens" in the work place and mandated that repetitive motion disorders be reported, the resulting epidemiologic literature has been substantial often examining frequency of disease and potential risk data studies.

#### **2.4.3. Epidemiology of WRMSDs:**

MSDs are the single largest category of work-related illness, representing a third or more of all registered occupational diseases in the, U.S., the Nordic countries and Japan (Punnett & Wegman, 2004). Numerous surveys of working populations have reported upper extremity symptom prevalence of 20 to 30% or even higher in the U.S., Canada, Finland, Sweden and England. MSDs cause more work absenteeism or disability than any other group of diseases. MSDs occur in certain industries and occupations with rates up to three or four times higher than the overall frequency. High-risk sectors include nursing facilities, air transportation, mining, food processing, leather tanning, heavy and light manufacturing "vehicles, furniture, appliances, electrical and electronic products, textiles, apparel and shoes". Upper extremity MSDs are also highly prevalent in manual-intensive occupations, such as clerical work, postal service, and cleaning, industrial inspection and packaging.

Back and lower limb disorders occur disproportionately among truck drivers, warehouse workers, airplane baggage handlers, construction trades, nurses, nursing aides and other patient-care workers and operators of cranes and other large vehicles. MSDs are widespread in many countries, with substantial costs and impact on quality of life. Epidemiologic studies have revealed several associations between physical work load factors and some common upper limb disorders. Although precise estimates are not available, most researchers agree that exposure to a combination of work place risk factors is a major contributor to these disorders. Along with personal factors "age, gender, etc.", epidemiologic studies of workers have associated these disorders with many work-place physical and psychosocial factors. Specific physical factors associated with these disorders include intense, repeated, or sustained exertions, awkward, sustained or extreme postures of the body, insufficient recovery time, vibration and cold temperatures. Specific examples of work-place psychosocial factors include monotonous work, time pressure, high work load, lack of peer support and a poor supervisor-employee relationship (Hales & Bernard, 1996). A study conducted to determine the prevalence and symptom-predicting factors at visual display terminal (VDT) workstations showed that 12-month prevalence of symptoms of the neck was 55%, shoulder region was 38%, hand/wrist was 21% and elbow/lower arm was 15%. The duration of VDT work had a significant impact on the frequency of neck symptoms in employees performing such work > 6 hours/day (Klussmann, *et al.*, 2008).

The U. S. Department of Labour showed that 65% of the 333,800 newly reported cases of occupational illness in 2001 were attributed to repeated trauma. WRMSDs account for approximately one third of all lost workday illnesses (Barr, *et al.*, 2004). Musculoskeletal conditions are extremely common and include more than 150 different diseases and syndromes, which are usually associated with pain and loss of function. In the developed

world, where these conditions are already the most frequent cause of physical disability, ageing of the most populous demographic groups will further increase the burden of these conditions impose. In the developing world, successful care of childhood and communicable diseases and an increase in road traffic accidents is shifting the burden to musculoskeletal and other non-communicable conditions (WHO, 2003).

On October 2003, an international conference held at GENEVA/LUND, reported that joint diseases, rheumatoid arthritis and osteoarthritis, osteoporosis, spinal disorders, low back pain and severe trauma are among 150 musculoskeletal conditions affecting millions of people globally, according to a comprehensive publication released by WHO on 2003, the burden collaboration with the bone and joint decade initiative of musculoskeletal conditions at the start of the new millennium – the first report of its kind – provides both a snapshot of the size of the problem and a baseline against which to measure the effects of health interventions. The aim is to map out the burden of the most prominent musculoskeletal conditions. These debilitating conditions are painful for the individual, lead to the inability to work and to enjoy life fully and are a cost to societies and countries. The numbers of those affected are set to rise over the next few decades (WHO, 2003).

A study conducted on 1992 - 2003 investigated work-related diseases among workers in Norway's offshore petroleum industry, its results showed that the upper limb disorders accounted for 53%, back disorders for 20% of all WRMSDs and lower limb disorders accounted for 16%. Types of exposure were reported high physical workload, repetitive work and walking on hard surfaces/climbing stairs and ladders (Morken, *et al.*, 2007). A study investigated WRMSDs among Nigerian physiotherapists reported 12- month prevalence of WRMSDs among Nigerian physiotherapists was 91.3%. Prevalence of WRMSDs was significantly higher in female physiotherapists and those with lower body

mass index. The low back 69.8% was the most commonly affected body part, followed by the neck 34.1% (Adegoke, *et al.*, 2008).

Another study investigated predictive factors for incident of MSDs in an in-plant surveillance program for upper-limb work-related musculoskeletal disorders (UWMSD) based on assessment of health and risk factors was implemented between 1996 and 2000 on a large shoe factory with overall high levels for biomechanical exposure. They observed 28 incident cases of UWMSD on 1997 and 24 incident cases from 1998 to 2000. Work pace as a risk factor accounted for 33% versus 13% respectively and prior history of UWMSD accounted for 58% versus 22%, psychological distress accounted for 36% versus 21%, physical fatigue accounted for 35% versus 22%, repetitiveness accounted for 30% versus 18% and task precision accounted for 33% versus 21% (Alexis *et al.*, 2007).

Chiron *et al.*, (2008) have studied "MSDs and job security of employees aged 50 years and over: a challenge for occupational health and public health", they reported about 11% of male and 15% of female workers suffered from at least one of the MSDs studied. After age 50, about 19% of male and 27% of female workers suffered from at least one MSD and 4% of male and 6% of female workers from at least two disorders. Exposure to MSD risk factors remained high after age 50.

"The prevalence of MSDs among hospital staff and the relevant underlying factors, in particular psychosocial and organizational considerations" were investigated by Maumet, *et al.*, (2005). The prevalence of reported MSDs was between 20.6% and 52% depending on the anatomical location. MSDs were more common among nurses than in other occupations. For staff members who had been working in the hospital for less than 15 years, physical and psychological factors that were associated with MSDs. For staff members who had been working for  $\geq 15$  years in the hospital, the factors that were

associated with MSDs were inadequate social support at work and the absence of professional recognition of their contribution. A local research studied the "occupational hazards among governmental healthcare workers in Gaza strip", it reported that slightly less than half of the study population 45.9% complained of myalgia and arthralgia where female workers were affected three times more than male (Jouda, 2006). In another study the results showed that prevalence rates of MSP were higher for women "39% of men and 45% of women" reported chronic complaints. Highest female predominance was found for the hip and wrist/hand, whereas lowest and not statistically significant gender differences were found for the lower back and knee (Wijnhoven, *et al.*, 2006). Another study showed that the occurrence rate of MSDs was 33% during 6-month service while the event-based incidence was 3.3 per 1,000 person-days; the most common types of MSDs were low back pain 20%, lower limb overuse injuries 16% and sprains or strains 13%. Those disorders mostly occurred in combat training in combat gear 40% and during marching on foot or bicycle 28%, overuse-related MSDs were more prevalent 66% than traumatic ones 34%. One-third 34% of the MSDs were recurrent and 66% were new ones. Disorders of the back and the knee were most frequently recurrent conditions 44% for both. Fractures, knee ligament ruptures, dislocations and muscle strains accounted for the highest number of service days lost (Taanila, *et al.*, 2009).

## **2.5 Musculoskeletal pain (MSP)**

Musculoskeletal pain is pain that affects the muscles, ligaments and tendons, along with the bones. Musculoskeletal symptoms of various types "neck pain, limb pain, low back pain, joint pain and chronic widespread pain" are a major reason for consultation in primary care. Pain complaints are usually self limiting, but if they become chronic the consequences are serious. These include the distress of patients and their families and

consequences for employers in terms of sickness absence and for society as a whole in terms of welfare benefits and lost productivity (Chris, *et al.*, 2002).

### **2.5.1. Causes of musculoskeletal pain:**

The causes of MSP are varied. Muscle tissue can be damaged with the wear and tear of daily activities. Trauma to an area "such as jerking movements, auto accidents, falls, fractures, sprains, dislocations and direct blows to the muscle" also can cause MSP. Other causes of pain include postural strain, repetitive movements, overuse and prolonged immobilization. Changes in posture or poor body mechanics might bring about spinal alignment problems and muscle shortening, therefore causing other muscles to be misused and become painful. The aetiology of WRMSDs is multifactorial and includes physical, individual and psychosocial factors that contribute to MSDs the presenting symptoms. Prolonged positioning away from the ideal posture will affect neural and other soft tissues in the upper extremity. Abnormal postures and positions may result in chronic nerve compression or may shorten muscles and, if the muscle crosses over a nerve, compression may occur. These postures may also contribute to muscle imbalance (Novak, 2004).

### **2.5.2. Symptoms of musculoskeletal pain:**

People with MSP sometimes complain that their entire bodies ache. Their muscles might feel like they have been pulled or overworked. Sometimes the muscles twitch or burn. Symptoms vary from person to person, but the common symptoms are: pain, fatigue and sleep disturbances (Medicinenet, 2009).

### **2.5.3. Management of musculoskeletal pain:**

In the management of work related MSP, modifications of work that are feasible to be implemented in the field should be done as a first priority. Some case studies suggest notable effects of ergonomic measures on the occurrence of upper limb disorders. Thorough clinical evaluation is necessary to identify all sites of nerve compression, muscle imbalance and factors affecting patient symptoms, so that, appropriate intervention can be instituted. Management must include patient education, postural correction and a specific physical therapy program to address the multiple levels of nerve compression and cervico-scapular muscle imbalance. In addition to physical therapy intervention, behavioural modification at home and at work may be necessary for successful management (Novak, 2004). Economic analyses of individual workplace have indicated that the investments usually have a short payback period. In work related carpal tunnel syndrome, the physical demands of the job, especially the force demands of gripping, should be considered before deciding on surgery, because gripping force may return slowly after surgery and may be compromised by the surgical procedure itself (Viikari, 1998). Different types of manual therapy, or mobilization, can be used to treat people with spinal alignment problems. For acute MSP these techniques have been shown to speed recovery. Exercise is also an important component of treating chronic MSP . Alignment problems might persist without treating muscle shortening or weakness, which might contribute to your alignment problems, as well as, poor mechanics and body posture. Stretching and strengthening exercise are important, as stretching can change the actual length of the muscle, while strengthening without stretching can cause the muscle to shorten further. Strengthening weak muscles also reduces the likelihood that muscles will become strained and painful with normal and recreational activity. Since pain and inactivity can lead to de-conditioning, aerobic exercise is important to improving your cardiovascular and muscular endurance

and depending on the type of exercise, can lead to increases in strength as well (Medicinenet, 2009).

In patients with MSDs such as fibromyalgia, medicines to increase the body's level of serotonin and norepinephrine "neurotransmitters that modulate sleep, pain and immune system function" are prescribed in low doses. Some of the medicines used to aid sleep include zolpidem tartrate "brand name Ambien", clonazepam, and trazadone.

Other treatments might include; injections with anaesthetic or anti-inflammatory medicines in or around the painful sites, strengthening and conditioning, physical or occupational therapy, acupuncture or acupressure, relaxation/biofeedback techniques, osteopathic manipulation a whole system of evaluation and treatment designed to achieve and maintain health by restoring normal function to the body, chiropractic care and therapeutic massage (Medicinenet, 2009).

## **2.6 Factors contribute to musculoskeletal pain**

Different groups of factors may contribute to MSP, including physical and biomechanical factors, organizational and psychosocial factors, individual and personal factors. These may act uniquely or in combination. Several work related risk factors which may be associated with the occurrence of MSDs have been described in different studies. Alison, *et al.*, (2006) used "longitudinal relationship of work hours, mandatory overtime and on-call to musculoskeletal problems in nurses", the result was schedule characteristics increasing MSD risk included 13+ hour/days, off-shifts, weekend work, work during time off "while sick, on days off, without breaks" and overtime/on-call.

The physical ergonomic features of work frequently considered as risk factors for MSDs include rapid work pace and repetitive motion, forceful exertions, non-neutral body postures and vibration was reported by Punnett & Wegman, (2004).

Wrist-hand complaints appear to be associated with some personal characteristics (smoking habits, fewer hobbies), work constraints "fewer breaks, heavy lifting efforts" and some personality "introversion" and psychosocial factors "worse appreciation of work". Neck complaints are also associated with some personal characteristics "young people, small, bad health, hormonal problems and fewer hobbies" and some personality "urgency of time" reported by Malchaire, *et al.*, (2001). What do play roles in the development of work-related MSDs are physical factors in the workplace as well as factors that increase worker stress. Devereux, (2005) in his study followed more than 3,000 workers, asking questions about their physical and psychosocial work factors, demographics, individual traits, stress reactions and musculoskeletal complaints over the course of 15 months. He found that workers who reported that they were highly exposed to both physical and psychosocial work risk factors were also the ones who reported the most lower-back, upper-back, neck, shoulder, elbows/forearm and hand/wrist musculoskeletal complaints. After 15 months, the follow-up study found that high exposure to both physical and psychosocial risk factors also increased the chances that a worker would report new episodes of low-back, neck, shoulder, elbow/forearm and hand-wrist complaints.

Björkstén, *et al.*, (1994) described the connection of risk factors associated with musculoskeletal complaints and the use of pipettes: They found there was an increase in the number of complaints concerning hands and shoulders associated with the use of pipettes for over 300 hour a year.

"Perceived work stress, over commitment and self-reported MSP": Across-sectional investigation done by Ljiljana, *et al.*, (2001) observed elevated prevalence odds ratios in employees who scored high on over commitment, who were exposed to physical job demand and who reported psychosocial work stress.

A study conducted by Windt, *et al.*, (2000) to systematically evaluate the available evidence on occupational risk factors of shoulder pain in Netherlands, its results showed that potential risk factors related to physical load and included heavy work load, awkward postures, repetitive movements, vibration and duration of employment. Consistent findings were found for repetitive movements, vibration and duration of employment odds ratio (OR) 1.4-46 on studies with method scores  $\geq 60\%$ ). Nearly all studies that assessed psychosocial risk factors reported at least one positive association with shoulder pain, but the results were not consistent across studies for either high psychological demands, poor control at work, poor social support, or job dissatisfaction. Another study done by Paris and Mario, *et al.*, (2006) of "risk factors associated with the reporting of musculoskeletal symptoms in workers at a laboratory of clinical pathology", its results showed that the symptoms have been significantly associated with the previous history of rheumatic or orthopaedic disease and with movements and postures at work. Absences from work due to musculoskeletal symptoms have been significantly associated with the low level of education. Another study conducted by Ostergren, (2001) concluded that job related mechanical exposure in both gender, and psychosocial factors in women, seem independently of each other to play a part for development of shoulder and neck pain in vocationally active people. The effect of psychosocial factors was more prominent in women, which could be the result of biological factors as well as gender issues. These results suggest that interventions aiming at reducing the occurrence of shoulder and neck pain should include both mechanical and psychosocial factors.

### 2.6.1. Physical factors:

Work related musculoskeletal symptoms have a multi-factorial origin. Possible risk factors are of a physical, psychosocial or personal origin. These factors can reinforce each other and their influence can also be mediated by cultural or societal factors. Initially, most research on neck and upper limb symptoms focused on work-related physical exposure (OSHA, 2007).

- Work environment: poor workspace layout and poor lighting making employees work in awkward positions, poor design of tools and machinery.
  
- Excessive heat increase overall fatigue, while excessive cold can make neck harder to grip. Upper extremity musculoskeletal complaints and disorders are frequently reported among visual display units' workers. These complaints include cold forearms, hands or fingers ([Meijer & Sluiter, 2006](#)). In a study aimed to gain an insight into the relationship between temperature decrease and musculoskeletal disorders (MSDs) in the upper extremity at work environment by "internal or external" cooling of the arm and hand. The results showed that there is no consistent evidence for the association between upper extremity MSDs and temperature changes in forearm, hand or fingers in an office work environment (Meijer, *et al.*, 2006).
  
- Heavy lifting, repetitive work, bending and poor body posture during work may lead to MSP. Fredriksson, *et al.*, (1999) noted that neck, shoulder, and lower limb disorders are associated with heavy lifting, monotonous work tasks, static work postures, vibrations, repetitive jobs, and a high pace of work.

To identify physical risk factors for neck pain, a systematic review of the literature was carried out. Based on methodological quality and study design, 4 levels of evidence were

defined to establish the strength of evidence for the relationship between risk factors and neck pain. The results showed some evidence for a positive relationship between neck pain and the duration of sitting and twisting or bending of the trunk. The results showed also that there was some evidence for a positive relationship between neck pain and the following work-related risk factors: neck flexion, arm force, arm posture, duration of sitting, twisting or bending of the trunk, hand-arm vibration, and work place design (Ariëns, *et al.*, 2000).

### **2.6.2. Individual factors:**

- Age plays an important role in the development of different health problems. In a study concerning the work ability of ageing workers; the results revealed that, in general, specific demands are more likely to overtax the capacities of older workers than those of younger workers in high-demand jobs, implying greater repercussions for health, although these effects also vary considerably within age cohorts. Functional tests for job-specific work ability should be developed for high-demand jobs in order to monitor individual functional ageing and to facilitate well-timed intervention (Sluiter, 2006). A study investigated WRMSDs among Nigerian Physiotherapists revealed that 50% of the physiotherapists first experienced their WRMSDs within five years of graduation and the highest prevalence 61.7% was found among physiotherapists younger than 30 years of age (Adegoke, *et al.*, 2008).

MSDs are highly prevalent, because of their association with aging, they are likely to become more prevalent as the population ages throughout the world. In one study of Detroit residents who kept track of daily health symptoms in a diary, musculoskeletal symptoms constituted the most frequent category of health symptoms. The prevalence of

MSDs generally increases with age, with the majority of persons aged seventy-five and over having some form of MSDs, especially arthritis (Felson, 2002).

- Gender: the physical capacity of workers varies between male and female. A literature review was conducted on the current literature base to determine the strength of support for the hypothesis that women experience higher prevalence of upper extremity musculoskeletal diseases (UEMSDs) than men. The majority of the studies showed that women had significantly higher incidences of various types of UEMSDs than men. This trend was consistently observed in studies based on self-report or plant/workers compensation records, with and without physical examination and after adjusting for potential confounders such as age and physical work factors. With men as the referent, the OR or prevalence ratio for UEMSDs ranged from 0.85 to 10.05 for self report. For self report combined with physical examination, the OR/PR ranged from 0.66 to 11.4. The OR/PR for carpal tunnel syndrome (CTS) ranged from 0.6 to 2.87 with confounder adjustment. These findings suggest that women do have significantly higher prevalence than men for many types of UEMSDs, even after controlling for the type of data source and confounders such as age or working factors (Treaster & Burr, 2004). Gender differences in the prevalence of musculoskeletal complaints might be explained by differences in the effect of exposure to work-related physical and psychosocial risk factors. A systematic review was conducted to examine gender differences in the relations between these risk factors and musculoskeletal complaints. For lifting, strong evidence was found that men have a higher risk of back complaints than women. The same was found for the relation between hand-arm vibration and neck-shoulder complaints. For arm posture, strong evidence was found that women have a higher risk of neck-shoulder complaints than men. For social support, no evidence of a gender difference was found for either neck-

shoulder or back complaints. For hand-wrist and lower-extremity complaints; inconclusive (Hoofman, *et al.*, 2004).

- Practice: static posture, prolonged sitting, poor posture, repetitive movements and sport practices. In a study aimed to estimate the prevalence and population impact of work-related neck and upper limb pain, a cross-sectional survey was conducted of 10,000 adults in North Staffordshire, UK, in which there is a common local manual industry. The results showed that one-month period prevalence of neck and upper limb pain was 44%. There were significant independent associations between neck and upper limb pain and: repeated lifting of heavy objects (OR = 1.4), prolonged bending of neck (OR = 2.0), working with arms at/above shoulder height (OR = 1.3), little job control (OR = 1.6) and little supervisor support (OR = 1.3). The population attributable fractions were 0.24 (24%) for exposure to work activities and 0.12 (12%) for exposure to psychosocial factors (Sim, *et al.*, 2006). On a study to quantify the relative contribution of work-related physical and psychosocial factors, individual factors and health-related factors to the development of more severe MSP in the neck and upper limbs and the back and lower limbs, the results showed that of the 4,006 baseline respondents, only 7.7% were free of regional pain. A total of 1,513 participants were free of severe pain at baseline and completed the 24-month follow up. Highly repetitive work predicted arm pain, heavy lifting and prolonged standing predicted low back pain and heavy pushing or pulling predicted lower limb pain. Low job satisfaction predicted neck/shoulder pain and lower limb pain, whereas other psychosocial work place factors were only of marginal importance. High levels of fear avoidance were associated with arm pain and lower limb pain. A high body mass index was highly associated with lower limb pain (Andersen, *et al.*, 2007). The study results of Adegoke, *et al.*, (2008) reported that treating large number of patients in a day was cited by 83.5% of the physiotherapists as the most important work factor for their WRMSDs. The most

commonly adopted coping strategy identified was for the therapists to modify their position and/or the patient's position 64.3%.

### **2.6.3. Psychosocial factors:**

Psychosocial factors may contribute to some signs of MSP among workers especially when working under pressure. An extensive review on the role of psychosocial factors in the development of musculoskeletal problems was published, it showed that the large majority of the studies reported an association between at least one work-related psychosocial factor and adverse upper extremity symptoms or signs. High-perceived job stress was consistently associated with all upper extremity problems (UEP) in high and lower quality studies, although not often studied, non-work-related stress was also consistently associated with UEP, also there was some evidence for a relationship between high job demands and UEP (Bongers, *et al.*, 1993). A study result revealed a positive relationship between fear-avoidance beliefs and LBP of more than 30 days in both groups "i.e. those without and with previous LBP" (Jensen, *et al.*, 2009). Nahit, *et al.*, (2001) studied the influence of short term work related psychosocial factors "work demands, job control, and social support" and psychological distress on regional pain syndromes. The results showed that 24% of participants reported low back pain, 20% reported shoulder pain, 9% reported wrist/forearm pain and 21% reported knee pain. High levels of psychological distress were associated with increased likelihood of pain, those who perceived their work as stressful most of the time were more likely to report back or shoulder pain than those who considered their work seldom stressful. Pace of work or job autonomy was less markedly related to pain at individual sites. Strong relationships were observed between psychological distresses, job demands "stressful work, hectic work", low job control and pain at multiple sites.

Pain and fatigue are commonly associated with work-related upper extremity disorders. Occasionally these symptoms persist beyond a reasonable healing period. One potential explanation for prolonged symptom expression is the concurrent development of a stress-mediated illness or chronic multi-symptom illness (CMI). In such a scenario, the chronic regional pain and other symptoms that the individual is experiencing would be attributable to the CMI rather than to tissue damage or a biomechanical dysfunction of the upper extremity (Clauw & Williams, 2002). There is always a psychological component to any illness or injury and unless it is appropriately addressed, such factors can complicate or delay the recovery from a work-related illness or injury, when a worker experiences delayed recovery and unexpected disability, significant contributing psychosocial factors must be assessed for and managed appropriately. A maladaptive belief or understanding about the condition and disability by a patient presents an obstacle to successful treatment (Derebery & Tullis, 2006). A study focused on evaluation of work-related psychosocial factors and regional MSP revealed that there was an association between workplace psychosocial factors and upper limb, back or knee pain. The specific work-related psychosocial factors were job demands, support, job autonomy and job satisfaction (Macfarlane, *et al.*, 2007). A study conducted by Grimby-Ekman, *et al.*, (2009) showed that perceived stress was a risk factor for pain at present, for developing pain and for number of years with pain. High work/study demands was associated with pain at present and with number of years with pain when the demands negatively affect home life. An other study aimed to assess the impact of mechanical exposure and work related psychosocial factors on shoulder and neck pain showed that high mechanical exposure was associated with heightened risk for shoulder and neck pain among men and women. In

women, job strain "high psychological job demands and low job decision latitude" correlated with heightened risk (Ostergren, *et al.*, 2005).

An other review aimed to summarize current knowledge concerning the role of psychological workplace variables in back pain. The results showed a clear association between psychological variables and future back pain. There was strong evidence that job satisfaction, monotonous tasks, work relations, demands, stress and perceived ability to work were related to future back pain problems. Further, moderate evidence was established for work pace, control, emotional effort at work and the belief that work is dangerous. There was inconclusive evidence about work content. The attributable fraction indicated that substantial reductions in the number of cases of back pain could be achieved if the exposure to the psychological risk factor was eliminated (Linton, 2001). Another study showed that depression and anxiety were highly significantly linked with increasing levels of neck pain. Educational level, deficits in social support and physical exercise were also associated with neck pain (Blozik, *et al.*, 2009).

## **2.7 Prevention of work related MSP**

Worker involvement is essential when tackling workplace hazards. The workforce and their representatives know the workplace as well as anyone. It is important to ensure that all workers receive appropriate information, education and training on health and safety in the workplace and know how to avoid specific hazards and risks. Preventive measures may cover the following areas:

- The workplace: improvement in workplace layout.
- Work equipment: modification of machines positioning.
- Work tasks: reduce physical demands of the job; using new tools or working methods.

- Work management: work can be planned or allocated better and safer systems of work implemented.
- Work organization: better work/rest ratios or job rotation can be arranged.
- Design and procurement: hazards can be eliminated in the planning stage.
- Workplace health promotion, e.g. preventing smoking and obesity (OSHA, 2007).

Conservative interventions such as physiotherapy and ergonomic adjustments play a major role in the treatment of most work-related complaints of the arm, neck or shoulder. A review study aimed to determine whether conservative interventions have a significant impact on outcomes for work-related complaints of the arm, neck or shoulder in adults. The results showed that there was limited evidence for the effectiveness of keyboards with an alternative force-displacement of the keys or an alternative geometry, and limited evidence for the effectiveness of exercises compared to massage, breaks during computer work compared to no breaks; massage as an add-on treatment to manual therapy, and manual therapy as an add-on treatment to exercises (Verhagen, *et al.*, 2007).

"Co-ordinated strategy of prevention and control of the biomechanical factors associated with the risk of MSDs" was reported by Malchaire, (2002). The strategy includes stage "one" screening aimed at motivating the operators to check the problems and bring about immediate solutions if possible. A stage "two" observation checklist is then proposed to guide the discussions during a meeting of the protagonists' workers and management. The assistance of an occupational health practitioner might become indispensable at stage "three" to deepen the analysis of the remaining problems, while experts are requested only in exceptional cases, stage "four" expertise.

## **2.8 Workplace health promotion**

According to the definition of the (WHO, 2003), health promotion includes all measures that enable individuals, groups or organizations to have increased control over the determinants of health. The objective of all measures is the improvements of the health of individuals, groups, organizations and communities.

Health promotion can be described as a process that enables people to reach a higher level of self-determination about their health and to strengthen it. In this sense, health represents a resource for daily life that enables a person or a group to fulfill their expectations and has a highly positive influence on behavioral attitudes (OSHA, 2007).

Workplace health promotion (WHP) is the combined efforts of employers, employees and society to improve the health and well-being of people at work. According to Luxembourg Declaration on WHP in European Union (OSHA, 2007), this can be achieved through a combination of:

- Improving work organization and the working environment
- Promoting active participation in the process of WHP.
- Encouraging personal development.

Health promotion at work benefits not only workers, but also the employer, with potential reductions in sickness-related costs and improved productivity. This also creates a societal benefit (OSHA, 2007).

Effective WHP occurs when:

- Action is taken based on an analysis of the health requirements and needs of an enterprise.

- All stakeholders in an enterprise are involved.
- WHP actions seek to improve the quality of working life and conditions as well.

As focusing on the behavior of the individual worker, workplace health actions are integrated into management practices and the daily routine of an enterprise (OSHA, 2007).

In industrialized countries, upper limb work related musculoskeletal diseases (UL-WRMSDs) are the most common form of occupational diseases. They are generating a growing population of workers with reduced working capacity. The link between these pathologies and different aspects of work organization has been convincingly proven. Experiences in Europe supporting the combination of traditional work design methods used in manufacturing companies with ergonomics methods are reported briefly, with special focus on the use of the occupational repetitive action method for risk assessment and management of manual repetitive tasks. The combined approach strives to achieve the goal of maintaining a satisfactory level of productivity while respecting ergonomics criteria and, definitely, workers' health. Ergonomics standards provide for interaction between job and machinery designers and ergonomists in the design of work processes and workplaces. These standards generally refer only to the healthy adult working population and do not always provide criteria for protecting particular working populations, such as that represented by workers affected by UL-WRMSDs. The results of preliminary studies concerning productive re-employment of workers with UL-WRMSDs allow the introduction of some criteria for implementing current ergonomics standards in this connection (Colombini & Occhipinti, 2006).

## 2.9 Cost of MSP

Consistent epidemiologic reports indicate that musculoskeletal pain is a major medical and economic problem. Pain and the associated disability is linked with a significant loss of productivity and substantial healthcare expenditures for women (Rollman & Lautenbacher, 2001). With regard to the loss of productivity, Leijon, *et al.*, (1998) observed that approximately 30% of all sick-leave days in Sweden were a result of neck/shoulder and low back pain and that absence because of sickness, and, in particular, musculoskeletal pain, is appreciably higher for women than for men. With regard to healthcare expenditures, Rekola, *et al.*, (1993) found that nearly 40% of women in the 55-64-year-old age group seek medical attention for musculoskeletal problems, particularly neck and shoulder problems. Pain in the neck and upper limb is common and contributes considerably to absence from work due to sickness.

A study was conducted in Iran on "Ergonomic workstation evaluation in clinical laboratories and its relationship to musculoskeletal problems and productivity" by Alireza, *et al.*, (2002). The results showed a significant negative correlation between the number of musculoskeletal complaints and the workstation evaluation score. There were 3247 lost working days during the past year of the study caused by musculoskeletal problems, equal to 12% of all human resources of the 10 labs.

Torril, *et al.*, (2004) found that, exercise interventions to prevent low back pain (LBP) among employees and interventions to treat employees with LBP have documented an effect on sick leave, costs and new episodes of LBP. Multidisciplinary interventions have documented an effect on the level of pain. The results show that there is good reason to be careful when considering interventions aiming to prevent LBP among employees. Of all

the workplace interventions only exercise and the comprehensive multidisciplinary and treatment interventions have a documented effect on LBP.

## **2.10 Workers knowledge about ergonomics**

Correctly applied, an ergonomics approach can reduce the likelihood of work-induced disorders and can assist in accommodating individuals who have work-related disorders, but it cannot eliminate disorders that have been mistakenly attributed to work by social processes (Pearce, 2006).

Regarding knowledge about safety and occupational services; a study in GS found that 77.2% of the participants know about them, while 93.1% of them know the work hazards and 50.3% have no enough knowledge (Jouda, 2006).

In Iran it was stated that 16.3% of the laboratory hospital workers in a high level of knowledge about ergonomics while 83.7% of them in a low level. Regarding musculoskeletal complain result, was the worse working conditions, the more lost working days and musculoskeletal complains (Alireza, 2002).

# **Chapter Three**

## **Methodology**

## **Chapter Three**

### **Methodology**

This chapter addresses issues related to methodologies used to answer the research questions. The chapter commences with study design, study population, study setting, and period of the study, sample size, sampling and method of the study. It presents construction of the questionnaire, piloting, ethical consideration and procedures, (data collection and data analysis). Furthermore it illustrates the validity and reliability of the study instrument and eligibility criteria of the study.

#### **3.1 Study design**

The type of this study is descriptive, cross sectional. The cross-sectional design has been selected because it is useful for descriptive purpose and it measures the variables of the study (prevalence of musculoskeletal pain and determinants factors) among laboratory technicians.

Cross-sectional studies are generally carried out on a population at a point of time or over a short period (Coggon, *et al.*, 1993).

Cross-sectional studies are usually quick and cheap. Exposure and outcome are determined at the same point in time; it is difficult to say which comes first.

However, this type of study may give insight to the association between the cause and effect and it provides important point to the possible cause(s).

#### **3.2 Study population**

The population of this study consisted of all medical laboratory technicians who are currently working at governmental hospitals' laboratories in GS. The total number is 228,

"139 males and 89 females"(Laboratory administration records, 2009). The directors / managers of laboratories were excluded from the study because usually they are not performing routine lab investigations regularly and most of their job directed toward administrative work.

### **3.3 Study sample**

Due to relatively small number of target population, the researcher has considered the population as the study sample for this research which gives full representativeness and affords a higher confidence in the study results.

### **3.4 Setting of the study**

The study was carried out at all governmental hospitals' medical laboratories in GS, which were 11 hospitals.

### **3.5 Instrument of the study**

Self administered questionnaires were used for data collection from subjects. The researcher reviewed relevant literature then developed a questionnaire that was suitable to investigate the problem under study.

### **3.6 Period of the study**

The study started in June 2009 after obtaining the required administrative approvals from the different sectors of MOH. The pilot study was conducted in June 2009. Data collection started in 1<sup>st</sup> July 2009 till the 15<sup>th</sup> August 2009. Data entry and data cleaning was conducted in August 2009 and finally, data analysis and writing the report continued till November 2009.

### **3.7 Response rate**

The number of respondents was 179 (Response rate was 89%) subjects out of the total number of sample subjects which was 208 medical laboratory technicians [after excluding the pilot study (20) and pregnant women in third trimester (7)].

### **3.8 Questionnaire**

A structural self-administered questionnaire was administered to 201 medical laboratory technicians who are working currently in governmental hospitals.

The data was collected by the researcher himself to avoid bias as it was cheaper and more practical. Finally, the time of filling the questionnaire took approximately from 15-20 minutes.

#### **3.8.1. Questionnaire design**

- The questionnaire was designed in Arabic and English language. (A structural Self-Administered Questionnaire).
- The questionnaire was revised by both experienced people in English & Arabic language (annexes' 3 &4)
- The researcher tried to avoid unnecessary personal data, leading, complex or duplicated questions.
- In each questionnaire, an explanatory letter (annex 5) was attached to cover ethical consideration and to facilitate questionnaire filling.

The questionnaire consisted of seven parts designed to accomplish the aim of the research, as follows:

1. The first part contained socio-demographic information.
2. The second part contained questions regarding prevalence of MSP.

3. The third part contained questions regarding determinant factors/ causes of pain.
4. The fourth part contained questions regarding seeking medical advice.
5. The fifth part contained questions regarding work environment of hospital medical laboratory.
6. The sixth part contained questions reflecting knowledge regarding safety measures to avoid pain during work.
7. The seventh part contained questions regarding suggestions/ recommendation.

The first six parts were developed using closed - ended questions (yes / no), while the seventh part was ranking scale according to the priority from No. 1 to 10 (annex 6).

The first draft was amended after it has been discussed with colleagues, epidemiologists and the academic supervisors. Their advice was considered. Then, the final refinement and organization of the questionnaire was completed after pilot study.

- Explanation was given just to avoid mistakes in wording of the questions to the subjects during data collection, so that the subjects would clearly understand the questions.

### **3.9 Pilot study**

A pilot study was conducted before the start of actual data collection (pre-test of instrument); it was conducted to test validity and reliability of the questionnaire. The study was carried out on 20 participants, medical laboratory technicians (10 Males and 10 Females) who are currently working in governmental hospitals' laboratories. After the pilot study was completed, necessary modifications were applied to questionnaire. The piloted participants were excluded from the actual sample.

### **3.10 Data collection**

Data was collected by the researcher; all questionnaires were arranged, organized and numbered serially. Each questionnaire consisted of consent form in the first page and tells the participants to participate in the study with time allotted extended 15-20 minutes. 179 (89%) questionnaires were completed by subjects.

### **3.11 Data entry and analysis**

The researcher entered the data of 179 questionnaires using the Statistical Package for Social Sciences (SPSS version 12) with assistance of statistician and the steps was as follows:

- Over viewing the filled questionnaires.
- Coding of questionnaires.
- Designing data entry model.
- Defining variables.
- Coding variables.
- Data cleaning.
- Frequency table for the study variables.
- Cross tabulation of results.
- Conducting advanced statistical procedures like *t* test and Pearson correlation test.

### **3.12 Validity and Reliability**

**3.12.1 Validity:** Validity of an instrument is essential step before the actual data collection.

Validity is defined as "the extent to which an instrument measures what it is supposed to measure (Polit, 2004). The researcher used two methods to ensure validity (expertise validity and internal consistency).

**3.12.1.1 Expertise validity:** The researcher distributed the questionnaire to eight experts in the field for their comments regarding the contents of the questionnaire, then their comments were reviewed and modifications were applied accordingly.

**3.12.1.2 Internal consistency:** The researcher calculated the correlation coefficient (using SPSS program) between the score of each statement and the total score of the dimension it belongs to. The results are shown in table (3.1).

**Table 3.1: Correlation between each statement and the total score of its dimension**

	No.	R		No.	R		No.	R		No.	R
<b>Seeking medical advice</b>	1	0.962 **	<b>Work risk factors</b>	1	0.835 **	<b>Environmental characteristics</b>	1	0.707 **	<b>Knowledge of safety measures</b>	1	0.364 ≠
	2	0.934 **		2	0.975 **		2	0.613 **		2	0.656 **
	3	0.885 **		3	0.800 **		3	0.686 **		3	0.728 **
	4	0.896 **		4	0.818 **		4	0.843 **		4	0.534 *
	5	0.922 **		5	0.818 **		5	0.555 *		5	0.417 ≠
	6	0.914 **		6	0.940 **		6	0.312 ≠		6	0.596 **
	7	0.926 **		7	0.917 **		7	0.335 ≠		7	0.656 **
				8	0.942 **		8	0.074 ≠		8	0.534 *
				9	0.854 **		9	0.885 **		9	0.318 ≠
				10	0.983 **		10	0.680 **		10	0.477 *
				11	0.796 **		11	0.344 ≠			
				12	0.892 **						
				13	0.835 **						
				14	0.829 **						
				15	0.957 **						
				16	0.893 **						
				17	0.801 **						
				18	0.863 **						
				19	0.775 **						

\*\* Sig. at 0.01

\* Sig. at 0.05

≠ Not significant

In seeking medical advice dimension and work risk factors dimension, all the questions were significantly correlated. But in environmental characteristics, three questions did not have significant correlation so they were omitted from the questionnaire (Q. 6, 8 and 11). Also in knowledge regarding safety measures dimension, three questions did not have significant correlation, so they were omitted from the questionnaire (Q. 1, 5, and 10).

**3.12.2 Reliability:** Reliability is concerned with how consistently the measurement technique measures the concept of interest, a measure is considered reliable if it gives the same results each time the situation is measured (Burns & Grove, 1997 and Polit, 2004). To ensure reliability, the researcher used two methods "Split half and Cronbache alpha).

**Split half:** The researcher calculated the correlation coefficient between the total scores of odd statements and the total scores of even statement, the correlation value was ( $R = 0.975$ ) which is significant at 0.01, then the researcher used unequal length Spearman-Brown equation, the correlation value was ( $R = 0.975$ ) which is acceptable.

**3.12.2.2 Cronbache alpha:** The researcher used Cronbache alpha test to find the reliability for each dimension and the total score of the scale. The results are shown in the table (3.2).

**Table 3.2: Cronbache alpha coefficient**

<b>Dimension</b>	<b>Cronbache alpha</b>
<b>Seeking medical advice</b>	0.619
<b>Work related risk factors</b>	0.976
<b>Environmental characteristics</b>	- 0.284
<b>Knowledge regarding safety measures</b>	0.181
<b>Total score</b>	0.707

The researcher estimated the reliability of the instrument of this study by using the equation of Cronbache alpha (No. of items = 40); where the value of alpha = (0.707), which means that this instrument has high reliability.

The normal range of Cronbach alpha value between (0.00- and +1.0) And the interclass correlation coefficient was 0.000 (strongly significant).

### **3.13 Limitation of study**

1. Lack of local studies and resources.
2. The trust on self-reported data with all self-reported data, there is a possibility that individuals with symptoms tend to misjudge their exposure or exaggerate their symptoms.
3. Frequent electricity cuts affected the ability to accomplish the work in a timely manner.
4. The political situation, especially the current internal conflict between the Palestinian political parties may affect the study findings. Some old employed technicians were not presenting themselves to their hospital laboratories due to political reasons and presence of newly employed staff.

### **3.14 Statistical analysis**

- Statistical Package for Social Sciences (SPSS version 12) was used for data entry and analysis.
- A data entry model was used to complete data entry then, data analysis was carried out.
- The researcher used frequency calculations, percentage, t- test, and Chi square to find out the study results. The results were accepted as statistically significant when the P- Value will be  $\leq (0.05)$ .

### **3.15 Ethical considerations**

An official letter of approval to conduct the study was obtained from the Helsinki Committee in GS (annex 9), Director-General of human resource development (annex 10).

Also an official letter has been obtained from MOH Director General of hospitals to conduct the study at MOH hospital laboratories (annex 11).

Every participant had been provided with a full explanatory form attached to questionnaire both verbally and written. This form was included the purpose of the study, assurance about the confidentiality of the information and the instructions regarding dealing with questionnaire. Also, it included a statement indicated that the participant have the right to refuse to participate in this study "participation is voluntary". The participation was optional, anonymity and confidentiality was given and maintained.

Consent form was obtained from each participant and it was attached to each questionnaire to ensure their voluntary participation after signing the consent (annex 5).

### **3.16 Eligibility Criteria**

#### **3.16.1. Inclusion Criteria:**

Medical laboratory technicians were included in the study who met the following criteria:

- Currently working (male and female), full time employment in a governmental hospital laboratory in GS.

#### **3.16.2. Exclusion criteria:**

Medical laboratory technicians were excluded if they are:

- Working in another field different from hospitals medical laboratories.
- Pregnant medical laboratory technicians in the third trimester (7 were pregnant).
- Any one who have a history of congenital deformity in the back, neck and upper extremities (no one had congenital deformity).
- Directors or managers of medical laboratories (11 directors).

## **Chapter Four**

### **Results and Discussion**

## **Chapter Four**

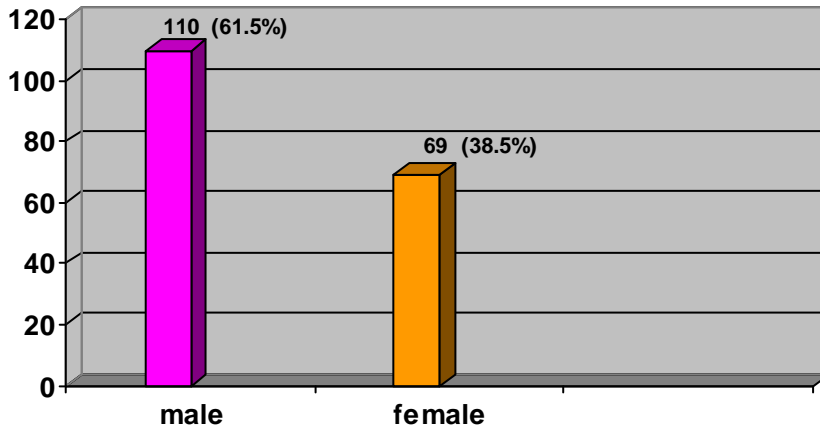
### **Results and Discussion**

#### **4.1 Introduction**

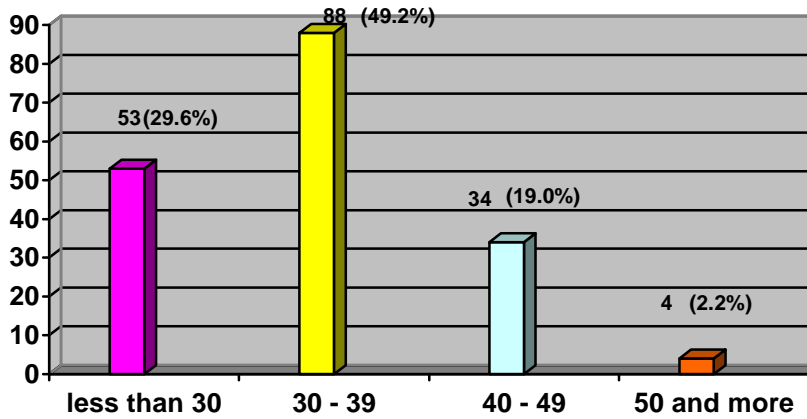
This chapter presents the findings of statistical analysis of data. Descriptive analysis of demographic characteristics of participants is illustrated and discussed in connection with previous studies. In addition results of different variables and dimensions were identified, moreover, the differences between selected variables and correlations were explored using proper analytical statistical tests. The results are illustrated below.

#### **4.2 Demographic characteristics**

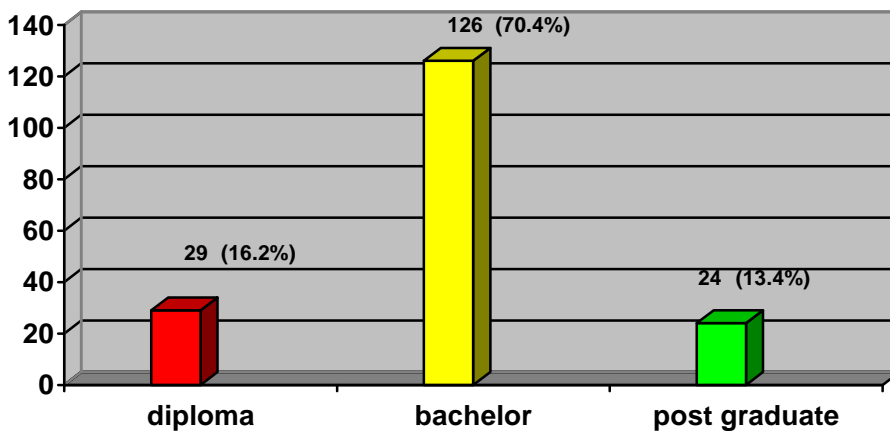
The study population consisted of 179 medical laboratory technicians, 110 (61.5%) were male and 69 (38.5%) were female (figure 4.1), their age ranged between 23 - 58 years, mean age was 33.78 and standard deviation 7.11. The highest age group was between 30 – 39 years and represented 49.2%, second age group was less than 30 years and represented 29.6%, third age group was between 40 – 49 years and represented 19.0% and the fourth age group was 50 years and more and represented 2.2% (figure 4.2). Participants included all medical laboratory technicians currently working in governmental hospitals in GS "11 hospitals" (table 4.1), from three different educational levels namely, diploma 16.2%, bachelor 70.4% and post graduate certificate 13.4% (figure 4.3).



**Figure 4.1: Distribution of participants by gender**



**Figure 4.2: Distribution of participants by age**



**Figure 4.3: Distribution of participants by educational level**

The total target population composed of 228 laboratory technicians, actual respondents were 179 (pilot study participants were excluded from the actual study) as illustrated in table 4.1. (Laboratory administration records, 2009).

**Table 4.1: Distribution of study population according to place of work**

Hospital name	Target population	Respondents	Response rate
Bet Hanoon	9	9	100.0%
Kamal Odwan	18	15	83.3%
A. Al-rantesey	13	13	100.0%
Al-Nassr	15	9	60.0%
Al-Shifa	54	42	77.7%
Al-Dora	12	11	91.6%
Shuhada Al-Aqsa	18	11	61.1%
Nasser Khanyounis	29	21	72.4%
EGH	31	27	87.0%
Al-Najar - Rafah	19	12	63.1%
Al-Emarati – Tal Sultan	10	9	90.0%
<b>Total</b>	<b>228</b>	<b>179</b>	

### 4.3 Job characteristics

Table 4.2 demonstrates participants' job characteristics, including years of employment, overtime work, additional job and number of working hours in the additional job.

**Table 4.2: Distribution of participants by job characteristics (N = 179)**

<b>Variable</b>	<b>Category</b>	<b>Freq.</b>	<b>%</b>
<b>Employment years</b>	5 years and less	91	50.8
	6 - 10 years	45	25.1
	11 years and more	43	24.0
	<b>Total</b>	<b>179</b>	<b>100.0</b>
<b>Overtime / week</b>	Zero	131	73.2
	1 – 10 hours	36	20.1
	More than 10 hours	12	6.7
	<b>Total</b>	<b>179</b>	<b>100.0</b>
<b>Additional working after formal job</b>	Yes	60	33.5
	No	119	66.5
	<b>Total</b>	<b>179</b>	<b>100.0</b>
<b>Working hours / day in additional job</b>	Less than 5 hours	22	36.7
	5 hours and more	38	63.3
	<b>Total</b>	<b>60</b>	<b>100.0</b>

The results revealed that, half of participants 91 (50.8%) have been employed for 5 years and less, 45 (25.1%) employed for 6 – 10 years and 43 (24.0%) were employed for 11 years and more. The majority of participants 131 (73.2%) do not work overtime and 119 (66.5%) do not have additional job. Among those who work in additional job, 36.7% work less than 5 hours / day and 63.3% work 5 hours and more.

#### 4.4 Health status history of participants

**Table 4.3: Health status history of participants**

Health problem	Onset of occurrence					
	Before getting this job		After getting this job		No problem	
	Freq.	%	Freq.	%	Freq.	%
<b>Arthritis / Rheumatoid</b>	3	1.7	21	11.7	155	86.6
<b>Carpal tunnel Syndrome</b>	1	0.6	6	3.4	172	96.1
<b>Tendonitis</b>	2	1.1	14	7.8	163	91.1

Table 4.3 shows that, 1.7% of participants had arthritis / rheumatoid before starting work in laboratory and it increased to 11.7% after getting work in laboratory. 0.6% had carpal tunnel syndrome before getting this job and rose to 3.4% after getting this work. 1.1% had tendonitis before getting this job and elevated to 7.8% after getting this work. These results revealed an increase in MSDs after getting work in laboratory and could support the assumption of work related MSDs. Also aging process should be considered.

#### 4.5 Musculoskeletal pain

##### 4.5.1. Distribution of MSP according to gender:

To explore the presence of MSP, the researcher used frequency calculations and percentage to find out the prevalence of MSP among participants. The results are clarified below.

**Table 4.4: Distribution of MSP in regard to gender (N = 179)**

Gender	Yes		No		Total	
	Freq.	%	Freq.	%	Freq.	%
<b>Male</b>	71	64.5	39	35.5	<b>110</b>	<b>100.0</b>
<b>Female</b>	52	75.4	17	24.6	<b>69</b>	<b>100.0</b>
<b>Total</b>	<b>123</b>	<b>68.7</b>	<b>56</b>	<b>31.3</b>	<b>179</b>	<b>100.0</b>

N = total number of participants

Table 4.4 shows that, 123 (68.7%) of total participants are complaining of MSP. When looking to each gender, the results show that males accounted for 71 (64.5%) and females accounted for 52 (75.4%). This result is higher than the results of Maumet, *et al.*, (2005) where their results showed that the prevalence of reported MSDs were between 20.6% and 52.0% depending on the anatomical location, also, this result is higher than the results of Jouda (2006) which reported that 45.9% of participants complained of myalgia and arthralgia. In contrast, the study result was lower than the results of Salik and Özcan, (2004) where 85% of the Turkish physiotherapists reported that they had suffered from work-related MSP or discomfort at some time in their occupational lives. These differences could be related to differences in tasks performed during work as physiotherapists often need to use their muscles and strength in moving, lifting and supporting their clients, which adds extra strain on their musculoskeletal system and may lead to MSP.

When looking to each gender alone, the results show that 64.5% of male participants complain of MSP and 75.4% of female participants complain of MSP, which means that according to the proportion of each gender, the prevalence of MSP is higher among female participants. This result agreed with the results of Wijnhoven, *et al.*, (2006) which showed that 45% of women and 39% of men complain of MSP. Also, the study result is consistent

with the results of Jouda (2006) which showed that female workers were complaining of MSP three times more than male. The findings of Rollman and Lautenbacher, (2001) suggest that musculoskeletal pain reports are markedly more common among women than among men.

These results could be attributed to the differences in body anatomical built-up and physiological functions, which make women to be more prone to weakness and fatigue more than men.

#### 4.5.2. Differences in severity of pain regarding gender:

To find out the differences in severity of pain regarding gender, the researcher used independent sample *t* test to examine the differences in mean scores between male and female technicians. The results are illustrated below.

**Table 4.5: Differences in severity of pain between males and females (N = 123)**

Pain character	Gender	N	Mean	S. dev.	<i>t</i> value	<i>P</i> . value
Severity of pain	male	71	4.605	1.952	0.138	0.890 ≠
	female	52	4.557	1.819		

≠ not significant      N = number

Table 4.5 shows that, there was no statistically significant differences at 0.05 level in severity of pain between mean score for male ( $m = 4.605$ ) and mean score for female ( $m = 4.557$ ),  $t$  value = 0.138, and  $P$  value = 0.890 which is not significant. This result indicates that both male and female laboratory technicians are equal in severity of pain which could be attributed to being exposed to the same work environment, same tasks and conditions.

### 4.5.3. Site of MSP:

**Table 4.6: Distribution of MSP according to site (N = 123)**

Site of MSP	Freq.	%	Site of MSP	Freq.	%
1	7	5.7	2 + 5	4	3.2
2	5	4.0	4 + 5	10	8.1
3	1	0.8	1 + 2 + 4	3	2.4
4	18	14.6	1 + 2 + 5	7	5.7
5	26	21.1	1 + 3 + 5	1	0.8
1 + 2	10	8.1	1 + 4 + 5	5	4.0
1 + 3	1	0.8	2 + 3 + 5	1	0.8
1 + 4	3	2.4	2 + 4 + 5	2	1.6
1 + 5	5	4.0	3 + 4 + 5	2	1.6
2 + 3	2	1.6	1 + 2 + 4 + 5	2	1.6
2 + 4	4	3.2	1 + 2 + 3 + 4 + 5	4	3.2
<b>Total frequency = 123</b>			<b>Total % = 100.0</b>		

1 = Neck 2 = Shoulders 3 = Upper extremities 4 = Lower extremities 5 = Back

From table 4.6 the results show that, back alone was the dominant site of MSP among participants, as it constitutes 21.1% among those who complain of MSP, 14.6% complain of pain at lower extremities, 5.7% neck pain, 4.0% shoulders and 0.8% complain of pain at upper extremities. This result is consistent with the results of Morken, *et al.*, (2007) which showed that back disorders account for 20% of all WRMSDs, also the study results agreed with the results of Salik and Özcan, (2004) which showed that the lower back was the body part with the highest frequency of occupational injury 26%. Some studies revealed a higher

prevalence of work-related back pain, the results of Rugelj, (2003) showed that back pain affects 73.7% of physiotherapists and Nyland results (2003) showed that back pain was 69% among study participants also the study of Smith, (2004) showed that low back pain was the highest 56.7% followed by neck 42.8% and shoulders 38.9%.

The above studies showed that back was the dominant site for MSP, this could be attributed to anatomical reasons as spine is located in the back. The spine is a complex interconnecting network of nerves, joints, muscles, tendons and ligaments, and all are capable of producing pain (Patel and Ogle, 2007).

#### 4.5.4. Type of MSP:

**Table 4.7: Distribution of MSP according to type**

Type of MSP	Freq.	%	Type of MSP	Freq.	%
1	2	1.6	2 + 4	7	5.7
2	8	6.5	3 + 4	2	1.6
3	7	5.7	3 + 5	1	0.8
4	75	61.0	4 + 5	2	1.6
5	8	6.5	1 + 2 + 4	4	3.2
1 + 2	2	1.6	1 + 3 + 4	1	0.8
1 + 4	1	0.8	2 + 4 + 5	1	0.8
2 + 3	1	0.8	1 + 2 + 3 + 4	1	0.8
<b>Total frequency = 123</b>			<b>Total % = 100.0</b>		

1 = Numbness 2 = Tingling 3 = Burning 4 = Spasm 5 = Tenderness

Table 4.7 revealed that, 61.0% of participants complain of spasm, 6.5% complain of tingling sensation, 6.5% complain of tenderness, 5.7% complain of burning sensation and 1.6% complains of numbness sensation.

5.7% of participants complain of tingling sensation and spasm, while 3.2% complain of numbness, tingling sensation and spasm. 0.8% of participants complain of combination of 4 types of pain (numbness, tingling, burning and spasm).

These results have some variability when compared to the results of El Keshawi (2008) which showed that 69.6% of participants described pain as spasm, 3.9% was tingling, 13.7% was numbness and 4.9% was burning. The study results of Masoud (2008) described pain as numbness among 9.2% of physiotherapy professionals, burning among 11.5%, electric sensation among 12.3% and throbbing pain among 36.2%.

#### 4.5.5. MSP and age:

**Table 4.8: Age and MSP (N= 179)**

Age group	Complain of MSP				Total	
	Yes		No			
	Freq.	%	Freq.	%	Freq.	%
<b>Less than 30</b>	36	67.9	17	32.1	53	100.0
<b>30 – 39 years</b>	62	69.7	27	30.3	89	100.0
<b>40 – 49 years</b>	22	66.7	11	33.3	33	100.0
<b>50 years and more</b>	3	75.0	1	25.0	4	100
<b>Chi square = 0.191</b>				<b>P value = 0.979</b>		

N= Total number of participants.

Table 4.8 show that, the highest complain of MSP was among the age group (50 years and more) and it was 75.0% within the group, followed by age group (30 – 39 years) was

69.7%, age group (less than 30 years) was 67.9% and age group (40 – 49 years) was 66.7%. This result is consistent with the study of Saastamoinen, *et al.*, (2005) which showed that chronic and disabling chronic pain were more common in older age groups among both genders. The study of Leveille, (2004) showed that over half the older adults in the United States report chronic joint symptoms and the number of elders with arthritis is expected to double in the next 25 years.

Even though the oldest age group represented the highest complain of MSP, but the above results showed that there was no significant relationship between age and MSP, as Chi square value = 0.191 and *P* value = 0.979 which is not significant. This result could be attributed to the fact that the participants in this study were relatively young as 78.8% of them were below 39 years old and the effects of aging process did not appear yet.

#### 4.5.6. MSP and employment years:

**Table 4.9: MSP and years of employment (N = 179)**

Employment years	Complain of MSP				Total	
	Yes		No			
	Freq.	%	Freq.	%	Freq.	%
<b>5 years and less</b>	58	63.7	33	36.3	91	100.0
<b>6 – 10 years</b>	32	71.1	13	28.9	45	100.0
<b>11 years and more</b>	33	76.7	10	23.3	43	100.0
<b>Chi square = 2.459</b>				<b>P value = 0.292</b>		

N= Total number of participants in each group.

Table 4.9 show that, the highest complain of MSP 76.7% was within the group who have been employed for 11 years and more, 71.1% was within the employment group 6 – 10

years and the lowest complain of MSP 63.7% was within the group who have been employed for 5 years and less. These results indicate that as the years of employment increase, the chance for developing MSP increase. This result agreed with the results of Masoud (2008), which showed that 52.7% of the study sample who complained of LBP have been employed for (7 years and above), 33.8% had (4-6 years) and 13.5% had (1- 3 years). These results support the assumption that long term exposure to risk factors at work place increases the chance for developing MSDs among workers. But the above results showed that there was no significant relationship between years of work and MSP, as Chi square value = 2.459 and *P* value = 0.292 which is not significant

#### **4.5.7 Characteristics of MSP**

Table 4.10 represents the characteristics of MSP; including its nature, side of the body where pain occurs and onset of pain.

**Table 4.10: Characteristics of MSP and gender (N = 123)**

Variable	Category	Gender				Total	
		Male		Female			
		Freq.	%	Freq.	%	Freq.	%
Nature of pain	Continuous	8	6.5	3	2.4	11	8.9
	Intermittent	63	51.2	49	39.8	112	91.1
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
Side of pain	Right	43	35.0	33	26.8	76	61.8
	Left	17	13.8	13	10.6	30	24.4
	Both	11	8.9	6	4.9	17	13.8
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
Onset of pain	Sudden	18	14.6	3	2.4	21	17.1
	Gradual	53	43.1	49	39.8	102	82.9
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
<b>Chi square = 3.169</b>				<b>P value = 0.530</b>			

Table 4.10 show that, the majority of participants 112 (91.1%) complain of intermittent MSP and 11 (8.9%) complain of continuous MSP, 76 (61.8%) complain of pain at the right side of their body and 30 (24.4%) complain of pain at left side of the body, 102 (82.9%) described pain as of gradual onset and 21 (17.1%) described pain as of sudden onset. Chi square was 3.169 and *P* value was 0.530 which is not statistically significant.

This result is slightly higher than El Keshawi (2008) which showed that 88.2% of participants complained of intermittent pain and 11.8% continuous pain, 13.7% their pain was in the right side and 17.6% was in the left side, 63.7% reported that pain starts gradually and 36.3% reported that pain starts suddenly. The study of Masoud (2008)

showed that 82.4% reported that pain started gradually and 17.6% their pain started suddenly.

These results revealed a range of variability in MSP characteristics. This variability could be related to differences in tolerance and adaptation between different people. The NIOSH (2001) reported that MSDs represent a wide range of disorders, which can differ in severity from mild periodic symptoms to severe chronic and debilitating conditions.

#### **4.5.8. Duration of MSP:**

Table 4.11 clarifies duration of MSP, its time of occurrence and if pain occurred in the preceding days.

**Table 4.11: Duration of MSP (N = 123)**

Variable	Category	Gender				Total	
		Male		Female			
		Freq.	%	Freq.	%	Freq.	%
<b>Duration of pain</b>	Hours	31	52.2	25	20.3	56	45.5
	One day	7	5.7	8	6.5	15	12.2
	Two days and more	33	26.8	19	15.4	52	42.3
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
<b>Time of occurrence</b>	Before working in hosp. lab.	13	10.6	7	5.7	20	16.3
	After working in hosp. lab.	58	47.2	45	36.6	103	83.7
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
<b>Pain occurred in the preceding 7 days</b>	Yes	37	30.1	26	21.1	63	51.2
	No	34	27.6	26	21.1	60	48.8
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
<b>Pain occurred within last 3 months</b>	Yes	14	11.4	14	11.4	28	22.8
	No	57	46.3	38	30.9	95	77.2
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>
<b>Pain appeared for more than 6 months</b>	Yes	9	7.3	17	13.8	26	21.1
	No	62	50.4	35	28.5	97	78.9
	<b>Total</b>	<b>71</b>	<b>57.7</b>	<b>52</b>	<b>42.3</b>	<b>123</b>	<b>100.0</b>

Table 4.11 show that, 56 (45.5%) of those who complain of MSP reported that pain occurs for hours and 52 (42.3%) pain continued for two days and more, 20 (16.3%) reported that MSP occurred before getting work in laboratory and 103 (83.7%) reported that MSP

occurred after getting work in laboratory, 63 (51.2%) reported that MSP occurred in the preceding 7 days, 28 (22.8%) had pain in the last three months and 26 (21.1%) reported that they have pain for more than 6 months. The study results of Masoud (2008) revealed a higher result as 56.2% of participants suffered from LBP within last 3 months, 56.9% suffered from LBP more than 6 months but the results were lower in the time of pain occurrence where 4.6% reported that they used to suffer from LBP before working in physiotherapy field.

#### 4.5.9. Sick leave due to MSP:

Figure (4.4) presents frequency of participants who got sick leave.

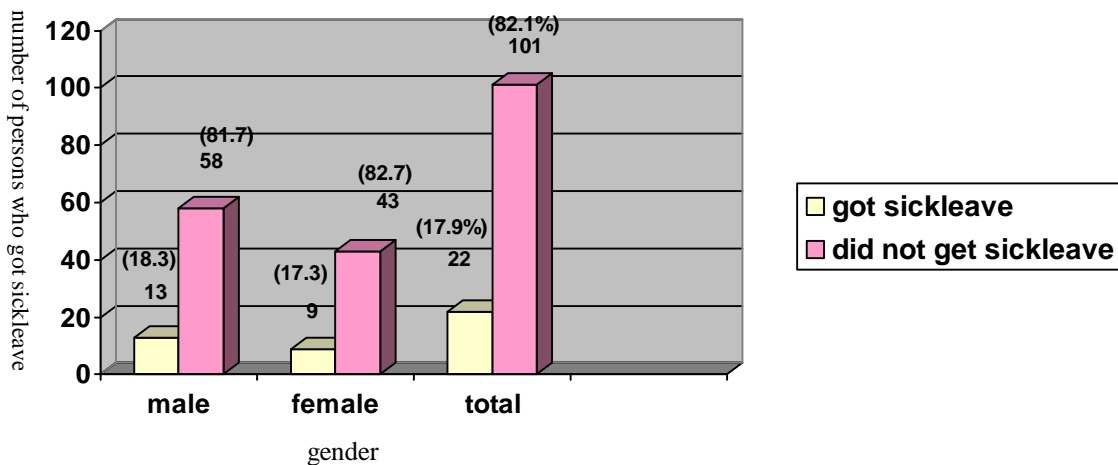
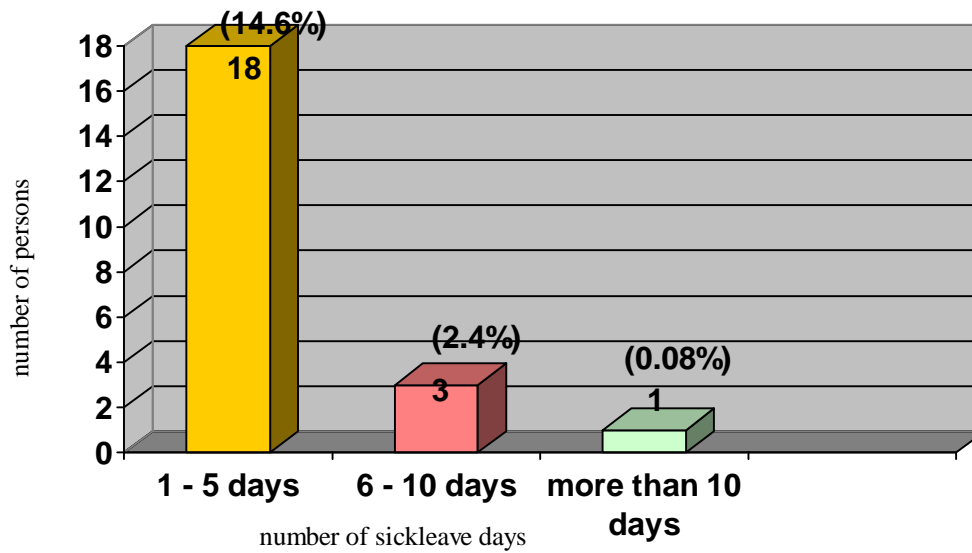


Figure 4.4 show that 22 (17.9%) of participants got sick leave due to MSP, while 101 (82.1%) did not get sick leave. This result indicates that pain was tolerable for most of participants so, they did not need to take sick leave, when looking back to table (4.9), it showed that pain was severe for 14.6% of participants only and the rest had mild to moderate pain.



**Figure 4.5: Number of sick leave days due to MSP**

From figure 4.5, the results show that among those who complain of MSP 14.6% got sick leave between (1 – 5) days, 2.4% get between (6 – 10) days, 0.8% get more than 10 days and the total number of participants who got sick leave accounted for 17.8%. The study results are higher than the results of Lund and Labriola (2004) which showed that 6.9% of participants developed long term sickness absence due to MSP, of them, 55.7% were women and 44.3% were men. On the other hand, the results of this study were lower than the results Masoud (2008) which showed that 30.8 % of participants had sick leave due to LBP.

#### **4.6 Seeking medical advice or treatment**

Table 4.12 explores whether the participants seek medical advice or treatment for their MSP and the type of prescribed advice or treatment.

**Table 4.12: Seeking medical advice / treatment (N = 97)**

Type of medical advice	Freq.	%
Received any advice	97	100.0
Included drugs	75	77.32
Included surgery	6	6.18
Included physiotherapy	54	55.67
Included rest	95	97.93
Included support devices	17	17.52
Advice relieved pain	74	76.28

Table 4.12 shows that 97 participants seek medical advice. Prescribed advice included; drugs for 75 (77.32%), surgery for 6 (6.18%), physiotherapy for 54 (55.67%), rest for 95 (97.93%) and support devices for 17 (17.52%). The prescribed advice relieved pain for 74 (76.28%) of them. The results of this study are higher than the results of Salik and Özcan (2004) which showed that 69% of the respondents with WRMSDs had visited a physician for their problem; they used their own occupational knowledge, rest, medications, and exercise to treat the problem.

These results indicate that MSP was uncomfortable among the majority of participants so they consulted their physician for a relief. It seems that discomfort from MSP was not severe as very few participants needed surgery for their problem, but most of participants had their pain relieved by medication, physiotherapy and rest.

#### 4.7 Determinants / risk factors of MSP

Table 4.13 presents the determinants / risk factors at work place that may lead to MSP. The risk factors included 19 items that covers most aspects of work place (subjects considered the following items as risk factors).

**Table 4.13: Determinants / risk factors at work place as perceived by participants**

	<b>Risk factor</b>	<b>Freq.</b>	<b>%</b>
<b>1</b>	<b>High concentration / attention</b>	110	89.4
<b>2</b>	<b>Work overload</b>	105	85.3
<b>3</b>	<b>Unsuitable posture</b>	104	84.5
<b>4</b>	<b>Repetition of same movements</b>	103	83.7
<b>5</b>	<b>Psychological pressure</b>	102	82.9
<b>6</b>	<b>Bending &amp; twisting</b>	90	73.2
<b>7</b>	<b>Uncomfortable chairs</b>	85	69.1
<b>8</b>	<b>Noise &amp; crowd</b>	74	60.2
<b>9</b>	<b>Prolonged time sitting</b>	73	59.3
<b>10</b>	<b>Task invariability</b>	64	52.0
<b>11</b>	<b>Sudden movements</b>	63	51.2
<b>12</b>	<b>Limited space</b>	62	50.4
<b>13</b>	<b>Poor working environment</b>	58	47.1
<b>14</b>	<b>Prolonged time standing</b>	65	45.5
<b>15</b>	<b>Lack of autonomy</b>	53	43.1
<b>16</b>	<b>Wearing high heel shoes</b>	42	34.1
<b>17</b>	<b>Lack of support from director</b>	42	34.1
<b>18</b>	<b>Lack of support from colleagues</b>	34	27.6
<b>19</b>	<b>Computer work</b>	32	26.0

Table 4.13 shows that, multiple factors are considered risk factors for development of MSP. The results revealed that high concentration and attention during task performance is the main risk factor (89.4%) followed by work overload (85.3%) and unsuitable posture during work (84.5%), while the least risk factor was computer work, including data entry and typing (26.0%) followed by lack of support from colleagues (27.6%) and directors (34.1%).

This result raise the question of suitability of laboratory design concerning the height of working tables / desks and appropriateness of chairs that maintain good body posture during work because working at medical laboratory with specific procedures needs high attention and concentration because mistakes in analyzing samples may lead to fatal consequences.

The study results are supported by some previous studies including; the study of Punnett & Wegman (2004), which indicated that different risk factors at work may cause MSDs including rapid work pace, repetitive motion, non-neutral body postures and vibration. The study of Windt, *et al.*, (2000) showed that potential risk factors included heavy work load, unsuitable postures, repetitive movements, vibration and duration of employment.

The study of Morken, *et al.*, (2007) examined risk factors at work, the results showed that the types of exposures most frequently reported as the cause of WRMSDs were high physical workload 38% and repetitive work 26%, walking on hard surfaces/climbing stairs or ladders was reported as the cause in 10% of the cases, primarily among workers with lower limb disorders, repetitive work was a frequently reported exposure in the catering category 43%.

Psychosocial factors may contribute to some signs of MSP among workers especially when working under pressure. Bongers *et al.*, (1993) in their extensive review on the role of

psychosocial factors in the development of musculoskeletal problems showed that the large majority of the studies reported an association between at least one work-related psychosocial factor and adverse upper extremity symptoms or signs. High-perceived job stress was consistently associated with all UEP. Although not often studied, non-work-related stress was also consistently associated with UEP. The study results of Salik and Özcan (2004) revealed that the respondents who had experienced a WRMSD indicated that lifting 18%, maintaining a position for prolonged period of time 17%, performing repetitive tasks 16% and transferring patients 16% were the activities that most often exacerbated their symptoms during clinical practice.

#### **4.8 Environmental Characteristics**

Table 4.14 explores environmental characteristics at work place. It includes eight items covering the main laboratory environment aspects. Participants described their work place environment as follows:

**Table 4.14: Environmental characteristics (N = 179)**

<b>Environment characteristics</b>	<b>Response</b>	<b>Freq.</b>	<b>%</b>
<b>Enough space for free movement</b>	Yes	100	55.9
	No	79	44.1
<b>Enough lighting in work place</b>	Yes	155	86.6
	No	24	13.4
<b>Good ventilation in work place</b>	Yes	100	55.9
	No	79	44.1
<b>Room temperature is hot</b>	Yes	66	36.9
	No	113	63.1
<b>Chairs have high back / support</b>	Yes	75	41.9
	No	104	58.1
<b>Too much furniture that restricts movement</b>	Yes	64	35.8
	No	115	64.2
<b>Work place is crowded</b>	Yes	102	57.0
	No	77	43.0
<b>Work place is noisy</b>	Yes	89	49.7
	No	90	50.3

Table 4.14 show that, 100 (55.9%) of participants reported that there was enough space for free movement at work place, 155 (86.6%) reported that there was enough lighting, 100 (55.9%) reported that there was good ventilation, 113 (63.1%) reported that the temperature at work place is not hot, 104 (58.1%) reported that there was good chairs with

high back and support, 115 (64.2%) reported that furniture is acceptable, 102 (57.0%) reported that work place is crowded and 89 (49.7%) reported that work place is noisy.

The results of this study compared to El Keshawi results (2008), revealed some variability. Concerning lighting and ventilation, 92.2% of the participants have enough lighting on their offices and 77.5% of the participants have good ventilation on their offices which is higher than the study results. Concerning chairs, only 12.7% sit on a high back chair which is lower than the results of this study.

The above results revealed that work environment needs modifications to be more comfortable for laboratory technicians to perform their tasks properly, those modifications should include removing unnecessary furniture to increase the spaces for free movements, affording comfortable chairs with back support, controlling the crowd and noise and improve ventilation at work place.

#### **4.9 Knowledge regarding safety measures**

Table 4.15 presents participants knowledge regarding MSP. It composed of seven items covering different aspects of information regarding safety measures to avoid MSP.

**Table 4.15: Knowledge regarding safety measures to avoid MSP (N = 179)**

<b>Knowledge items</b>	<b>Response</b>	<b>Freq.</b>	<b>%</b>
<b>Have enough information about proper sitting during work</b>	Yes	116	64.8
	No	63	35.2
<b>Repeated work with comfortable hand position reduce MSP</b>	Yes	129	72.1
	No	50	27.9
<b>Sitting in one place for long time do not affect MSP</b>	Yes	22	12.3
	No	157	87.7
<b>Stretching your body intermittently reduce MSP</b>	Yes	141	78.8
	No	38	21.2
<b>Wearing high heel shoes during work increase MSP</b>	Yes	149	83.2
	No	30	16.8
<b>Fluctuating room temp. will not affect MSP</b>	Yes	40	22.3
	No	139	77.7
<b>Noise and crowd at work place increase MSP</b>	Yes	128	71.5
	No	51	28.5

Table 4.15 show that, 118 (65.9%) of participants have enough knowledge about proper sitting during work, 130 (72.6%) know that repeated work with comfortable hand position reduce MSP, 157 (87.7%) know that sitting in one place for long time will affect MSP, 141 (78.8%) know that stretching the body intermittently reduce MSP, 149 (83.2%) know that wearing high heel shoes during work increase MSP, 139 (77.7%) know that fluctuating room temperature will affect MSP and 128 (71.5%) know that noise and crowd at work place increase MSP.

The above results indicate that the majority of laboratory technicians have enough knowledge regarding safety measures to avoid MSP, but we do not know if they apply these knowledge during laboratory work? looking back to previous result in this study, there was a total of 123(68.7%) of laboratory technicians complain of MSP. This result raises the query of the degree of applying these knowledge in the real work?

#### 4.10 Suggestions to reduce MSP

Table 4.16 identifies how participants ranked suggestions to reduce pain. The researcher used mean score to list these suggestions in order from number 1 – 10. Number one took the highest priority and number 10 the lowest priority.

**Table 4.16: Ranking suggestions to reduce MSP (1 – 10)**

<b>Rank</b>	<b>Suggestion</b>	<b>Mean score</b>
<b>1</b>	<b>Work or task rotation</b>	6.553
<b>2</b>	<b>Practice exercise during free time</b>	6.474
<b>3</b>	<b>Avoid sudden movements</b>	6.245
<b>4</b>	<b>Stop working when pain starts</b>	6.061
<b>5</b>	<b>Work exactly by weekly working hours</b>	5.659
<b>6</b>	<b>Change working position frequently</b>	5.575
<b>7</b>	<b>Need advice / training to maintain body safety</b>	5.419
<b>8</b>	<b>Wear comfortable shoes during work</b>	4.508
<b>9</b>	<b>Afford comfortable chairs for lab. technicians</b>	4.324
<b>10</b>	<b>Take rest time during work</b>	4.100

Table 4.16 show that, work or task rotation took the first priority in the list with mean score 6.553, practice some exercise to relax body muscles during free time was in the second place with mean score 6.474, avoid sudden movements took the third place with mean score 6.245, stop working when the pain starts took the fourth place with mean score 6.061, work exactly by weekly working hours took the fifth place with mean score 5.659, change working position frequently took the sixth place with mean score 5.575, need advice / training to maintain body safe during work took the seventh place with mean score 5.419, wear comfortable shoes during work was in the eighth place with mean score 4.508, afford comfortable / suitable chairs for laboratory technicians was in the ninth place with mean score 4.324 and take rest time during work was in the tenth place with mean score 4.100.

The study of Masoud (2008) reported some suggestions / recommendations regarding safety measures to decrease low back pain during work among physiotherapists, they ranked those suggestions as follows: (98.5%) suggested that control of patient numbers during daily work will reduce LBP, (98.5%) change working position frequently, (97.7%) wearing comfortable shoes during work and avoid heavy lifting, (96.2%) practice sports daily, (94.6%) take more rest breaks or pauses during the workday, (93.8%) help from other person if needed, (93.8%) praying movements, (89.2%) increase physical therapy professional numbers, (81.5%) need advice and education, (75.4%) wearing comfortable clothes during work, (75.4%) reducing working hours, (73.1%) stopping working when hurt or when symptoms occur and at the end (55.4%) recommended avoiding manual techniques.

From the above results, there was an agreement between Masoud results and this study results in 6 aspects of suggestions. They include practice exercise / sports, stop working when pain starts, change working position frequently, need advice / education, wear

comfortable shoes during work and take rest time during work. This match in suggestions among different professions implies its importance in alleviating MSP raises the need for their implementation and reveals the possibility of generalizing these suggestions to other health professions.

## **Chapter Five**

### **Conclusion and Recommendations**

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### **Conclusion and Recommendations**

#### **5.1 Conclusion**

This study aimed to identify determinants / risk factors that may cause MSP among laboratory technicians working at governmental hospitals' medical laboratories in Gaza governorates.

The study explored prevalence of MSP among laboratory technicians in relation to demographical characteristics including (gender, age, years of experience) and the characteristics of pain.

The target population consisted of 228 participants; response rate to questionnaire was 89%.

The overall prevalence of MSP among participants was 68.7%. MSP was among 64.5% of total male participants and 75.4% of total female participants.

The highest complain of MSP was among the age group (50 years and more) and it was 75.0% within the group and the lowest complain was among age group (40 – 49 years) and it was 66.7% within the group.

Back was the dominant site for MSP among participants who reported pain, it accounted for 21.1% followed by lower extremities 14.6%, neck 5.7%, shoulder 4.0% and upper extremities 0.8%.

Among those who complained of MSP, 61.0% described pain as spasm, 6.5% tingling, 6.5% tenderness, 5.7% burning and 1.6% described pain as numbness. 91.1% complained of intermittent pain, pain was of sudden onset among 17.1% of participants and of gradual

onset among 82.9%. Pain lasted for hours among 45.5% of participants, lasted one day among 12.2% and lasted for two days and more among 42.3% participants. 17.9% of those who reported pain got sick leave due to their complaints and the number of sick leave days ranged between 1 – 14 days.

The study revealed no significant differences between male and female technicians regarding severity of pain.

Among those who reported pain, 97 participants seek medical, advice included drugs among 77.32% of them, included surgery among 6.18%, physiotherapy 55.67%, rest 97.93% and included support devices among 17.52%. Prescribed advice relieved pain for 76.28% of participants.

Regarding risk factors at work place, 89.4% reported that high concentration and attention was the dominant risk factor followed by work overload and unsuitable posture during work, 26.0% reported that computer work was the lowest risk factor followed by lack of support from colleagues.

The study findings showed that environment at work place needs some modifications including comfortable chairs, decrease level of noise, crowd and removing unnecessary furniture to increase space for free movement. There were no significant differences in perception of environment between male and female technicians.

The results showed that the majority of participants have enough knowledge regarding safety measures to avoid MSP but this study did not focus on degree of application of safety measures during work.

On ranking suggestions to reduce MSP, the participants considered work task rotation as the highest followed by practice exercise during free time and avoid sudden movements; on the other hand, take rest time during work was the lowest suggestion.

The study results might help in improving work environment at medical laboratories to alleviate the occurrence of MSP and its consequences.

## **5.2 Recommendations**

In the light of study results, the researcher recommend the following:

- Afford instruction program for new employed technicians regarding safety measures during work.
- Application of work environment modifications to improve the quality of work place. Modifications should include furniture, control crowd and noise.
- Perform regular assessment of laboratory environment to examine suitability for work.
- Establish a tool scale to measure the degree of applying safety measures during work.
- Increase the number of laboratory technicians to meet the increasing number of patients visiting hospitals laboratories.
- Encourage further studies regarding health and safety during work.

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Accessed in March 26, 2009.

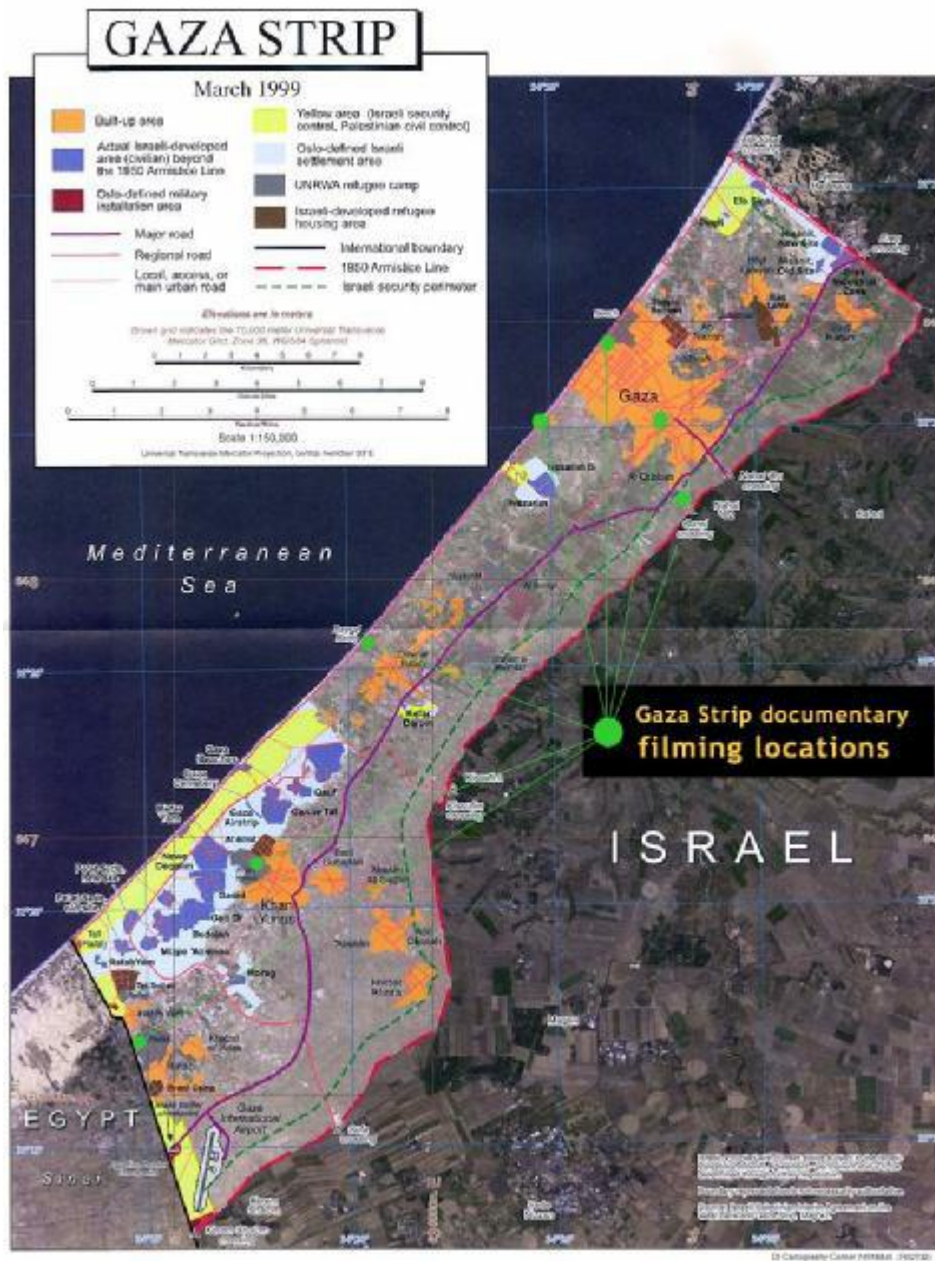
# **Annexes**

## Annex (1): Map of Palestine



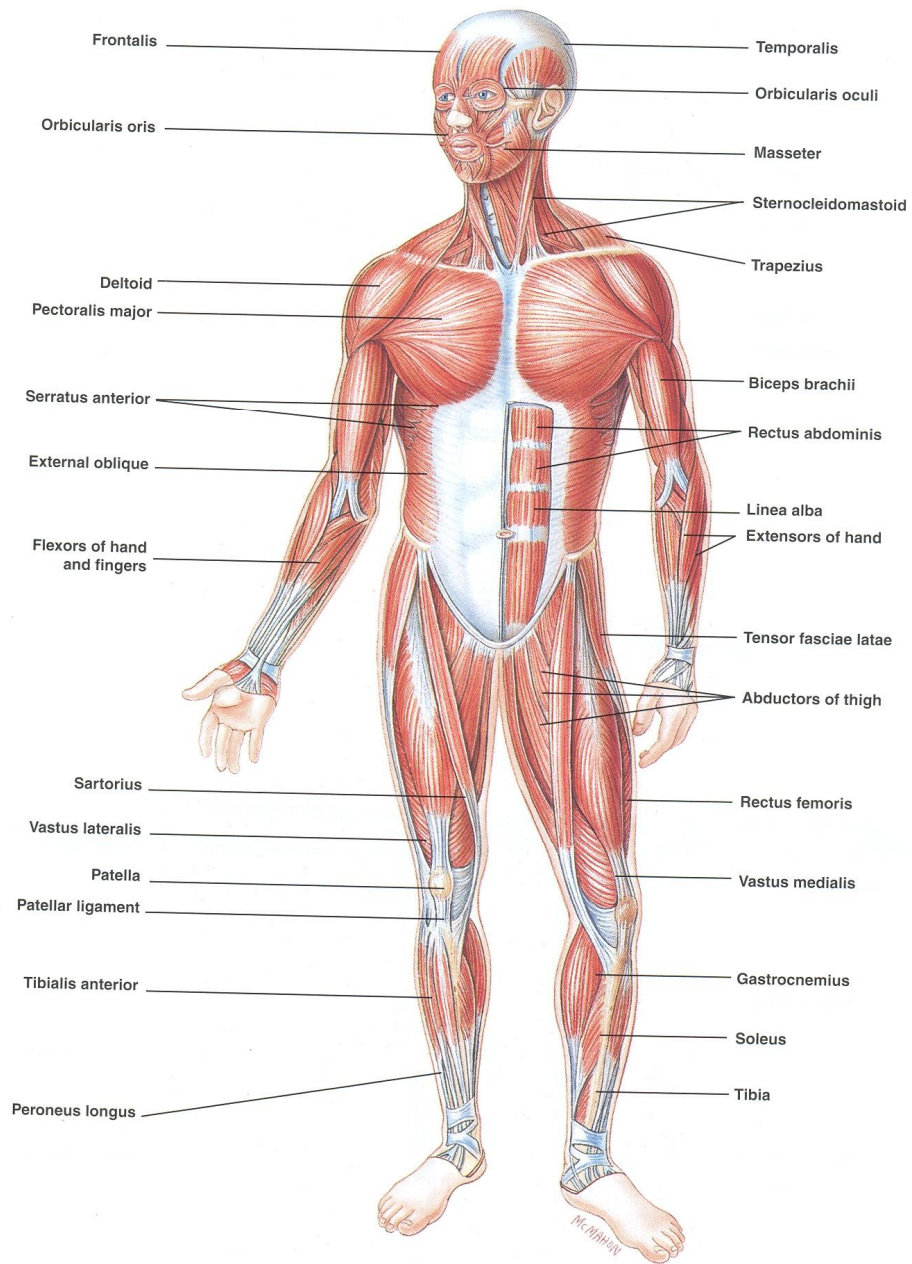
(<http://www.mideastweb.org/misrael.htm> [Accessed 24/11/2009]).

## Annex (2): Map of Gaza Strip



(<http://www.littleredbutton.com/gaza/map.html> [Accessed 24/11/2009])

### Annex (3): Muscular system (front View)



#### Annex (4): Explanatory letter for experts

بسم الله الرحمن الرحيم

السيد الدكتور /ة:----- حفظه الله

السلام عليكم ورحمة الله وبركاته

تقوم الباحثة بإعداد دراسة للحصول على درجة الماجستير في الصحة العامة والدراسة

بعنوان:

#### **(Determinants of musculoskeletal pain among governmental hospitals laboratory technicians in Gaza Governorates)**

ويقوم الدكتور : زكريا الأسطل بالإشراف على هذه الدراسة ، والباحثة قامت بإعداد استبانته سيتم توزيعها على جميع

العاملين في مجال المختبرات الطبية بالمستشفيات الحكومية التابعة لوزارة الصحة.

لذا نرجو من سيادتكم التكرم بإبداء آراؤكم في الاستبانته المرفقة من حيث ملاءمتها في الحصول على المعلومات

اللازمة لقياس مدى انتشار آلام العضلات الحركية والعوامل المرتبطة بها بين العاملين في مجال المختبرات الطبية في

المستشفيات الحكومية بقطاع غزة وتعديل أي فقرة ترون أنها بحاجة إلى تعديل.

شاكرين لكم حسن تعاونكم

وتفضلوا بقبول فائق الاحترام والتقدير

الباحثة: إيمان الأسطل

تحاليل طبية بمستشفى غزة الأوروبي/ خان يونس

جوال:0599993435

بريد الكتروني([eastal1976@hotmail.com](mailto:eastal1976@hotmail.com))

## **Annex (5): Experts panel names**

<b>Member</b>	<b>Place of work</b>
Dr. Yehia Abed	Al-Quds University
Dr. Bassam Hamad	Al-Quds University
Dr. Yusif Abu Safiya	Al-Quds University
Dr. Bassem Ayesh	MOH – Gaza
Dr. Randa El-Khodary	MOH – Gaza
Mr. Abed El Rheem Shagora	MOH – Gaza
Mr. Rushdi Rusros	MOH – Gaza
Mr. Sadi Abu Awwad	Al-Quds University

## Annex (6): Questionnaire explanatory letter

(the Arabic version)

الإخوة والأخوات الزملاء الأفاضل

السلام عليكم ورحمة وبركاته

تقوم الباحثة بدراسة

"محددات آلام العضلات الحركية بين فنيي المختبرات العاملين في المستشفيات الحكومية في محافظات غزة"

إن هذا البحث يشكل جزء ضروري من دراستي للحصول على درجة الماجستير في الصحة العامة/ بجامعة القدس- وقد تم اختياركم ضمن مجموعة العاملين في مجال المختبرات الطبية بالمستشفيات الحكومية للإجابة على العبارات الواردة فيها.

إذا كنت توافق/ي على المشاركة في هذه الدراسة يرجى التكرم بقراءة العبارات التالية بدقة والإجابة عليها بموضوعية لما في ذلك من اثر كبير على صحة النتائج والنصائح التي سوف يتوصل إليها الباحث مع التأكيد بأن هذه البيانات سوف تستخدم لأغراض البحث العلمي فقط وسوف تعامل بسرية تامة.

أوافق  لا أوافق

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

شاكرين حسن تعاونكم

الباحثة/ إيمان الأسطل

رقم جوال: 0599993435

بريد الكتروني: [eastal1976@hotmail.com](mailto:eastal1976@hotmail.com)

**Annex (7): The final version after panel committee of questionnaire in Arabic**

بسم الله الرحمن الرحيم

رقم التسلسل:000000000000

**الاستبيان باللغة العربية**

محددات آلام العضلات الحركية بين فنيي المختبرات العاملين في المستشفيات الحكومية في محافظات غزة

الجزء الأول:

أ : المعلومات الشخصية

- الجنس  ذكر  أنثى

- العمر ----- سنة

- الحالة الاجتماعية  أعزب  متزوج  مطلق /ة  أرمل /ة

- المستوى التعليمي  دبلوم  بكالوريوس  دراسات عليا

- مكان العمل (اسم المستشفى) -----

- عدد ساعات العمل اليومي ----- ساعة

- عدد ساعات العمل الإضافي/أسبوعيا----- ساعة

- سنوات الخبرة ----- سنة

هل تعمل بوظيفة أخرى بعد العمل الرسمي ؟  نعم  لا

إذا كانت الإجابة نعم

أ: حدد نوع العمل  أعمال مهنية  مختبرات  أعمال أخرى حدد -----

ب: عدد الساعات التي تعملها خارج المختبر----- ساعة

ب- الحالة الصحية : (الرجاء حدد ما يناسبك )

المشكلة الصحية	قبل العمل بهذه الوظيفة	بعد العمل بهذه الوظيفة	لا يوجد مشاكل
الروماتيزم، أمراض عظام			
متلازمة النفق الرسغية			
التهاب في الأوتار			

الجزء الثاني:

شكوى الم العضلات الحركية (وجوده وخصائصه)

هل تعاني/ عانيت من آلام في العضلات الحركية (آلام في الرقبة ، الأكتاف ، الأطراف العلوية ، الأطراف السفلية أو

الظهر) ؟  نعم  لا

إذا كانت الإجابة نعم استمر في الإجابة

أما إذا كانت الإجابة لا ، من فضلك انتقل إلى الجزء الخامس ، واستمر

1- الرجاء حدد أي جزء من الجسم يؤلمك أو يسبب لك عدم الراحة

الرقبة

الأكتاف

الأطراف العلوية

الأطراف السفلية

الظهر

2- نوع الألم

نممة

خذلان

حرقان

شد عضلي

ألم عند اللمس

3- طبيعة الألم

مستمر

متقطع

4- شدة الألم

درجة أو شدة الألم (الرجاء اختيار رقم واحد)			
شديد	متوسط	خفيف	لا يوجد
10 9 8 7	6 5 4	3 2 1	0

- 5- جانب الجسم الذي يمتد فيه الألم  الأيمن  الأيسر
- 6- بدأ الألم بشكل  مفاجئ  تدريجي
- 7- مدة استمرار الألم  ساعات  يوم واحد  يومان أو أكثر
- 8- هل ظهر الألم قبل العمل في مختبر المستشفى الحالي؟  نعم  لا
- 9- هل ظهر الألم خلال الأيام السبعة الماضية؟  نعم  لا
- 10- هل ظهر الألم خلال الثلاثة شهور الماضية؟  نعم  لا
- 11- هل ظهر الألم منذ أكثر من ستة أشهر؟  نعم  لا
- 12- هل أخذت إجازة مرضية بسبب تلك الآلام؟  نعم  لا
- إذا كانت الإجابة نعم حدد عدد الأيام:  1 - 5 أيام  6 - 10 أيام  أكثر من 10 أيام

الجزء الثالث:

البحث عن نصائح طبية / علاج

الرقم	الفقرة	نعم	لا
1	هل تلقيت نصيحة طبية/علاج لألمك		
2	تضمنت النصيحة أدوية أو عقاقير لتسكين الألم		
3	تضمنت النصيحة جراحة		
4	تضمنت النصيحة علاج طبيعي		
5	تضمنت النصيحة راحة		
6	تضمنت النصيحة أدوات دعم(ياقة رقبة، أحزمة دعم،.....)		
7	هل النصيحة/العلاج الطبي قللت من الألم		

الجزء الرابع:

التعرف على عوامل الخطر والضغط في العمل (أي من العوامل التالية يمكن ان تكون سبب في ألمك)؟

الرقم	الفقرة	نعم	لا
1	المكان محدود جدا لحرية حركة العمل		
2	كراسي غير مريحة		
3	الجلوس لفترة طويلة خلال العمل في المختبر		
4	العمل يؤدي وأنت واقف (لا يوجد إمكانية للجلوس والراحة)		
5	الحركة المفاجئة		
6	الانحناء والالتواء		
7	تكرار نفس حركة العمل		
8	وضعية غير مريحة خلال العمل		
9	عدم تنوع في طبيعة العمل (Task invariability)		
10	عبء العمل الزائد		
11	لبس الأحذية العالية المتعبة أثناء العمل		
12	الضغط النفسي / إجهاد		
13	عدم وجود دعم أو مساعدة من الزملاء		
14	عدم وجود دعم أو مساعدة من المسؤول		
15	المهام تتطلب كثير من التركيز والانتباه		
16	عدم وجود الحرية والاستقلالية (autonomy) في العمل		
17	بيئة عمل غير ملائمة (إضاءة، تهوية ، حرارة)		
18	الضوضاء والازدحام في العمل		
19	عمل حاسوب (إدخال معلومات ، طباعة ، .....الخ)		

الجزء الخامس:

خصائص بيئة العمل

الرقم	الفقرة	نعم	لا
1	مكان العمل يسمح بحرية الحركة		
2	يوجد إضاءة كافية في مكان عملي		
3	يوجد تهوية جيدة في مكان عملي		
4	درجة الحرارة مرتفعة في مكان عملي		
5	الكراسي لها ظهر عالي لدعم الجسم خلال العمل (كراسي مريحة)		
6	يوجد أثاث كثير يمكن ان يحد من حرية الحركة		
7	مكان عملي مزدحم		
8	مكان العمل يعج بالضوضاء		

الجزء السادس:

المعرفة بخصوص إجراءات السلامة لكي تتجنب آلام العضلات الحركية أثناء العمل

الرقم	الفقرة	نعم	لا
1	هل لديك معرفة كافية بكيفية الجلوس بطريقة صحيحة على الكراسي أثناء العمل المخبري؟		
2	تكرار العمل والأيدي والأذرع تعمل في وضعية مريحة يقلل آلام العضلات الحركية؟		
3	الجلوس في مكان واحد أثناء العمل لفترة طويلة لا يؤثر على آلام العضلات الحركية؟		
4	شد جسمك من فترة إلى أخرى يقلل من آلام العضلات الحركية؟		
5	ارتداء الأحذية العالية المتعبة خلال العمل تزيد من آلام العضلات الحركية؟		
6	تقلب درجة الحرارة لا تؤثر على آلام العضلات الحركية؟		
7	الضجة والازدحام في العمل لا تؤثر على آلام العضلات الحركية؟		

الجزء السابع:

اقتراحات / نصائح لتقليل الآلام (رتب الاقتراحات التالية طبقاً للأولوية من رقم : (1 - 10)

الترتيب	الاقتراحات / النصائح	الرقم
	الالتزام بعدد ساعات العمل الأسبوعية	1
	اخذ فترات راحة خلال العمل	2
	ممارسة بعض الرياضة خلال أوقات الفراغ	3
	لبس الأحذية المريحة خلال العمل	4
	الحركة أثناء العمل	5
	التوقف عن العمل عندما يبدأ الألم	6
	إعادة دوران توزيع مهام العمل (work or task rotation)	7
	توفير كراسي مريحة ومناسبة لموظفي المختبر	8
	تجنب الحركات المفاجئة	9
	الحاجة إلى نصائح/دورات تدريبية للحفاظ على سلامة الجسم أثناء العمل المخبري	10

شكراً لكم على حسن تعاونكم

**Annex (8): Questionnaire explanatory letter (The English version )**

**Cover Letter and Consent Form**

**Determinants of Musculoskeletal Pain among Governmental Hospitals Laboratory  
Technicians in Gaza Governorates**

**Dear participant:**

You are invited to be in the above mentioned research study.

This study is conducted as a part of the requirement for master program in Public Health at Al-Quds University School of public health, Palestine.

The purpose of this study is to identify the determinants of musculoskeletal Pain among laboratory technicians. This in turn will identify determinants factors.

Your participation is voluntary; you have the right to refuse to answer the questions.

If you agree to be in this study, you need to answer the interviewer questions that will be filled.

The data from this study will be kept confidential.

It is your decision whether or not to participate in this research study.

**Statement of consent**

I have read / know the above information. I have asked question and received answers. I understand that by answering the self administered questions, I give consent for participation in this study.

**Thank you for your cooperation.**

**Researcher**

**Eman El Astal**



**B. Health Status History: (please mark which suits you)**

<b>Health problem</b>	<b>Before getting this job</b>	<b>After getting this job</b>	<b>No problem</b>
Arthritis or Rheumatism			
Carpal Tunnel Syndrome			
Tendonitis			

**PART II**

**Musculoskeletal complaints (presence & characteristics):**

Do you have/ had pain or discomfort in any of the following body parts (neck, shoulders, upper extremities and lower extremities and back)?  Yes  No

**If the answer is Yes, please continue.**

**If the answer is No, please skip to part (V) and continue.**

1. Please indicate below which body part has been painful or caused discomfort

- Neck
- Shoulders
- Upper extremities
- Lower extremities
- Back

2. Nature of pain:

- Numbness
- Tingling
- Burning
- Stiffness
- Tenderness

3. Nature of pain over previous year:  Continuous  Intermittent

4. Severity of pain:

The degree / severity of pain is / was: (please choose one number)			
None	Mild	Moderate	Sever
0	1 2 3	4 5 6	7 8 9 10

5. The side of the body where the pain appeared:  Right  Left

6. Onset of pain was:  Sudden  Gradual

7. Duration and intensity of pain:  Hours  One day  Two days or more

8. Did musculoskeletal pain appear before your work in this hospital laboratory?

Yes  No

9. Did the pain occur in the preceding 7 days?  Yes  No

10. Did the pain appear within last three months?  Yes  No

11. Did the pain appear more than six months?  Yes  No

12. Did you have get a sick leave due to MSP?  Yes  No

If yes, how many days you had because of pain

1 – 5 days  6 – 10 days  more than 10 days

**Part III:**

**Seeking medical advice / treatment:**

No.	Statement	Yes	No
1	Had you ever received medical advice / treatment for your pain		
2	Advice included drugs or medication to relieve pain		
3	Advice included surgery		
4	Advice included physiotherapy		
5	Advice included rest		
6	Advice included support devices (neck collar, support belts, plint)		
7	Did the prescribed medical advice decrease pain		

## **PART IV**

### **Identification of risk factors and stress at work**

**(Which of the following factors cause your pain?)**

<b>No.</b>	<b>Risk factor / cause</b>	<b>Yes</b>	<b>No</b>
1	The space is too limited for work movement		
2	Uncomfortable chairs		
3	Prolonged time sitting during work		
4	The work is performed whilst standing (there is no possibility to sit and rest)		
5	Sudden movements		
6	Bending and twisting		
7	Repetition of similar work movement		
8	Unsuitable posture during work		
9	Task invariability		
10	Work overload		
11	Wearing high heel shoes during work		
12	Psychological pressure / stress		
13	Lack of support from colleagues		
14	Lack of support from supervisors/ directors		
15	Tasks requiring high level of concentration and attention		
16	Lack of autonomy over work		
17	Bad working environment (light, ventilation, heat)		
18	Noise and crowded at work place		
19	Computer work (data entry, typing, ...)		

## **PART V**

### **Work environment characteristics:**

<b>No.</b>	<b>Statement</b>	<b>Yes</b>	<b>No</b>
1	There is enough space for free movement		
2	There is enough lighting in your work place		
3	There is good ventilation in your work place		
4	Room temperature is too hot		
5	The chairs have high back to support your body during work (comfortable chairs)		
6	The work place is crowded		
7	The work place is noisy		

## **PART VI**

### **Knowledge regarding safety measures to avoid MSP during work:**

<b>No.</b>	<b>Statement</b>	<b>Yes</b>	<b>No</b>
1	Do you have enough information about how to sit correctly on your chair during laboratory work?		
2	Repeated work, with forearm and hand is performed with comfortable hand position reduce MSP pain.		
3	Sitting in one place during work for long time not affect your MSP pain.		
4	Stretching your body intermittently decrease your MSP pain.		
5	Wearing high heel shoes during work increase your MSP pain.		
6	Fluctuating room temperature not affects your MSP pain.		
7	Noise and crowed at work place increase your MSP pain.		

## **PART VII**

### **Suggestions / recommendations to reduce pain**

*(Rank the following suggestions according to priority from No. 1 to 10)*

<b>No.</b>	<b>Suggestion / recommendation</b>	<b>Rank</b>
1	Work exactly by weekly working hours	
2	Take rest period during work	
3	Practice some exercises to relax body muscles during free time	
4	Wear comfortable shoes during work	
5	Change work position frequently	
6	Stop working when pain starts	
7	Work or task rotation	
8	Afford comfortable / suitable chairs for laboratory technicians	
9	Avoid sudden movement	
10	Need advices / training to maintain body safe during laboratory work	

*Thank you for your cooperation*

## Annex (10): Ethical approval: Helsinki Committee

Palestinian National Authority  
Ministry of Health  
Helsinki Committee



السلطة الوطنية الفلسطينية  
وزارة الصحة  
لجنة هلسنكي

التاريخ 2009/6/3

Name:

الاسم: إيمان علي الأسطل

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

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

**Prevalence of Musculoskeletal Pain among Governmental Hospital Laboratory Technicians in Gaza Strip**

In its meeting on June 2009 and decided the Following:-

و ذلك في جلستها المنعقدة لشهر 6 2009

To approve the above mention research study.

و قد قررت ما يلي:-

الموافقة على البحث المذكور عاليه.

Signature

توقيع

Member

عضو

Member

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 (11): Ethical approval: Director General of Human Resources Development

الرقم: .....

التاريخ: 2019/07/22

الأخوة مدراء المستشفيات المحترمين،،،،،  
تحية طيبة وبعد،،،،،

الموضوع/ تسهيل مهمة باحث

بالإشارة إلى الموضوع أعلاه، يرجى تسهيل مهمة الطالبة/ إيمان علي الأسطل في جمع البيانات الخاصة بتطبيق بحث التخرج لنيل شهادة الماجستير من كلية الصحة العامة بعلوم التعرف على مسددات آلام العضلات الحركية بين فنيي المختبرات بالمستشفيات الحكومية في قطاع غزة

**Determinates of musculoskeletal pain among Governmental Hospital Laboratory Technicians in Gaza Governorates.**

وتشمل الدراسة باللغة الانجليزية جمع البيانات اللازمة من فني التحاليل الطبية العاملين في أقسام المختبرات بمستشفيات وزارة الصحة، بحيث لا يتعارض مع مصلحة العمل وضمن ضوابط وأخلاقيات البحث العلمي.

وتفضلوا بقبول الاحترام والتقدير ،،،،،

  
د. ناصر رأفت أبو شعبان  
مدير عام تنمية القوى البشرية



صورة لـ/  
- مدير عام المستشفيات  
- كلية الصحة العامة  
- الملف

غزة - حلف مجمع النداء الطبي - هاتف - 08-2827298 - فاكس: 08-2868109

08-2827298

**Annex (12): Ethical approval: Director General of hospitals, MOH**

Palestinian National Authority  
Ministry Of Health  
Hospitals General Administration



السلطة الوطنية الفلسطينية  
وزارة الصحة  
الإدارة العامة للمستشفيات

التاريخ: 2009/08/02

الرقم: أ.م

المحترمون،،،

السادة مدراء المستشفيات

السلام عليكم ورحمة الله وبركاته ،،

الموضوع/ تسهيل مهمة باحث.

قادمة إليكم الأخت/إيمان الاسطل من كلية الصحة العامة و التي تجري بحث بعنوان

Determination of musculoskeletal pain among Governmental Hospital Laboratory Technicians in Gaza Governorates.

وبناء علي خطاب مدير عام تنمية القوي البشرية كبحت متطلب تخرج لدرجة الماجستير نفيديكم بأنه لا مانع لدينا من تسهيل مهمة الأخت المذكورة في جمع المعلومات اللازمة لإجراء بحثها من العاملين في أقسام مختبرات المستشفيات حسب الاستبيان المقدم منها بحيث لا يتعارض مع مصلحة العمل و ضمن ضوابط و أخلاقيات البحث العلمي.

وتفضلوا بقبول فائق الاحترام،،،

د. محمد الكاشف

مدير عام المستشفيات

صورة للسيد مدير عام تنمية القوي البشرية.



وزارة الصحة - الإدارة العامة للمستشفيات- غزة الرمال-شارع عمر المختار-فندق الأمل الطابق الثاني- تليفاكس 082820734

## ملخص الدراسة

هذه الدراسة بعنوان "محددات آلام العضلات الحركية بين فنيي المختبرات العاملين في المستشفيات الحكومية في محافظات غزة".

هدفت الدراسة إلى تحديد مدى انتشار آلام العضلات الحركية، حدتها، الأعضاء التي يحدث فيها الألم ووصف الألم وعلاقته ببعض المتغيرات مثل الجنس، العمر وسنوات العمل، كما هدفت إلى التعرف على محددات تلك الآلام لدى فنيي المختبرات العاملين في المستشفيات الحكومية بمحافظة غزة.

استخدمت الباحثة دراسة وصفية مقطعية، وقد تكون مجتمع الدراسة من جميع الفنيين العاملين في المختبرات الطبية في جميع المستشفيات الحكومية في محافظات غزة والتي كان عددها 11 مستشفى. تكون مجتمع الدراسة من 179 فرداً وقدرة نسبة استجابتهم لاستبانة الدراسة 89%. تكونت أداة الدراسة من استبانة تم إعدادها لقياس متغيرات الدراسة، وقد قامت الباحثة بإجراء اختبارات الصدق والثبات للاستبانة من خلال عينة استطلاعية تكونت من 20 فرداً.

للحصول على نتائج الدراسة قامت الباحثة باستخدام المعالجات الإحصائية التالية: التكرار، النسب المئوية، المتوسط الحسابي، مربع كاي واختبار (ت).

أظهرت نتائج الدراسة انتشار آلام العضلات الحركية بنسبة 68.7% بين فنيي المختبر وبلغت النسبة 64.5% بين الذكور و 75.4% بين الإناث، وكان أفراد الفئة العمرية (50 سنة فأكثر) الأكثر شكوى من الآلام حيث بلغت نسبتهم 75% من تلك الفئة، وقد سجلت أعلى درجات الشكوى من آلام الظهر بنسبة بلغت 21.1% يليها الأطراف السفلية 14.6%، الرقبة 5.7%، الأكتاف 4.0% ثم الأطراف العلوية 0.8%، كما بينت النتائج أن 61% من الذين يشكون من الألم وصفوا الألم بأنه على شكل تقلص عضلي، 6.5% وصفوه بأنه خذلان، 6.5% وصفوه بأنه ألم عند اللمس، 5.7% وصفوه بأنه حرقان و 1.6% وصفوه بأنه على شكل نممة.

كما أظهرت نتائج الدراسة أن 91.1% من أفراد عينة الدراسة اشتكوا من آلام متقطعة، 56.1% وصفوا الألم بأنه متوسط الحدة، 29.3% وصفوا الألم بأنه بسيط و 14.6% وصفوا الألم بأنه حاد جداً، وقد ظهر الألم بشكل مفاجئ عند 17.1% من أفراد عينة الدراسة وظهر بشكل تدريجي عند 82.9% وتراوح مدة الألم من عدة ساعات إلى عدة أيام، ونتيجة لتلك الآلام فإن 17.9% من الذين اشتكوا من الألم حصلوا على إجازة مرضية تراوحت مدتها بين يوم واحد إلى أكثر من عشرة أيام، وبلغت نسبة الذين احتاجوا إلى وصفة طبية من طبيب المستشفى 78.9% وكانت الوصفة الطبية فعالة في تخفيف الألم لدى 76.28% منهم.

أظهرت نتائج الدراسة عدم وجود فروق ذات دلالة إحصائية بين الذكور والإناث بالنسبة إلى حدة الألم. بالنسبة لمحددات الألم / عوامل الخطر في مكان العمل فقد رأى 89.43% أن الاهتمام والتركيز في العمل كان أكثر محددات الألم يليه العمل الزائد 85.3%، اتخاذ أوضاع غير مناسبة أثناء العمل 84.5%، تكرار نفس الحركات 83.7%، الضغط النفسي 82.9% بينما رأى 26.1% من أفراد عينة الدراسة أن أعمال الكمبيوتر (إدخال بيانات، طباعة ..) كانت أقل محددات الألم.

بينت نتائج الدراسة الحاجة إلى إدخال بعض التعديلات على بيئة المختبرات الطبية في المستشفيات والتي تتضمن توفير كراسي مريحة للعمل، تقليل مستوى الضوضاء والازدحام في بيئة العمل والتخلص من الأثاث الغير ضروري من أجل زيادة المساحة التي تمكن العاملين في المختبر من التحرك بسهولة. كما بينت النتائج أن الغالبية العظمى من فنيي المختبر لديهم معلومات كافية عن معايير السلامة في مكان العمل.

بالنسبة للاقتراحات للحد من آلام العضلات الحركية فقد أظهرت النتائج أن التغيير الدوري للمهام يحتل المرتبة الأولى يليه القيام ببعض التمارين الرياضية في وقت الفراغ وتجنب الحركات الفجائية أثناء العمل، بينما كان تحديد أوقات للراحة أثناء العمل في ذيل قائمة المقترحات.