Analysis of Musculoskeletal Disorders amongst Nurses: a case study of Kenyatta National Hospital

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

I dedicate this thesis to my late grandmother and parents namely, Alistera, Florence and Lucas

ACKNOWLEDGEMENT

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LIST OF ACRONYMS

A & E	Accident and Emergency
BLS	Bureau of Labour Statistics
BMI	Body Mass Index
CBS	Colesbrook Bosson Saunders
CCDPM	Centre for Chronic Disease Prevention and Management
CTDs	Cumulative Traumatic Disorders
DHHS	Department of Health and Human Services
ICN	International Council of Nurses
ICU	Intensive Care Unit
KNH	Kenyatta National Hospital
MSDs	Musculoskeletal disorders
NIOSH	National Institute for Occupational Safety and Health
OOS	Occupational Overuse Syndrome
OSHA	Occupational Health and Safety Act
OSHE	Occupational Safety, Health and Environment
ROSPA	Royal Society for the Prevention of Accidents
RSI	Repetitive Strain Injuries
UK	United Kingdom
US	United States
USDOL	United States Department of Labour
VDT	Visual Display Terminal

DEFINITION OF TERMS

Awkward posture: positions of the body that deviate significantly from the neutral positions while jobs are being performed.

Musculoskeletal disorders: conditions where parts of the musculoskeletal system are injured resulting from the buildup of trauma and are ascertained on the basis of frequent pain and a duration with symptoms persisting for at least 3 days.

Neutral positions: the natural position of the body parts with the least tension or pressure.

Top occupations: priority listed skilled occupations in high demands and any disruption in their supply would result in significant impacts to the state.

Treatment areas: the areas assigned for the intervention.

ABSTRACT

The nursing profession is ranked among the top occupations with the highest rate of musculoskeletal disorders (MSDs). MSDs are a large group of conditions that result from a buildup of trauma. The nursing profession is one of the most physically demanding jobs, involving excessive manual handling of patients. The objectives of the study were to identify risk factors which lead to MSDs among nurses in Kenya; establish the prevalence of MSDs among the nurses; and characterize the MSDs according to frequently incurred MSDs.

A descriptive cross-sectional study design was performed to analyze MSDs among nurses at Kenyatta National Hospital (KNH). A self-administered questionnaire was used to gather information from 314 randomly selected nurses working at KNH, Kenya's largest hospital, out of which the response rate was 78%. Information on the nurses' demographics and employment characteristics was collected and analyzed to establish risk factors. Ergonomic issues perceived by the nurses as factors causing MSDs were also examined. Six treatments (medical, surgical, paediatrics, accident and emergency, intensive care unit and clinic areas) which were chosen using a purposive sampling method were applied in the study and the highest response rate was found in the medical areas (85.3%), followed by the surgical areas (84%).

The study established that the prevalence of reported incidences of MSDs among the nurses was 74.2%. The study further established that physical factors involving poor

posture, lifting of heavy objects, and use of excessive force were the most apparent ergonomic aspects precipitating MSDs at 50% prevalence. The other ergonomic aspects identified were the structural lay out of work place (37%) and work organization (13%). The most vulnerable parts of the body were found to be the back, feet and shoulders, revealing a rate of 32.5, 21.5 and 20.4%, respectively. Further, the study found out that age in the female nurses was significant in the etiology of MSDs but independent among their male counterparts (at a CL of 95%, df of 4, $\chi^2 = 11.4$, $p < 0.05$ in female nurses but, $\chi^2 = 8.43$ and $p > 0.05$ in male nurses). The most vulnerable age among nurses was found to be in the age bracket of 35 to 44 years. Despite their vulnerability 52% of the nurses who suffered from MSDs sought medical intervention. Age and experience was significantly related to sick leave. Based on the study findings, the suggested recommendations on measures and strategies for prevention or reduction of MSDs occurrences includes early detection of MSDs; incorporation of a comprehensive ergonomics training to improve manual handling techniques; and adaptation of the working environment.

CHAPTER ONE

1.0   INTRODUCTION

1.1   Background information

1.1.1   Musculoskeletal disorders

The term musculoskeletal disorders (MSDs), identifies a large group of conditions that result from traumatizing the body over a period of time. It is the buildup of trauma that causes the disorder (Mc Graw Hill Dictionary, 2002). MSDs are also referred to as Cumulative Traumatic Disorders (CTDs), Occupational Overuse Syndrome (OOS), or Repetitive Strain Injuries (RSIs). MSDs have various definitions. Some of the definitions rely on subjects reported frequency, duration or intensity of pain (Trinkoff, 2002) while others define subjects as any report of pain that causes changes in functioning (Garg, 1989).

MSDS in the work place continue to be a major occupational health problem to both government agencies and the private industry (Lee, 1994). MSDs were recognized as having occupational etiologic factors as early as the beginning of the 18th century. However, it was not until the 1970's that occupational factors were examined using epidemiologic methods (DHHS, 1997). Since then studies and literature have increased dramatically, yet the relationship between MSDs and work-related factors remains the subject of considerable debate. In a study carried out by Baldwin (2004), it was reported that work related musculoskeletal disorders are the leading cause of work absences and

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lost productivity accounting for one-third of occupational injuries and illnesses reported to the bureau of labor statistics each year. Olson (1999) also noted that MSDs account for the largest fraction of temporary and permanent disability. It is estimated that more than 60% of people suffer MSDs at times in their lives (Smeldley, et al, 2003).

Work related MSDs and chronic pain is a serious problem for many workers. Time lost from work is the first issue that arises, medical expenses and rehabilitation costs are other financial burdens that many experience. People may have to live with constant pain or may have more serious problems as permanent damage (Webster and Snook, 1990). A study carried out by Jeffrey (2002) shows that over 350,000 working adults file for some kind of work related injury compensation each year. In addition, the study reported that 50% of women and 31% of men complain of work related headaches. It was noted that overall 96% of all complaints are back related. Data from the Occupational Health Supplement of the National Health Interview survey (2002) shows that in the US in 1989 alone, the total compensable cost of only upper extremity work related MSDs was estimated to be $563 per person.

1.1.2   Nurses and musculoskeletal disorders

Nursing personnel are consistently ranked among the top occupations with the highest rate of MSDs. According to the bureau of labor statistic (2008), nurses, nursing aides, orderlies and attendants reported the highest MSDs incidence rate of requiring days away from work in 2007. This is because the nursing profession is one of the most

physically demanding jobs in industries. The nature of nursing involves manual handling of patients whereby excessive muscular force or effort is used to lift, move, push, pull, hold and carry patients. It also includes repetitive activities. These constrained working postures, repetitive movement, carrying of heavy patients and performance of other physically demanding tasks makes nurses highly prone to MSDs (Smedley et al., 2003; Snook, 1987).

Inadequate staffing is another risk factor that increases the potential for MSDS amongst nurses. Often stressful tasks such as transferring patients from a bed to a chair or vice versa may be done alone and manually due to lack of staff and equipment. Several studies have examined the association between nursing staff levels and workplace injuries and illness (Lipscomb et al., 2004; Allen, 2001; Kingma, 2006; Trinkoff et al., 2009). These studies analyzed the staffing variables which included the ratio of nurse to patients, the availability of nursing aides to assist in patient transfers, and the reported worker injuries. High injury rates were reported in areas with low staffing levels. Working for more hours is also a result of inadequate staffing. This causes increased exposure to physical demands and reduced recovery time between work shifts, resulting in increased MSDs (Lipscomb et al., 2002). Engkvist et al (1998) found out that Swedish nurses working over 35 hours were at increased risk of back injuries. Similar findings were documented by Engels et al (1996) in a study carried out in Netherlands. At Kenyatta National Hospital, all nurses work for at least 40 hours per week, exposing most of them to MSDs.

Although many efforts have been made to analyze MSDs among nurses, the focus has been predominantly on patient handling tasks (Smedley et al., 2003). These efforts have minimally looked at the demographic features and on the association of the work areas. This study focuses on demographic and employment characteristics as risk factors leading to MSDs. However, not much has been reported in developing countries, such as Kenya. The present study was therefore conducted to address this issue.

The high levels of stress, inadequate staffing and equipment, long working hours and excessive manual handling tasks make nursing among the top most industry in need of an ergonomic intervention. It is believed that these findings will be appropriate for planning and implementing an ergonomic program and improving the nurses' health. Through the principle of ergonomics, work can be redesigned or modified to match the human characteristics and capabilities. The goal of the health care ergonomic is to fit the job to the worker so as to reduce occupational injuries as much as possible.

1.1.3   Government controls

The Occupational Safety and Health Act (OSHA), 2007 (Kenya Gazette Supplement, 2007) is an act of parliament to provide for the safety, health and welfare of all persons lawfully present at workplaces. The Act states that every occupier shall carry out appropriate risk assessments in relation to the safety and health of persons employed and on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools

and process under the control of the occupier are safe and without risk to health. The act defines an occupier as an employer or owner of a work place. Failure to comply with this duty is an offence and the occupier shall on conviction be liable to a fine not exceeding Ksh 500,000 or to imprisonment for a term not exceeding six (6) months or to both. This duty imposed is believed to play a big role in the prevention of MSDs and other occupational injuries in Kenya. Weber and Arndt (1998) noted that most of proposed standards have been sidetracked due to ignorance and significant controversy in the business and industry arenas. Despite these controversies, many OSHA resources exist to assist employers in implementation of the program (OSHA, 1998). In Kenya, the Occupational Safety, Health and Environment (OSHE) department in the Ministry of Labour is resourceful in the development of the ergonomic programs. To safeguard the safety and health of employees, it is a requirement that all organizations with more than 20 workers should have safety committees which should comprise of representatives from the management.

In KNH a Safety and Health Committee was established in accordance with the prescribed regulations of the Occupational Safety and Health Act, 2007. The overall function and activities of this committee are not only geared towards the health and safety of the employers in KNH but also the patients, students, visitors, and contractors. The importance of safety at work is now being recognized and general safety measures are being put in place (KNH OSHE, 2009).

Highlights from the international council of nurses (ICN, 2003) concluded that the powers of the nursing community can be enhanced by increased cross national research, openers to replication studies, and increased cross-national policy formulation. President Kibaki, during his visit to KNH (Kenya Broadcasting Corporation, 2009) noted that to improve staffing levels the government will hire 1,600 nurses before the end of the year. This could be recognition of the current deficiency in the nursing personnel. Shortage of personnel resources, expose the few available ones to injuries and fatigue. During the same visit, Professor Nyongo, the Minister of Medical Services, said that the government was upgrading all provincial general hospitals to referral status to decongest the Kenyatta and Moi referral facilities. This shows that the government acknowledges the problems faced in the health sector.

1.2   Statement of the problem

MSDs are significant global health problems. According to the Bureau of Labor Statistics, in addition to economic burdens incurred MSDs, suffering and pain is also experienced (BLS, 2003). Various studies have been carried out to determine the risk factors of MSDs and on strategies to control them. However, despite this, MSDs are still the most prevalent and the most common cause of disability among nurses worldwide. The U.S. Bureau of Labor Statistics (BLS) has conducted annual surveys since 1972 and has provided basic information about occupational injury of which MSDs account for the largest proportion of these cases. Several other studies have reported high incidences of MSDs (Guo et al., 1995; Leggart & Smith, 2003). Despite the large literature on work

related MSDs in other parts of the world, very little has been done in Kenya, and specifically on the nurses who also experience MSDs at an exceeding rate. The size and complexity of the problems caused by MSDs calls for further investigation into the risk causing factors, analysis of the MSDs to find out the magnitude of the problem, and exploration of the effectiveness of the control measures put in place.

1.3   Justification

Actual and potential losses due to MSDs cause enormous problems globally. This study is therefore significant in the following ways: foremost, by addressing the health and safety of the employee, its findings are hoped to alleviate or prevent suffering to the targeted cadre of the health personnel. Secondly, since the hospital incurs expenses and loss of manpower as a result of MSDs the study will help in reducing costs due to hospitalization, insurance claims and rehabilitation of its employees. The results of the study will provide the policy maker with evidence to improve strategies of integrating proper ergonomic principles in the practice of nursing. Finally, the study will add to existing knowledge about the impact of MSDs on nurses and can serve as a reference material for further research. KNH, being the largest referral and training hospital in the country has a large population of nurses of all ages. It also has various departments and represents all the variables presented in the study. No study on MSDs amongst nurses has been carried out in this hospital.

1.4   Research questions

Though a number of studies have been carried out and remedies suggested, the continued incidences of MSDs led to the following research questions:

1. What are the risk factors leading to musculoskeletal disorders among nurses at Kenyatta National Hospital?

2. What is the prevalence of musculoskeletal disorders among nurses at Kenyatta National Hospital?

3. How have the musculoskeletal disorders among nurses at Kenyatta National Hospital been characterized?

1.5   Objectives of the study

1.5.1   General Objectives

The preceding information shows that MSDs among nurses continue to be a major health problem. In an attempt to identify ways of preventing or reducing MSDs, this study in general aimed at analyzing musculoskeletal disorders among nursing personnel at Kenyatta National Hospital.

1.5.2   Specific Objectives

1. To identify risk factors leading to musculoskeletal disorders among nurses at Kenyatta National Hospital.

2. To establish the prevalence of musculoskeletal disorders among nurses at Kenyatta National Hospital.

3. To characterize the musculoskeletal disorders on the basis of frequently incurred injuries.

1.6 Scope of the study

The study was conducted at KNH, the largest teaching and referral hospital in the country. KNH is located in Nairobi, the capital city of Kenya and caters for patients from all over the country and as well as those from the neighbouring countries. Criteria for eligibility of respondents included nurses who were in full employment and had worked in the nursing career for at least 3 years. The inclusion criteria also incorporated those who had no history of an MSD before employment. MSDs were ascertained on the basis of frequent pain and duration, with symptoms persisting for at least 3 days.

1.7 Limitations

The study was carried out within some limitation; first the study only investigated the prevalence of MSDs and other factors of interest as they existed in the nursing profession at a particular time, regardless of what may have preceded. Secondly the study relied on self-reported data, the respondents may not have reported all incidences of MSDs. Thirdly, ergonomic problems investigated were only restricted to the physical stressors. The study did not address the environmental and psychological aspects that may have caused the MSDs because of limitation of time; however a study on these aspects is warranted in the future.

1.8   Conceptual framework

Figure 1.1 shows the conceptual framework relating the independent and dependent

variables in the study

Independent variables
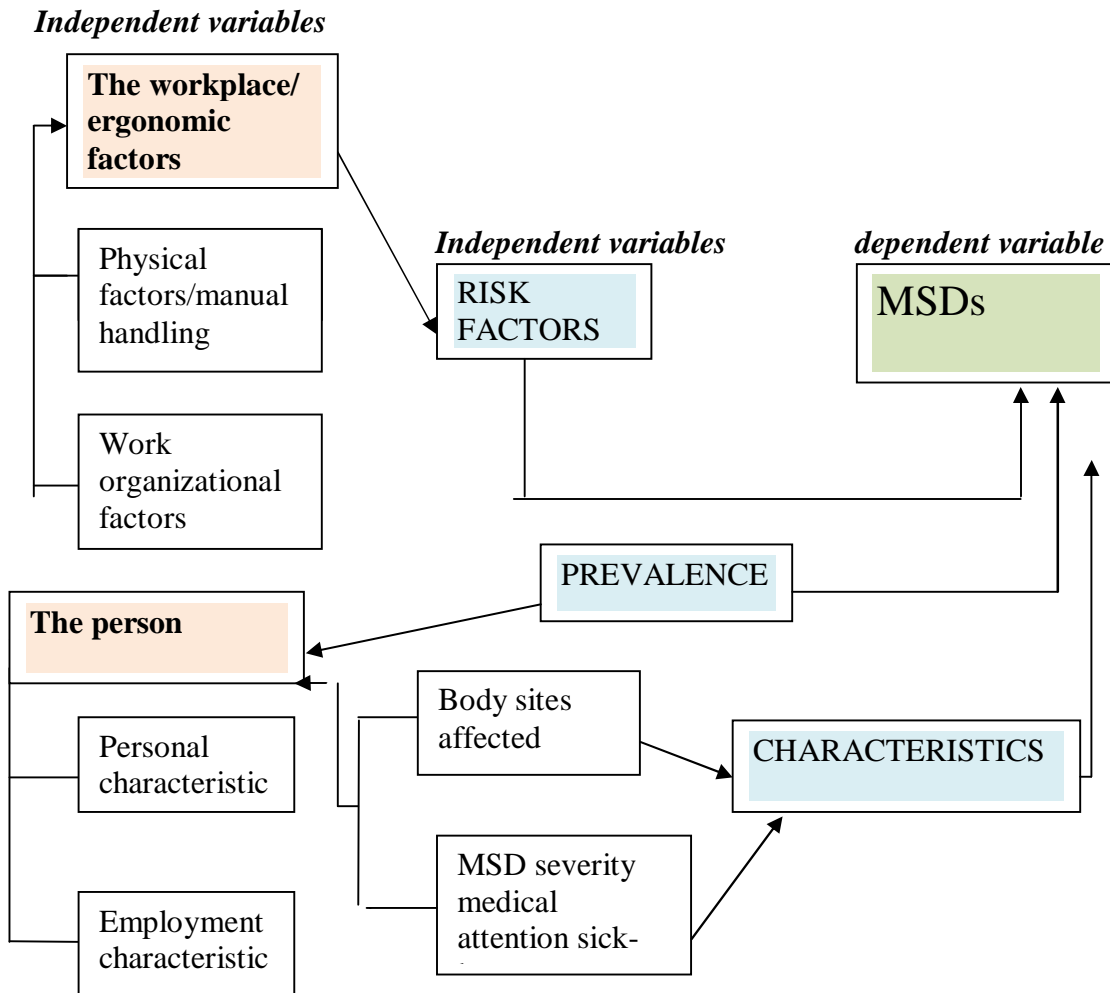
Figure 1.1: Conceptual framework of perceived factors that may influence the development, characteristics, and prevalence of MSDs.

CHAPTER TWO

2.0   LITERATURE REVIEW

2.1   Risk factors

Nursing is a physically demanding occupation, involving lifting and handling of people, Wilson (2001). Nurses therefore have higher rates of MSDs than most occupational groups. Various studies have suggested that MSDs among hospital nurses may have associations with some actual tasks and items related to work postures, work control and work organization (Ando et al., 2008; Allen, 2001). Trinkoff et al (2009) conducted a study to examine the relationship between perceived physical demands and reported MSDs. The results showed that physical demands are associated with risk factors leading to MSDs in registered nurses and the association is stronger in staff nurses. Alexapaulo et al (2003) carried out a study in a Greek hospital which supported the results by Trinkoff'et al (2009). However, they noted that the MSDs among nurses which are due to handling of physical loads are normally associated with the general health of the nurse. This implies that when occupational MSDs are being investigated, the general health of the employee should be put into consideration. In a study carried out in Australia, Lunn (1991) indicated that nurses and medical personnel have been notorious in the neglect of their own health and that of their colleagues. This results in the workers suffering from stress, anxiety, and exposure to infections, chemicals, radiation and MSDs.

Smedley et al (2003) investigated the incidences of risk factors for neck and shoulder pains. A longitudinal study was carried out in female nurses who were followed up for an average of 13 months. Personal and occupational risk factors were assessed. It was observed that 65% of the nurses completed the follow up while in the same job; thirty four percent (34%) of the nurses reported at least one episode of neck and shoulder pain. The strongest predictor of pain was previous history of the symptom. Those with the highest risk were associated with specific patient handling tasks that involved reaching, pushing and pulling. The study also indicated that nurses who reported low mood or stress were more likely to develop neck and shoulder pains. According to Oslo (1999), Carg (1995) and Hagberg (1984) the main ergonomic stressors that workers in hospitals and nursing homes face include force, repetitive activities and awkward postures. Lifting and handling of people is an integral part of nursing care. Clients attended to by nurses often require assistance to walk, bathe or perform other daily activities and in some cases these clients are totally dependent upon the nurses for mobility.

Awkward postures such as excessive twisting, bending and over-reaching, especially when combined with load handling are risk factors in the onset of MSDs in industries and work places. In the study by Snook (1987), it was reported that 9-19% of back pains are caused by twisting and 12-14% by prolonged bending. The study also indicated that lifting contributes from 37-49%, pushing from 9-16%, pulling from 6-9% and carrying from 5-8% of the cases of back pain. In another study, ROSPA (2001) reported that every year many workers in the United Kingdom (UK) incur injuries due to practices

associated with handling loads in the workplace. However, there are additional risk factors which include vibrations, repetitive movement and falls that lead to MSDs. Smedley et al (1995) investigated the risk factors for low back pain in hospital nurses and found a 69% overall response rate. Significant associations were found with frequency of manually moving patients around the bed and manually transferring patient between bed chair and floor. The study also indicated that 13% of compensable back pain was caused by slips and falls.

There is evidence that MSDs result from ergonomic hazards (USDOL, 1990). A relationship between high force and repetitive tasks, and pathology of MSDs was demonstrated by Silverstein et al, (1987). Research reports on risk factors associated with musculoskeletal injuries concur that these injuries are associated with overload in manual handling tasks, forceful motions, working in awkward positions, and carrying excessive weights (Leamon, 1994; Garg & Moore, 1992; and Oslo, 1999).

Kingma (2006, 2008) reported that the reason for the majority of Kenyan nurses migration to the US is due to lack of job satisfaction. This lack of job satisfaction may be a risk factor in the etiology of MSDs amongst nurses in Kenya. Several studies have indicated that there is a relationship between demotivation and MSDs (Alexapaulo et al., 2003; Allen, 2001). The immigration has also contributed to the problem of inadequate staffing which has led to higher rates in MSDs amongst the remaining understaffed nurses. WHO (2006) confirms that a half of the nursing positions in Kenya are unfilled

and yet a third of qualified nurses are unemployed. During the highlights from the international council of nurses in 2003 it was reported that Kenya has a high percentage of nurses, however, there is a lot of disparity in the national distribution of nurses resulting in shortages in some areas. This shortage was once more viewed as a risk factor which could results in the remaining nurses being overworked and thus being exposed to injuries. It was noted that nurses have big problems related to the infrastructure of the organization, such as unreliable support services, old and poorly maintained equipment, inadequate IT and administrative support (Allen, 2001). Not many studies have been carried out to establish the risk factors contributing to musculoskeletal disorders in Africa, particularly in Kenya. This study intends to establish the common perceived risk factors amongst nurses in the biggest hospital in Kenya, KNH.

2.2   Prevalence and frequently incurred injuries

Lipscomb et al (2002) carried out a study to establish the relationship between a combination of demanding work schedule characteristics and reported MSDs of the neck, shoulders and back. The results show that the prevalence of reported cases of MSDs in the back, neck, and shoulders were 29, 20 and 17%, respectively. Further analysis suggested that work schedule was significantly related to the occurrence of MSDs. Reports from various studies showed that weekend and full time shifts were particularly associated with MSDs of the back. Also working long hours, i.e., about 12 hours per day showed a statistical significant increase in reported MSDs in the back,

neck and shoulders (Lipscomb et al., 2002;Tamminan, 2008; Trinkoff et al., 2003). Findings from other studies also indicate back injuries as the most frequently incurred MSD (Retsas & Pinikahana, 2000; 1999). Smith et al (2004) subdivided the back into the upper section constituting of the thoracic spine and lower sections comprising of the lumbar, sacrum and coccyx. He reported that most common body site that is affected is the lower back with 56.7% followed by the neck with 42.8%.

Kee and Seo (2007) examined the prevalence of MSDs among nursing personnel in Korea and established the shoulder to be the most susceptible to MSDs, followed by the knee, lower back hand and wrist, neck and ankle, respectively. The study results also indicated that the particular departments in which the participants worked were significant in the determination of the relationship between work departments and MSDs. The prevalence of MSDs was highest in the intensive care unit, followed by the surgical wards. It was lowest in the emergency room. The study did not indicate the particular risk factors found in these wards and units. In Iran, Shafizadeh (2011) ascertained that more than 90% of the paramedics he studied atleast experienced one episode of MSDs. The most prevalent site affected was the neck (64%) followed by the head (62.1%) and the knees (54.7%). MSDs were more common in female workers and increased with age and years of service. The incidence was also notably high in New Zealand where 88% of the respondents had experienced pains lasting more than one day. Eighteen percent (18%) of the workers took time off work (Harcomb et al., 2009).

Smith (2003) conducted a study on occupational disease and MSDs among nursing staff and the results showed that there were major differences in the location and occurrence of MSDs. MSDs were found to be most prevalent among the Japanese nursing staff at almost all body sites. The study did not indicate the reasons for these findings. Kee and Seo (2007) also compared the prevalence of MSDs in different countries and established that Korea had the lowest number of nurses suffering from MSDs as compared to Japan and Sweden. A similar study was carried out by Smith et al (2004) in the US, Japan and England. The outcome showed that Japan had the highest percentage of MSDs whereas England had the smallest percentage of MSD, which is 47 and 24.2%, respectively.

Sick leave due to MSDs was noted to be higher among health care workers, especially amidst the nurses and nursing aides (Hornej et al., 2004). In Sweden, disorders of MSDs causes approximately a third of all sick leaves. This includes impaired working ability, long term sick leave and disabilities (Vingard, 2006). Bergman (2007) and Ostelo et al (2005) noted that effectiveness in the treatment of MSDs included a cognitive-behavioral component which is aimed at increasing self-efficiency. According to a systematic review of the studies on sickness absence, Alexanderson and Norlund (2004) noted that despite the magnitude of the problem, few studies have focused on this aspect. Documentation on epidemiology of low back pain in the rest of the world carried out by Vollinne (1997) reviewed surveys in low, middle and high income countries. Most of the studies accessed were restricted to the high income countries which comprise of less than 15% of the world's population. The findings indicated that low back pain rates are

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higher among the high income countries than in low income countries. Data on MSDs amongst nurses in Kenya is limited so this study is geared towards establishing the level of injuries and characterizes them according to prevalence and frequently incurred injuries.

2.3   Work practice controls

A research on injury as a global phenomenon of concern in nursing science was carried out by Summers (2006). It was aimed at developing models to explain the association between risk taking and injury. Culturally relevant interventions to prevent and limit injury were tested. The results showed that nurse scientists can apply unique perspectives such as training in manual handling and ergonomic principles to increase understanding of injury and its consequence.

Collins et al (2000) conducted a study on an evaluation of a "best practices" MSDs prevention program in nursing homes in the US. The "best practices" MSDs prevention program consisted of mechanical lifts and repositioning aids, a zero lift policy, and employee training on lift usage. The intervention was implemented in six nursing homes and the results indicated that there was a significant reduction in handling injury incidences, workers compensation costs, and lost workday injuries after the intervention.

A case study by Tadano (1999) explored work practice controls combined with workstation modification to reduce MSDs in visual display terminals (VDT) operators.

Education and anatomical reasons for MSDs was provided and inexpensive workstation modifications such as lumbar rolls and seat cushions were implemented during the study. The company noted a nearly 50% decrease in the number of injuries reported six (6) months after intervention.

Good work station design reduces unnecessary bending, twisting and reaching. Proper designs can only be achieved through implementation of the principles of ergonomics. The term "ergonomics" comes from two Greek words "ergon" meaning work and "nomos" meaning laws. Ergonomics has its roots in Ramazzinis study of the ill-effect posture and poorly designed tools on the health of workers in the early 1700s (Tayyan and smith, 1997). The overall goal of ergonomics is to maximize workers capabilities while concurrently ensuring their safety, comfort, efficiency and effectiveness (Oslon, 1999).

Several studies indicate how the role of ergonomics in containing costs became evident to the government and also business owners, particularly the costs incurred due to absenteeism, retraining injured workers, medical expenses and insurance (Scheer and Mital, 1997; Sharn, 1999). Ergonomics analyses are confined to three major areas, i.e., the design of the workplace, safe work procedures and postures and handle and tool design (Trombly 1995). Rizzo (1990) described an ergonomic program implemented in a university setting which focused on computer users. The program recommended that to minimize injury through work habits and proper work postures, breaks, stretches and

strengthening exercises were necessary. Prior to the program, 30% of the workers reported severe levels of discomfort. Following implementation of the program, 95% of these workers reported improved personal comfort.

Garg and Owen (1994) carried out an intervention study in two units of a nursing home to determine the effectiveness of ergonomic changes. Modification of rooms and selected devices was done. The findings showed that incidences and severity rates for back injuries over 13 months decreased from 83 to 43% and 63 to 40%, respectively

CHAPTER THREE

3.0   MATERIALS AND METHODS

3.1   Introduction

This chapter discusses the materials and methods used in the study. It describes the research design, study area, sampling procedures and data collection and analysis methods.

3.2   Research design

A descriptive cross-sectional design which entailed collection of data from a sample of 314 nurses was conducted. Data was gathered from a specified population, at a single point in time, without regard to what may have preceded. The aim of the study was to analyze MSDs amongst nurses at KNH. Information on risk factors causing MSDs, the prevalence of the disorders, and characteristics of the MSDs was gathered. Cross-sectional studies are often used as a basis for health policy decisions whereby current, not obsolete information is required for this purpose (Last, 2002). One of the main rationalizations of this study was to come up with health policy decisions so as to curb MSDs amongst nurses.

3.3   Target population

The study on analysis of MSDs among nurses was conducted at Kenyatta National Hospital (KNH). The hospital is located in Nairobi, the capital city of Kenya. KNH is

the largest referral hospital in the country with approximately 1700 nurses. It has over 40 inpatient wards. It also has specialized units and a number of outpatient clinics. The hospital, apart from providing curative and preventive services, is a teaching hospital which hosts a number of students from various institutions

3.4 Sampling technique and sample size

3.4.1 Sampling technique

Sampling was conducted in two steps. First, a purposive sampling, which is restricted and non-probability, was used to select the wards and clinics based on the types of patients managed. This resulted in six different sites namely medical, surgical, paediatrics, intensive care unit (ICU), accident and emergency (A&E) and the clinics. These areas were selected on the basis of subjective judgement since the generalizations from this sample to the population under study was desirable (Cochran, 2008). Secondly, a simple random sampling was employed to draw the respondents from each site since it is a technique which provides a sample highly representative of the population of interest (Cochran, 2008).

3.4.2 Sample size

The standard Fisher method (1983) was used to determine the sample size. The method is presented by equation (3.1) in which *n is* the desired sample size (if population is > 10,000) Z is the standard normal deviate at a confidence level of 95% or 1.96, *p* is the

proportion in the population estimated to have particular characteristics (estimated at 0.50), q is 1.0-p (0.50) and d is the degree of accuracy desired (set at 0.05).

$$n = \frac{Z^2 pq}{d^2} \qquad (3.1)$$

Using the equation (3.1) the value of n was found to be 384. Since the population of nurses of 1700 was less than 10,000, the desired sample size (n_f) was computed using equation (3.2), Fisher (1993) where N in the sample size is 1700.

$$n_f = \frac{n}{1 + \dfrac{n}{N}} \qquad (3.2)$$

3.6   Data collection instruments

A self-administered semi-structured questionnaire which comprised of four parts (viz., personal information, perceived risk factors leading to MSDs, prevalence of MSDs and characterization of incurred injuries) was used in this study to acquire data in order to address the stated three objectives. The developed questionnaire had some aspects borrowed from the standardized Nordic questionnaire (Kuorinka et al., 1987) and is shown in Appendix 1. This questionnaire allowed for both qualitative and quantitative data to be collected.

The demographic and employment characteristics variables which encompassed age, gender, height, weight, experience, and the workplace area were found in part one of the questionnaire. The second part addressed the risk factors which included ergonomic factors. These were assessed in terms of work organization, layout of the work station and physical factors. The domains addressed in part three were similar to those used by Lagerstrom et al (2002). These included the prevalence of MSDs, whether medical advice had been sought, and absence from work. Part four of the questionnaire sought information on the characteristics of MSDs in nurses, and the body sites frequently affected.

3.7   Pilot survey

At the pilot stage 10 questionnaires were distributed to test the adequacy of the instrument by identifying ambiguities and difficult questions. Minimal adjustments were made on the original questionnaire; the unnecessary and difficult questions identified during the collection of the preliminary data were discarded.

3.8   Data collection

Data collection began after the study was approved by the Board of Postgraduate Studies, JKUAT and KNH research and ethics committee. The study was conducted during the months of November and December, 2010 and January, 2011. The nurses involved had sufficient knowledge of the procedures embraced and confidentiality was guaranteed through the use of codes. A questionnaire, as shown in Appendix 1, was

developed and used to acquire the data. A copy was distributed to each nurse and a period of two weeks was given to fill the form, after which the forms were collected. The number of questionnaires distributed in the specific areas was determined by both the total number and availability of the nurses in each area. Other methods used to collect data were observation of the work procedures and photography. Random visits were made in the wards and documented by photography when the following activities were being performed: dressing of wounds, feeding of a patient, carrying laundry and storage. The photographs were taken when the nurses were carrying out their procedures but were unaware.

3.9   Data analysis

The collected data was coded and the descriptive data was arranged according to themes. Both qualitative and quantitative methods were used during analysis. The information collected was then analyzed using the Statistical Package for Social Sciences (SPSS) version 17 (SPSS Inc, 2008. Chicago). The photographs taken from selected areas were analyzed for ergonomic risk factors.

In order to identify the risk factors, nurses were asked what they perceived as risk factors at their workplace. Their responses were documented according to similarities and then categorized by frequencies. The study also aimed at establishing whether MSDs are dependent on demographic and employment variables. The demographic and employment factors study variables were characterized using descriptive statistics and

cross tabulations. Chi Square statistics were used to examine the association of the prevalence of MSDs and independent variables such as the demographic factors and employment factors (i.e., age, height, gender, years of service and workplace). The presence of MSDs was measured by the declaration of pain with symptoms persisting for at least 3 consecutive days in a period of one year. A confidence level of 95% was used during the statistical analysis.

The magnitude of MSDs among nurses were established by a descriptive analysis of the presence and duration of pain, its effect on work, and management in terms of seeking medical advice. The results were determined in terms of frequency. Finally, the characterization of MSDs was determined on the basis of frequently incurred injuries. A descriptive statistics for experience of pain by the nurses was obtained and used to determine the MSD cases. Cross-tabulation was then carried out, with the unit of definition as the body site. Most nurses reported a problem at more than one body site.

CHAPTER FOUR

4.0   RESULTS AND DISCUSSION

4.1   Introduction

This chapter contains the research results and discussions. Section 4.2 describes the demographic and employment characteristics of the respondents; Section 4.3 presents the descriptive summary of the findings on risk factors leading to MSDs; Section 4.4 establishes the prevalence of MSDs among nurses; and Section 4.5 characterizes the MSDs on the basis of frequently incurred injuries.

4.2   Description and characteristics of the respondents

Table 4.1 shows the rate of response attained from the various treatment areas studied. Two hundred and forty-four (244) nurses out of the 314 responded to the questionnaire. The greatest challenge encountered during the study was the nurses' work shifts which kept on changing. This hindered the distribution and collection of the questionnaires. The highest response rate was established in the medical areas (85.3%), followed by the surgical, paediatric and the clinic areas (84, 82 and 78% respectively) with an average of 82.3%. There was a noteworthy variance in the response rate of the ICU and A&E sites. This is probably due to the frequent rotation of the work shifts noted in these areas, making it difficult to access the nurses. The A&E department was also noted to have an immense workload especially because the nature of the patients attended to here required urgent attention, making it almost impossible for the nurses to spare time to fill

the forms. The overall response rate was 77.7%. This response rate is considered reasonably adequate because from these results, the purpose of the research which is to recognize the magnitude of MSDs and identify the risk causing factors was established. Babbie (2007) ascertains that "a review of the published research literature suggests that a response rate of at least 50% is considered adequate for analysis and reporting; a response of 60% is good; a response of 70% is very good".

Table 4.1: Response rates attained for various treatment sites studied

Treatment	Total number of nurses in each site	Number of questionnaires distributed	Number responses	Response rate (%)
Medical	220	75	64	85.3
Surgical	212	75	63	84.0
Paediatrics	160	50	41	82.0
ICU	155	50	30	60.0
A&E	58	14	7	50.0
Clinics	184	50	39	78.0
Total	**989**	**314**	**244**	**77.7**

77.7% is the overall response rate. Standard deviation is 13.4

The demographic and employment characteristics of the nurses studied are shown in Table 4.2. Majority (47%) of the respondents were in the age bracket of 36 to 44 years while most of the nurses (45%) were between 5.1 and 5.5 feet (ft.) in height with a common weight ranging from 65 to 74 kg. More than half of the nurses (55.8%) had a work experience of 3 to 12 years; whereas the nurses who had worked in their present sections for less than 4 years were the majority, accounting for 55% of all the respondents studied. KNH is affected by the sluggish formal sector employment growth resulting in low rate of staff employment. This probably explains why there are fewer

nurses below 35 years. Statistics indicate that the rate of formal employment is decreasing with time, in the years 1998 and 1999 it was 14.6%; it reduced to 12.7% in 2005 and 2006 (CBS, 2005).

Table 4.2: Demographic and employment characteristics of the nurses

Characteristics	Range	Response rate (%)
Age (yrs)	18 – 27	6.6
	28 - 35	30.9
	36 - 44	44.2
	45 - 50	11.6
	51 and above	6.6
Height (ft)	Less than 4.5	3.3
	4.6- 5.0	7.1
	5.1- 5.5	45.0
	5.6- 6.0	34.6
	6.1 and above	10.0
Weight (kg)	45 – 54	6.0
	55 - 64	25.0
	65 - 74	40.0
	75 - 84	22.0
	85 and over	7.0
Nursing Experience (yrs)	3 – 12	55.8
	13 - 22	34.5
	23 - 32	9.9
	33 and above	0.8
Length of Stay in present Workplace (yrs)	0 – 4	55.0
	5 - 9	32.0
	10 - 14	12.0
	15 and above	1.0

4.3   Identification of risk factors leading to MSDs

4.3.1   Introduction

The risk factors leading to MSDs considered were the demographic and employment characteristics of the nurses, and ergonomic factors. The demographic and employment characteristics comprised of age, height, weight, gender, and work experience. The ergonomic factors perceived by the respondents as the most common risk factors were grouped into three categories. The first was the physical factors which constituted awkward postures, excessive force, repetitive movements, lifting heavy objects, and long static positions. The second factor that featured was the layout of the workplace and the areas mentioned included infrastructures such as the stairs, the physical plan for the wards, accessibility of the workplace, limited space, and location of the shelves. The organizational structure of the workplace was the third ergonomic risk factor perceived by the respondents which comprised of communication, supervision, staff shortage, teamwork, and the policies.

4.3.2   Risk factors leading to MSDs

Tables 4.3a and 4.3b illustrate the relationship between MSDs and age amongst the nurses. It was observed that the highest prevalence of MSDs (43.6% for male and 44.4% for female) was among those in the age category of 36-44 years for both male and female. The incidence of MSDs was lowest in the nurses aged 27 years and below, and those aged above 51 years. A Chi-square statistical analysis was conducted to test for the relationship between age and the occurrence of MSDs, at a confidence level of 95% and

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alpha 0.05. The null and alternative hypotheses considered were 'age does not influence the prevalence of MSDs' and 'age influences the prevalence of MSDs', respectively. The null hypothesis was rejected in the female nurses indicating that age is a risk factor in the prevalence of MSDs in female nurses $(df = 4, \chi^2 = 11.14, p\text{-value} = 0.02)$. However, among the male nurses, the null hypothesis was not rejected indicating that there is no difference in prevalence of MSDs among male nurses in different age groups $(df = 4, \chi^2 = 8.43, p\text{-value} = 0.07)$.

Table 4.3a: Relationship between MSDs and age amongst female nurses

Age bracket (yrs)	Frequency	Percentage	p-value
EY 18-27	8	7.3	
LY 28-35	39	30.9	
EMA 36-44	56	43.6	0.02
LMA 45-50	14	12.7	
E above 51	9	5.5	
Total	126	100	

Table 4.3b: Relationship between MSDs and age amongst male nurses

Age bracket (yrs)	Frequency	Percentage	p-value
EY 18-27	4	6.4	
LY 28-35	17	30.9	
EMA 36-44	24	44.4	0.07
LMA 45-50	7	11.1	
E above 51	3	7.2	
Total	55	100	

In tables 4.3a and 4.3b: EY stands for early youth, LY is late youth, EMA, early middle age, LMA, late middle age, and E, elderly. The age groupings are based on US census list (Bureau Labor of Statistics) since there was no available data on specific age groupings in Kenya.

The results indicate that MSDs frequently occur during the age bracket of 36 to 44 years among nurses at KNH and are comparable to other study results. Lipscomb et al (2004) found that most MSDs occur during the ages of 30 to 45 years. Guo et al (1995) also

stated that most people have their episodes of back pain by the age of 35 years. However, these findings differ from Best (2000) who indicated that MSDs are more common in nurses over 45 years of age. With regards to this study, the possible explanation for the trend of age in relationship to MSDs is the nature of work allocated to different age groups. The younger nurses are left to carry out the heavy tasks as compared to the older nurses, who are believed to be less energetic. For nurses aged 27 years and below, MSDs may not be common since these disorders are known to be cumulative and are caused by long exposures to risk factors.

The results of this study show statistical significance in association between age and MSDs in female nurses. MSDs were found to be more prevalent in female than male nurses. A probable explanation for these results could be the fact that female nurses are exposed to other predisposing factors during this period, such as child bearing, child rearing, and other greater responsibilities at home. Female are also known to have lesser physical strength, making them more prone to MSDs in comparison to the male nurses. Findings from several studies have reported similar observations. Bos et al (2007) and Choobineh et al (2010) reported that among the workers and in the general population as a whole, muscular pain of the neck, shoulder and back are more common in the female than in the male. Findings in a study by Sikiru and Hanifa (2010) reported that there was a higher prevalence of MSDs in female as compared to male nurses at a rate of 68 and 32%, respectively.

The relationship between the prevalence of MSDs and height in both female and male nurses is shown in Tables 4.4a and 4.4b. The results indicated that MSDs increased amongst female who were in the 5.1-5.5 ft height category (39.7%) and male who were in the height bracket of 5.6-6.0 ft (49.1%). The null hypothesis, 'there is no association between MSDs and height' and the alternative hypothesis, 'height and MSDs are significantly associated' were tested. A Chi-square test conducted at a confidence level of 95% showed that there was no significant association between height and MSDs, thus the null hypothesis was accepted (in female nurses, df is 5, p-value = 0.5, χ^2 is 3.90; and male the df is 5, p-value is 0.19, and $\chi^2 = 7.47$). Although the results do not show statistical significance, the explanation of having some specific height measurements with higher percentages of MSDs is probably because of the poor postures observed during work. Most of the nurses' height falls within the range 5.1-6.0ft, a few nurses measure more than 6.1ft. Inefficient knowledge in ergonomics among nurses in KNH is a likely explanation for increase of MSDs in certain heights. In the study, it was noted that most of the equipment used in the wards, such as trolleys, and beds were not adjustable, resulting into awkward postures for the nurses. Drawers and cupboards in the wards were also placed at unfavorable positions forcing the nurses either to bend so low or overstretch to reach.

Table 4.4a: Relationship between height and MSD prevalence in female nurses

Height range (ft)	Frequency	Response rate (%)	p-value
Less than 4.5	23	18.3	
4.6-5.0	23	18.3	
5.1-5.5	50	39.7	0.50
5.6-6.0	26	20.5	
Above 6.1	4	3.2	
Total	126	100	

In the table, p-value of both genders combined = 0.72

Table 4.4b: Relationship between height and MSD prevalence in male nurses

Height range (ft)	Frequency	Response rate (%)	p-value
Less than 4.5	8	14.5	
4.6-5.0	3	5.5	
5.1-5.5	16	29.1	0.19
5.6-6.0	27	49.1	
Above 6.1	1	1.8	
Total	55	100	

In the table, p-value of both genders combined =0.72

Other studies (Liira et al, 1996; Smedley et al, 1995) had similar outcomes; however they differed in the statistical findings which showed significant association between height and MSDs. In a survey carried out by Boshuiza et al (1990), taller people were at risk for sciatica. Likewise another study reported that the prevalence of back pains doubled among tall workers (Merriam, et al, 1980). A study by Walsh et al, (1991) indicated that the presence of back pain was highest amongst nurses taller than 5.2ft, although the results were not statistically significant. In the present study the association between height and MSDs may not be strong, but it still plays a role as a risk factor in MSDs.

Tables 4.5a and 4.5b present the relationship between weight and MSDs in male and female nurses. The majority of the nurses who experienced MSDs nurses fell in the

weight categories of 65 to 74 and 75 to 84 kg (totaling to 57.2% in female nurses and 67.3% in male nurses). It was also noted that a relatively high number of female nurses (20.6%) in the weight category of 55 to 64 kg had experienced occurrences of MSDs. The least number of male nurses with MSDs weighed 54 kg and below; whereas in the female nurses, the least number was found in those who weighed 84 kg and more. The majority of the nurses surveyed weighed between 65 and 74 kg. The null and alternative hypotheses regarded were 'there is no relationship between weight and MSDs in nurses' and 'MSDs are dependent on the weight of the nurses', respectively. A Chi-square statistical test was carried out and the results indicated that weight and MSDs were not significantly related (at a confidence level of 95%, in female nurses, df is 4, p-value = 0.09 and χ^2 = 9.39; in male nurses, df is 4, p-value = 0.46 and χ^2 = 2.55). These results confirmed the null hypothesis that MSDs are not dependent on the weight of the nurses.

Table 4.5a: Relationship between weight and MSDs among female nurses

Weight (kg)	Frequency	Response rate (%)	p-value
45-54	16	12.7	
55-64	26	20.6	
65-74	38	30.2	0.09
75-84	34	27.0	
> 84	12	9.5	
Total	126	100	

p-value of both M and F = 0.73

Table 4.5b: Relationship between weight and MSDs among male nurses

Weight (kg)	Frequency	Response rate (%)	p-value
45-54	3	5.4	
55-64	6	10.9	
65-74	21	38.2	0.46
75-84	16	29.1	
> 84	9	16.4	
Total	55	100	

When considering the definition of heavy weight, most of the Kenyan nurses fall under this category. Heavy weight is defined as a person scoring more than 25 body mass index (BMI). BMI is calculated as the ratio of weight to height squared. These results show that weight does not play a significant role in MSDs probably because a heavy person is considered to have more muscle growth thus enabling him to perform prolonged load carrying tasks (Commission for OSH, 2010). A report by Ulrika (2005) indicated that a bigger stature is more favorable for load carrying tasks.

The relationship between nurses' work experience and the prevalence of MSDs is shown in Tables 4.6a and 4.6b. The data indicated that 84.7 and 86.6% of the nurses with 20 and less years of experience, suffered from MSDs in male and female respectively. The number of nurses with MSDs was relatively high in this category as compared to those with more years of experience. This implied that as the number of years of experience increased, the number of nurses suffering from MSDs decreased. The highest occurrence of MSDs in the female nurses was seen amongst those who had an experience of 11-20 years (44.4%) whereas in male nurses they occurred more frequent between 0-10 years (45.3%). The null hypothesis considered was 'MSDs and work experience are independent' and the alternative hypothesis was 'there is a relationship between MSDs and work experience'. The Chi-square statistical test carried out confirmed the null hypothesis, thus MSDs and work experience are independent (at a confidence level of 95% and alpha of 0.05: male $df = 2$, $\chi^2 = 1.63$ and p-value = 0.26; the female $df = 3$, $\chi^2 = 1.63$, p-value = 0.44).

Table 4.6a: Association between work experience and MSDs in female nurses

Experience (yrs)	Frequency	Response rate (%)	p-value
0-10	50	40.3	
11-20	55	44.4	0.44
21-30	18	14.5	
31-40	1	0.8	
Total	124	100	

P-value for both M and F = 0.20

Table 4.6b: Association between work experience and MSDs in male nurses

Experience (yrs)	Frequency	Response rate (%)	p-value
0-10	24	45.3	
11-20	22	41.5	0.26
21-30	7	13.2	
31-40	0	0	
Total	53	100	

p-value for both M and F = 0.20

The probable explanation of the high MSD cases occurring in nurses having a work experience of 20 years and less is that the majority of the respondents interviewed fell in this category. However, also the trend in KNH is that young, newly employed nurses are mostly deployed in areas which are physically demanding. As the years progress, they are moved to lighter areas and probably have increased knowledge on proper ergonomic principles. The lower rate of MSDs among nurses with advanced age and more years of experience may be attributed to less patient handling and allocation of more administrative duties. Arrighi (1994) observed lower prevalence of MSDs in older workers who have higher clinical experience. He termed this as "survivor effect". Survivor effect describes a continuing selection process such as those who remain in an employment tend to be healthier overtime. The results of the MSDs in relation to age in

this study is similar to that of Tinubu et al, (2010), who also reported a higher percentage in nurses with less than 20 years of practice.

Tables 4.7a and 4.7b present the relationship between different workplaces and MSDs in nurses. Of all the workplaces studied, the highest percentages of MSDs were observed in the medical and surgical wards. The cases of MSDs among the male nurses were 36.4% in the medical wards and 21.8% in the surgical wards; whereas the female presented with 19.8% in medical, and 30.9% in the surgical wards. The A & E department had the least number of MSD cases. The null hypothesis tested is 'MSDs are independent of the workplace'. The alternative hypothesis is 'MSDs and the workplace are dependent'. The statistical results indicated that the rate of MSDs was not significantly associated with the workplace (at a confidence level of 95%, the chi-square results in both the male and female were; $df = 5$, $\chi^2 = 2.23$, p-value = 0.81, and $df = 5$, $\chi^2 = 5.61$, p-value = 0.47, respectively). In both genders, the null hypothesis was rejected, meaning that there is no relationship between MSDs and the nurses' workplaces.

Table 4.7a: Relationship between the workplace and MSDs in female nurses

Workplace	Frequency	Response rate (%)	p-value
Medical	25	19.8	
Surgical	39	30.9	
Pediatrics	21	16.7	0.47
Accident and Emergency	1	0.8	
Intensive Care Unit	16	12.8	
Clinics	24	19.0	
Total	126	100	

p value for both genders = 0.94

Table 4.7b: Relationship between the workplace and MSDs in male nurses

Workplace	Frequency	Response rate (%)	p-value
Medical	20	36.4	
Surgical	12	21.8	
Pediatrics	8	14.5	0.81
Accident and Emergency	3	5.5	
Intensive Care Unit	5	9.1	
Clinics	7	12.7	
Total	55	100	

p-value for both genders = 0.94

In KNH it was observed that most of the patients who attend the A & E department were accompanied by relatives or care givers who assisted during the patient handling. It was also noted that each of the workplaces was mediated by the different job types and specific exposures. In the present study, each of these different areas of work had specific kinds of challenges because the characteristics of the patients such as age and diagnosis; the layout of the workplace and the type of equipment used in each area differed.

The results in this study differed from those by Kee and Seo (2007) and June and Cho's (2010) which recognized ICU as the area with the highest number of nurses suffering from MSDs, followed by the surgical wards. In this study, ICU is one of the areas with the least number of nurses with MSDs. Similarly, Cho's (2010) reported learnt cases of MSDs in A & E department. Smith et al (2003) also noted that the prevalence of MSDs have variations in different work settings because of the difference in the work tasks.

4.3.3 Ergonomic risk factors

The ergonomic factors perceived by the respondents as the most common occurring risk factors were physical factors, layout of the workplace, and the organizational work structure. Physical factors comprised of awkward postures, lifting of heavy objects, long static positions, excessive force and repetitive movements. In the layout of the workplace, the areas mentioned as risk factors included physical infrastructures such as the stairs, the physical plan for the wards, and accessibility of the workplace, limited space resulting into overcrowding and locations of the shelves. As pertaining to the organizational structure of the hospital, the respondents were concerned about communication, supervision, staff shortage, teamwork, and workplace policies.

Figure 4.1 illustrates the rating of the perceived ergonomic risk factors that contribute to MSDs among nurses. The results indicated that physical factors were the most perceived ergonomic risk factors precipitating MSDs (50%), followed by the layout of the workplace (37%); work structure was the least perceived factor with 13%. The physical factors frequently mentioned were lifting of patients, carrying out procedures in awkward positions and standing for long hours. In the layout of the workplace, the respondents had problems with the location of the workplace in relation to other departments frequented. The nurses had to walk long distances to take and collect reports from their administrators despite their heavy schedules. Other areas of concern in the layout of the workplace were lack of ramps, height of equipment, and overcrowding of the work areas. The workplace structure was also viewed as a contributory factor in

the cause of MSDs. Here, pressure of work, inadequate communication, and poor supervisor-nurse relationship were indicated as frequent occurrences in the workplace.
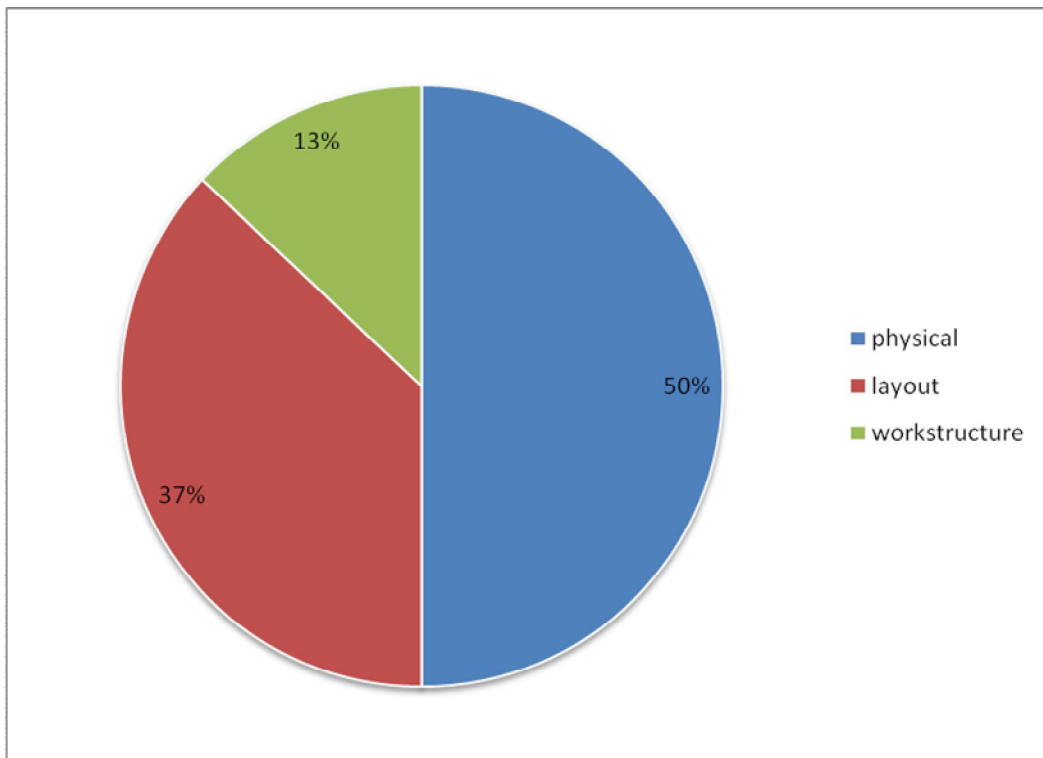
Figure 4.1: Rate of perceived ergonomic factors leading to MSDs among nurses.

Plate 4.1 highlights a storage facility for equipment and other accessories. The store is crowded, leaving inadequate room for maneuvering, and also reaching out for items will require awkward postures such as bending and overstretching the arms which poses a danger to the user. This is evident of poor housekeeping in the area.

Photo taken at KNH
Plate 4.1: Storage area in the ward.

Photo taken at KNH
Plate 4.2: Nurses dressing wounds in the ward.

Plate 4.2, above, captures a typical dressing room scenario replete with overcrowding.

This poses a risk factor as it compromises the safety of the workers.

In KNH, it was observed that the patient population was high resulting in limitation of space. The other probable cause of these alleged physical risk factors was staff shortage which resulted in inadequate assistance when carrying out tasks such as lifting or transferring patients and items. The weight carried and the postures incurred posed a risk to MSDs. Plate 4.3 shows a nursing aide transporting laundry to the wards. The size of the load obviously requires excessive force, not only posing a physical strain on the workers, but also eminent danger should the luggage fall.

Photo taken at KNH
Plate 4.3: A nursing aid carrying laundry.

Lack of equipment like hoists and mechanical lifts forced the nurses to lift the patients manually. Garg et al (1991) and Daynard et al (2001) also concur that the availability of mechanical devices has a positive impact on the health of the worker. High risk patient handling tasks vary according to clinical settings. In KNH the majority of patients

admitted in the medical and surgical areas are adults who are dependent; meaning a lot of manual handling is required. The other places where there are many adult patients are specialized units (viz, ICU, A & E, and outpatient clinics); however the A & E department and clinics cater for outpatients whereas the ICU and specialized units have a higher number of staff in comparison with other areas. Several studies have indicated that certain clinical settings especially the geriatrics and long-term settings are risk factors in the causation of MSDs (Garg and Owen, 1992; Oslon and Garg, 1995; and Smedley et al., 1995).

The results of this study show that the outstanding factor that significantly associated with MSDs is the age of the nurses. In both male and female, it is evident the ages prone to MSDs was the late youth (28-35 years) and the early middle age (between 36-45 years). The study also indicate that the factors perceived by the respondents as risks to causing injuries were physical factors, infrastructure and work organization.

4.4   Establishment of the prevalence of musculoskeletal disorders among nurses

4.4.1   Introduction

The prevalence of the MSDs was determined by the incidences of MSDs in nurses, the medical attention sought, and the sick leave taken. The occurrence of MSDs in both male and female nurses was determined by the presence of pain exceeding three consecutive days. The off duty days taken due to these injuries was based on self-reports.

4.4.2   Prevalence of MSDs in nurses at KNH

The prevalence of MSDs among nurses is presented in Table 4.8. The nurses who suffered from MSDs were 74.2% of the total nurses studied. Those who suffered from MSDs amongst the female nurses were the 76% and the male nurses with MSDs accounted for the 70%. The number of female nurses with MSDs is more than twice that of the male nurses. This data clearly shows that the prevalence of MSDs in KNH is comparatively high. The prevalence of MSDs has varied according to studies but has been generally high in most of the previous studies encountered. Fabunmi et al (2008), in a study from Nigeria, reported that the prevalence of MSDs was 90.7%. A study carried out in Japan by Smith et al (2006) showed that the number was much higher here with 99.9%. In Korea the prevalence was 73.3% (Smith and Choe, 2005). This compares closely with the KNH situation. Amongst the studies encountered, the one with the least number of MSDs recorded is that by Harber et al, (1985), which stated that 52% of nurses reported experiencing MSDs. The variations noted in prevalence of MSDs over national boundaries may be a result of organizational differences in work settings, cultural differences in perception of pain and economic status and availability of instruments.

Table 4.8: Prevalence of MSDs among nurses

Gender	Respondents having MSDs		Respondents without MSDs		Total respondents		p-value
	N	(%)	N	(5)	n	(%)	
Male	55	22.5	24	9.8	79	32.4	0.42
Female	126	51.6	39	16	165	67.6	
Total	181	74.2	63	25.8	244	100	

In the table: n is number

Table 4.8 further shows results of the statistical analysis which indicate that the relationship between gender and MSDs is not significant ($p > 0.05$; $CL = 95\%$; $\chi^2 = 1.75$; df = 1). With regards to previous results of this study, gender with the age variable shows significance; but when looking at the gender without considering the variable, the results fail to show any relationship. In several studies, gender differences are considered to be a key feature in the epidemiology of MSDs (Silverstein, et al., 2009; Tosii et al., 2005; Fillingin, 2000; Wijnhoven et al., 2006).

4.4.3 Medical attention sought amongst nurses with MSDs

Tables 4.9 and 4.10 showed the frequency of the nurses who sought medical attention for the musculoskeletal problems experienced and those who had to take sick leave from work in a period of one year. The total number of respondents who experienced MSDs was 181 (74.2%), out of which only 52% sought medical intervention. Seventy nine percent (79%) of those who sought medical attention took sick off from duty during the last twelve months.

Table 4.9: Nurses with MSDs that sought medical attention

Nurses	No. of respondents	Response rate (%)
Sought medical attention	95	52
No medical attention	86	48
Total	181	100

Table 4.10: Nurses who sought medical attention and sick leave

Nurses	No of respondents	Response rate (%)
Got leave	75	79
No leave	20	21
Total	95	100

Majority of nurses attributed their symptoms to back pains. In this study, the magnitude of MSDs is evident; however almost half of the nurses (48%) did not pursue medical attention. This could possibly be because of the nurses' perseverance or lack of adequate information on importance of treatment by medical personnel. Culturally, most people are reluctant to seek medical attention unless the pain is acute (Pollard et al., 2011; CCDPM, 2011). This has also been observed in a study carried out by Lunn (1991), who noted that nurses and medical personnel have been notorious in the neglect of their own health. Out of all the nurses who had MSDs (181), about 41% had sick offs'. This number is relatively large when considering the consequences of the nurses being off duty. Leif et al. (2009), reports how sick leave has negative consequences for employers and colleagues in the development of salary and career. Simo (2012) confirms that MSDs are responsible for more sick leaves than other conditions in Finland; in his survey, he indicated that support for sick leave is strong but the consequences are severe. Some of the positive consequences he mentioned were enough rest to enable recovery delay of progressive course of disorder, and opportunities to participate in rehabilitation. Table 4.11 above shows a further analysis of the sick leave in relation to age, gender, work place and experience. It was noted that the nurses who were aged between 35-44 years had the most number of sick leave days taken in the year (42.7%). However, this was also the age bracket noted to have the largest number of MSDs. According to the workplaces, the highest number of sick-offs was observed in the medical and surgical wards (24 and 22.6%, respectively) and the lowest number was in the A & E department. Forty percent (40%) of the nurses who had worked for less than 10 years

had the most sick-off days taken in the category of experience, followed by those who had worked for 11-20 years (38.7%). There was no sick leave taken in that year by the nurses who had worked for over 31 years. The female nurses, as compared to the male, had a total of 52 nurses (69.3%) who had sick-leave that year.

Table 4.11: Sick leave taken in relation to age, gender, workplace and experience

Variable	Category	No of nurses who took sick leave	Response rate (%)	P–value
Age	18-27	4	5.3	
	27-35	16	21.3	0.011
	35-44	32	42.7	
	44-50	14	18.7	
	50 and above	9	12	
Sex	Male	23	30.7	0.822
	Female	52	69.3	
Workplace	Medical	18	24	
	Surgical	17	22.6	
	Paediatrics	11	14.7	0.469
	A & E	2	2.7	
	ICU	11	14.7	
	Clinics	16	21.3	
Experience	0-10	30	40	
	11-20	29	38.7	0.050
	21-30	16	21.3	
	31-40	0	0	

n = 75

The results of the statistical analysis indicated that only the age and experience variables were significantly related with sick leave (*CL* of 95%, for age the *p*-value < 0.05, df-4 and $\chi^2 = 13.077$; and experience the *p*-value = 0.05, df = 3 and $\chi^2 = 7.629$). In KNH most of the nurses who have an experience of 11-20 years fall in the age bracket

of 35-44 years. MSDs are cumulative conditions and this is the probable time when the symptoms set in.

The prevalence of MSDs amongst nurses in KNH has been fairly high at 74.2%. Despite there being no significance relationship in gender and MSDs, the injuries were found to be quite high in the female nurses. It was also noted that not many nurses (52%) sought medical intervention. Seventy nine percent of the nurses who sought medical attention had taken sick leave.

4.5   Characterization of musculoskeletal disorders

4.5.1   Introduction

The existing MSDs are characterized on the basis of frequently incurred injuries, the age of the nurses commonly affected, the years of experience, and the particular workplace where nurses are prone to MSDs.

4.5.2   Frequently incurred injuries

Musculoskeletal disorders were characterized according to the body areas frequently injured. As shown in Table 4.12, the highest prevalence of MSDs according to body areas affected was the back (32.5%), followed by the feet (21.5%) and the neck and shoulder (20.4%). The findings indicate that hands are the least affected body parts with 6.3%. Most of the nurses indicated presence of pain in more than one body area.

Table 4.12: Response rate of nurses who reported suffering from MSDs in various body parts

Injured body parts	No of respondents	Response rate (%)
Back	169	32.5
Feet	112	21.5
Neck and Shoulder	105	20.4
Knees	59	11.3
Head	42	8.0
Hands	33	6.3
Total	520	100

In the present study, the frequency of back problems in KNH is probably because most of the beds, trolleys, and other equipment are faulty as reported by the respondents. This equipment cannot be adjusted forcing the worker to acquire unacceptable postures so as to be able to perform his job. This is against the ergonomic principles which states that the job should be fitted to the worker, not the worker to the job. Lack of lifting equipment also contributes greatly to development of back problems. The major causes of back problems are poor posture and improper lifting techniques (Bridger, 1995). The high prevalence of injury to the back as reported in this study is in accordance with several studies (Smedley et al., 1995; Yip, 2001; Trinkoff et al., 2002 and Smith et al., 2004). Plate 4.4 captures a nurse feeding a patient. The patient is on the floor as a result of lack of equipment. It can be noted that the nurses posture shows awkward bending, exposing her to MSDs.

Photo taken at KNH
Plate 4.4: A nurse feeding a patient.

The analysis further breaks down the frequency of the body parts according to age, gender, years of service and the workplace. As shown in Table 4.13, the majority of nurses in all the variables (age, gender, experience and work place) suffered from back pains followed by problems of the feet. Except for the category of nurses aged less than 27 years which did not have any of the respondent suffering from pains in the shoulders, hands and knees, the rest of the categories had at least a nurse having problems in each of the body areas. Despite the difference in the number of MSD cases, the pattern of the MSDs is similar, with the majority of nurses having back pains and the least experiencing problems with the hands.

Pain of the feet are caused by long standing which results in stress on the heel bone, decrease in motions of the joints of the foot and reduced blood circulation in the lower

extremity (Bridger, 1995). This is a possible cause for feet pains amongst the respondents in KNH where it was observed that the nurses hardly sat down and rarely had breaks during work. Likewise, poor posture and misalignment of the spine and over exertion is witnessed in KNH.

Table 4.13: Response rate (%) of the nurses on body parts affected by MSDs in relation to age, gender, workplace and experience

Category	Head	Neck and shoulder	Hands	Back	Knees	Feet
Age						
18-27	7	0	0	2	0	2
27-35	35	36	31	32	27	33
35-45	31	43	39	42	48	44
45-50	17	10	15	14	15	10
>50	10	11	15	10	10	11
Gender						
Male	21	36	39	28	32	27
Female	79	64	61	72	68	73
Workplace						
Medical	38	26	42	26	21	23
Surgical	24	23	18	29	25	31
Paediatrics	17	16	21	17	24	14
A & E	5	6	3	2	0	3
ICU	7	12	3	11	15	13
Clinics	9	17	13	15	15	16
Experience						
0-10	40	45	40	42	37	38
11-20	40	33	45	42	49	45
21-30	20	19	15	15	14	15
31-40	0	3	0	1	0	2

The total number of nurses experiencing pain of the head, neck and shoulder, hands, back, knees and feet was 42, 105, 33, 169, 59 and 112, respectively.

In the age classification the highest number of nurses experiencing pains in all body parts fell between 36-45 years. In comparison with all the other work places, the medical wards had the largest number of nurses suffering from pains in the head, shoulders and hands (38, 26 and 42%, respectively); on the other hand, the surgical wards had the highest number of nurses suffering from back, knees and feet injuries (29, 25 and 31%, respectively). In relation to experience, nurses who had worked for 0-10 and 11-20 years had similar percentages of head pains (40%) and back injuries (42%). Shoulder pains were experienced more in nurses who had worked for less than 10 years (47%), while hand, knee and feet pains were prevalent in the nurses who had worked for 11-20 years (45, 49 and 45%, respectively).

The most frequent occurring body part injury was the back, followed by the feet (32.5 and 21.5%, respectively). Most of the nurses indicated pain in more than one body part. The medical wards had the highest number of nurses suffering from the head, neck and shoulders and hands injuries, whereas most of the nurses in the surgical wards experienced back, knee and feet injuries.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1   Conclusions

Musculoskeletal disorders among nursing personnel at Kenyatta National hospital are a major occupational health problem. This study established the following conclusions:

1   The perceived causes of MSDs among nurses in KNH were ergonomic factors such as the physical factors, layout of the workplace, and the organizational structure. The physical factors mentioned included awkward postures, long static positions and lifting of heavy loads. The areas identified in the layout were overcrowding of the work area and the physical infrastructure. In the work structure classification, inadequate communication and poor supervisor-nurse relationships were mentioned as frequent occurrences that are likely to lead in MSDs. In the female nurses, age was the outstanding characteristic that was significant in the etiology of MSDs. The late youth (28-35 years) and the early middle ages (36-45 years) were found to be prone to MSDs.

2   The nurses who experienced MSDs were 74.2% of all the nurses studied, indicating that the prevalence is quite high in KNH. Out of the female nurses, 76% suffered MSDs, and in male nurses the incidence was 70%.

3   Musculoskeletal disorders were characterized on the basis of frequently incurred injuries. The results showed that the incidence was more in the back, feet and shoulders (32.5, 21.5 and 20.4%, respectively). However, most nurses indicated pain

in more than one body region. The nurses response of the body areas affected varied in different workplaces; the medical wards had the highest numbers of head, shoulders and hand injuries (38,26 and 42% respectively) whereas most of the nurses in the surgical wards experienced back, knee and feet pains (29, 25 and 31% respectively).

4   The results indicate there is a great need for an ergonomic intervention to control the MSDs

5.2   Recommendations

Based on the findings and observations of the study, the following recommendations were made:

1   Characteristics of the nurses that affect vulnerability to MSDs comprise of age and gender. This calls for a development of an integrated program which will provide continuing education concerning risk factors inside and outside the workplace; and periodic screening with timely feedback to the nurses.

2   Ergonomic programs to address equipment design, teach safe handling techniques, attend to the work procedures and organizational factors should be incorporated.

3   The high prevalence of MSDs amongst nurses, as the study results show, is a clear indication that priority should be given to provide more comprehensive surveillance of MSDs and develop mechanisms to assist workers in understanding and utilizing the available interventions designed to reduce MSDs.

4   The study design, being cross sectional, was limited to the present work force. The

study was carried out at a onetime point thus giving no indication of the sequence of

events. There is need to carry out a longitudinal study which will investigate MSDs

amongst nurses over a period of time.

5   Most of the data comes from self-reported surveys. Self-reported data, despite being

valid may underestimate the prevalence of the MSDs. Further research that

establishes an inclusion of measurements and observations is required.

6   The ergonomic factors investigated in this study did not include the environmental

and psychosocial aspects. Also, other factors such as the participants' characteristics

of their lifestyle which could have an impact on their health at work need to be taken

in consideration in future studies.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

INSTRUCTIONS

- Please tick where there is a box

- Fill in where there are spaces provided

I   Personal information of the respondent

BIO-DATA

1. Age of respondent:

   a) 18 - 27 ☐

   b) 28 - 35 ☐

   c) 36 - 44 ☐

   d) 45 - 50 ☐

   e) 51 and above ☐

2. Gender:

   a) Male ☐   b) Female ☐

3. Height:

   a) 4.5 and less ☐

   b) 4.6 - 5.0 ☐

   c) 5.1 - 5.5 ☐

   d) 5.6 - 6.0 ☐

e) 6.1 and over ☐

4. Weight:

    a) 45 - 54 ☐

    b) 55 - 64 ☐

    c) 65 - 74 ☐

    d) 75 - 84 ☐

    e) 85 and above ☐

II   Risk factors leading to MSDs

WORKPLACE INFORMATION

5. Total number of years in the Nursing Career:

    a) 3 – 12 ☐

    b) 13 - 22 ☐

    c) 23 - 32 ☐

    d) 33 and above ☐

6. Present workplace:

    a) Medical Wards ☐

    b) Surgical wards ☐

    c) Paediatric wards ☐

    d) Accident and Emergency ☐

    e) Intensive Care Unit ☐

f) Others ☐

7. Length of stay in the present work area:

   a) 0 - 4 ☐

   b) 5 - 9 ☐

   c) 10 - 14 ☐

   d) 15 and above ☐

8. Nature of employment.

   a) Full time ☐

   b) Part time basis ☐

   c) Temporary Basis ☐

   d) Others ☐

ERGONOMIC FACTORS

9. List three major daily tasks performed at work

_____

_____

_____

10. Which of the above mentioned tasks do you find most strenuous during the

procedures?

_____

_____

11. Which one of the following factors do you think contributes most to musculoskeletal or workplace injuries?

    a)   Physical factors and characteristics of nature of work ☐

    b) Work organization ☐

    c) Workplace infrastructure and layout ☐

12. In reference to No. 11, please list down your reason for the chosen factor.

_____

_____

_____

13. Tick the requirements of the patients in your area according to the physical dependency level.

Patient requirements	Most frequent	Frequent	Rare
a) Total dependence			
b) Extensive assistance			
c) Limited assistance			
d) Requires only supervision			
e) Independent			

III   The prevalence of musculoskeletal disorders and characterization of frequently incurred injuries

14. Do you experience regular body pains?

a) Yes [____]   b) No [____]

15. In reference to No 14, if yes, tick against the part of the body that is affected.

    a) Head [____]

    b) Neck and Shoulders [____]

    c) Hands [____]

    d) Upper Back and Lower Back [____]

    e) Knees [____]

    f) Feet [____]

16. For how long have you experience such pains?

_____

17. Have you sought medical advice been sought?

a) Yes [____]   b) No [____]

18. Have you had sick leave during the past one year?

a) Yes [____]   b) No [____]

19. In reference to No 18, if yes, how many days in total have you taken?

_____

_____

THANK YOU

APPENDIX B: OBSERVATIONAL CHECKLIST

Task performed:

_____

_____

_____

Numbers of workers performing the task:

_____

Review of task

Process:

1. Duration of the task

2. Variety of tasks

3. Machines/ equipment used in the task

4. Posture required

5. Frequency of task performance/ repetitive

Materials:

1. Weight

2. Storage location

3. Nature of packaging

Environment:

1. Working space

2. Overcrowding

3. Temperatures

4. Flooring

5. House keeping

Equipment:

1. Working height

2. Location of controls

3. Mobility

4. Location

5. Maintenance

6. Adjustability

Human:

1. Insufficient training on techniques

2. Differences in work methods

3. Behavior observed

Observed risks:

_____

_____

_____

APPENDIX C: CONSENT FORM

My names are Juliet Mugga and I am an occupational therapist undertaking a Masters Degree in Occupational Safety, Health and Environment (OSHE) at Jomo Kenyatta University of Agriculture and Technology, Nairobi. I am carrying out a study on analysis of musculoskeletal disorders amongst nurses. The purpose of the study is to investigate the conditions and procedures under which the nurses work with the aim of identifying the risk factors for prevalence of musculoskeletal disorders. The findings of the study will lead to recommendation on strategies to prevent occurrence of musculoskeletal disorders.

You are requested to fill up a questionnaire which will take approximately 15 minutes. Any information you give will be confidential and will be used for the research purpose. You may withdraw from participation at any time if you don't wish to continue. You are encouraged to discuss any concern or ask any question you may have regarding the study with the investigator at any time.

If you consent, please sign below

Name _____ Signature _____ Date _____

Investigator: Juliet Mugga

Telephone: 0733801373

E-mail: julietmugga@yahoo.com   Signature _____

THANK YOU

APPENDIX D: PUBLICATION

Mugga Juliet, Mailutha Joseph, Kanali Christopher. Analysis of musculoskeletal disorders among nurses: a case study of Kenyatta national hospital. Presented at the 7th Egerton University Conference in 2012.