

**ASSESSMENT OF WORK-RELATED MUSCULOSKELETAL
DISORDERS AMONG NURSES IN MOMBASA COUNTY, KENYA**

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**MASTER OF SCIENCE
(Occupational Safety and Health)**

**JOMO KENYATTA UNIVERSITY OF
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2015

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**A THESIS SUBMITTED IN PARTIAL FULFILLMENT FOR THE
AWARD OF THE DEGREE OF MASTER OF SCIENCE IN
OCCUPATIONAL SAFETY AND HEALTH IN THE JOMO
KENYATTA UNIVERSITY OF AGRICULTURE AND
TECHNOLOGY**

2015

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 work to my dear parents, Mr Elkanah Songol and Mary Tanui and My husband Clinton Ovamba, my children Audreylyne Vinanywa, Joy Clairia Mwavishi and Samantha Lwegado.

ACKNOWLEDGEMENT

I would like to thank the Almighty God for seeing me through this process. My supervisor Professor Erastus Gatebe and Dr Bendard Kirui are highly acknowledged for supporting and encouraging me to accomplish my dream. I will also like to thank Professor Robert Kinyua the chairman of the department for his tireless mentorship and encouragement.

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LIST OF ABBREVIATIONS/ACRONYMS

MSDs	Musculoskeletal disorders
WRMSDs	Work related musculoskeletal disorders
NMQ	Nordic musculoskeletal symptom questionnaire
ICs	Industrialized Countries
IDCs	Industrially Developing Countries
BMI	Body mass index
MSW	Municipal solid waste workers
MRI	Magnetic resonance imaging
EMG	Electromyography
ENMG	Electroneuromyography
NCV	Nerve conduction velocity
LBP	Lower back pain

OPERATIONAL DEFINITIONS OF TERMS

Awkward posture Working in a poor position which is a risk factor to WRMSD

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

ABSTRACT

Work-related musculoskeletal disorders (WRMSDs) are injuries affecting the connective tissues of the body. They are leading causes of occupational injury and disability in the world. In Kenya, nurses are exposed to work-related musculoskeletal disorders because of long hours of static work with awkward postures, heavy load lifting and repetitive movement. The main aim of this study was to assess work-related musculoskeletal disorders among nurses working in private and public hospital in Mombasa County. A descriptive cross-sectional study design was employed. A self administered questionnaire was used to gather information from 130 randomly selected nurses out of a sample size of 169 giving a response rate of 79.9%. Ergonomic issues perceived by the nurses as factors causing WRMSDs found to be significant ($p \leq 0.05$). The study showed that 76.9% of the nurses were female while 23.1% were males. Analysis showed that there was no significant association ($P=0.40$) between any age category and the gender as well as nursing profession. The 12 months prevalence of work-related musculoskeletal among the nurses at any body part was 70.8%. The WRMSDs was highest in the low back (76.9%), followed by the neck (53.8%) then shoulder and ankle/feet (48.5%). The leading risk factor for WRMSDs were inadequate training on injury prevention (93.1%) followed by working in the same position (89.2%) carrying and lifting or moving heavy material or equipment (81.5%). The level of awareness of nurses on WRMSDs was moderate to high. There was strong association between prevalence of work related musculoskeletal disorders and how they affect the nurses' productivity and patient care in hospitals ($p < 0.05$). The findings can be used by the hospitals administrators to come up with proper guidelines on addressing prevention and coping strategies for work-related musculoskeletal disorders among nurses in order to reduce the rate of occupational hazards and improve patients' care in hospitals.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Work-related musculoskeletal disorder (WRMSDs) is a disorder that affects the tendons, muscles, joints, peripheral nerves, inter-vertebral discs and vascular system, resulting from work activities which are frequent and repetitive, or activities with awkward postures. In the nursing profession WRMSDs is caused by repetitive movements, continuous static awkward postures, genetic predisposition and number of years in practice (Aptel *et al.*, 2002). Other factors includes; sub-optimal lighting, age and sex all of which appear to affect more female than male nurses. While physical factors are important predictors in developing WRMSDs for nurses, psychological factors may also be involved. These factors include; mental stress due to unexpected procedural events, the conditions of patients and time limitations on treatment sessions for patients (Alexopoulos, *et al.*, 2003). The work related muscular skeletal disorders (WRMSD) are a worldwide concern and distributed among both Industrialized Countries (ICs) and Industrially Developing Countries (IDCs). In IDCs, the problems of workplace injuries are extremely serious. Poor working conditions and the absence of an effective work injury prevention program in IDCs has resulted in a very high rate of WRMSD (Holder, 1999). Risk factors of WRMSDs are known to include workplace activities such as heavy load lifting, repetitive tasks and awkward working postures, while demographic characteristics and psychosocial factors are also known to be important predictive variables (Aptel *et al.*, 2002).

The most common body regions that are affected by WRMSDs are the lower back, neck and shoulders (ILO, 2007). Most employees including Nurses complained most of back pain followed by neck and shoulder as a result of their day to day work activities (WHO, 2005). The WRMSDs are very common health problem experienced by workers and a major cause of disability throughout the world in the workplace (WHO, 2010). The WRMSDs are known as major causes of significant human suffering, and loss of productivity on industries. In addition, WRMSDs may result in discomfort, difficulty in

performing jobs and absence from work. Others are; low work efficacy, economic impact due to reduced working hours, high costs of medical treatment, effects on daily life and premature retirement from the profession (Smith *et al.*, 2003; Leijon *et al.*, 2009; Holder *et al.*, 2009). Assessment of exposure level to WMSDs risks can be an appropriate base for planning and implementing interventional ergonomics program in the hospitals in Kenya. The WMSDs have a wide range of impacts on the work and life of nurses working in selected Government and private hospitals in Mombasa County.

1.2 Problem Statement

The nursing profession is a very demanding job, both physically and emotionally. Nurses are exposed to poor working condition for instance, stressful posture as a result of the chairs used in the selected hospitals that are not ergonomically designed and hence exposing the nurses to body problems for instance back ache among other body pains. The problem is complex and costly; it has a negative impact on nurses' quality of life, with economic consequences in terms of costs of treatment, with potential for lost days of work and poor performance at work. Inadequate staffing could also be a contributing factor to high prevalence of WRMSDs among nurses since they work for long hours with repetitive task. Nurses routinely perform activities that require lifting heavy loads, lifting patients, working in discomfited postures and transferring patients out of bed and from the floor. These work tasks put nurses at high risk of acute and cumulative WRMSDs.

1.3 Justification of the Study

Despite the large literature on work related WRMSDs in other parts of the world, very little has been done in Kenya especially at the Mombasa County, among the nurses who experience WRMSDs at an exceeding rate. Nurses in Mombasa County deal with a variety of critical and encounter patients with catastrophic injuries, which can be emotionally traumatic. Nurses in some times are forced to work for long hours and deal with a large number of patients especially in public Hospitals. These actions often result in musculoskeletal disorders. The study has also established the awareness level of

nurses' on WRMSDs. In addition measures to reduce the prevalence of the problem and coping strategies has been recommended. The study has availed information which can be used in improving the ergonomic standards and patient care delivery services. Considering the significance of WRMSDs as a common problem in the nursing profession, the negative impact on nurses and the major role the nurses' play in hospitals. Therefore it was worth investigating the prevalence of work- related musculoskeletal disorders in Mombasa county since the study had not be done prior hence it has availed data for other researchers to make reference or comparison.

1.4 Objectives

1.4.1 Main objective

To assess the prevalence of work-related musculoskeletal disorders among nurses working in private and public hospital in Mombasa County, Kenya

1.4.2 Specific Objectives

1. To establish nurses awareness on work related musculoskeletal disorders in Mombasa County
2. To determine the risk factors that may contribute to development of work-related musculoskeletal disorders among nurses in Mombasa County
3. To determine the prevalence and the impact of work-related musculoskeletal disorders on nurses productivity in Mombasa County

1.4.3 Alternate Hypothesis

1. WMSDs is a common problem among the nurses population in Kenya
2. Work related musculoskeletal disorders has an impact on nurses' productivity in hospitals
3. Long working hours with discomfited postures contribute to development of WMSD among nurses in Kenya

1.5 Research Question

1. What is the awareness of nurses on work- related musculoskeletal disorders?
2. What are the risks factors that cause work-related musculoskeletal disorders?
3. What is the prevalence of WMSD on nurses' productivity in hospitals?

1.6 Scope of the study and limitations

The study was carried out in selected private and public hospitals in Mombasa County, which include Tudor District Hospital, Port Reitz District Hospital, Jocham Hospital, Aga Khan Hospital and Pandya Hospital.

This study was limited by the use of a convenience sample, which reduces the generalization of the findings. In addition, the study design could not measure the cause-effect relationship between the study variables. Therefore, it may be possible that there are other variables that could be affecting the study findings. However, the persons without WMSDs may have a similar degree of burnout resulting from other occupational stressors.

This study is limited in its generalizability because of the non-probability sample employed. However, this error was minimized as much as possible by systematically selecting two public and four private hospitals in Mombasa County each of them representing the different tiers of health care providers.

The variability of the workload and ergonomics knowledge of the study respondents in these different hospitals may influence homogeneity. This study investigated the lifetime and 12 months period experience of WMSDs which could also lead to some degree of misclassification due to recall bias. Like all other cross-sectional or self-report studies, it is possible that the respondents might have given vague answers or exaggerated their WMSDs. It is also possible that some of the respondents in the study perceived their musculoskeletal disorders as WMSDs regardless of whether they were caused by work or not. This study was delimited to nurses in active service only, those

who left the workforce due to retirement or WMSDs or any other reason were not included in the current analysis.

1.7 Conceptual Frame Work

The fundamental principle of occupational health and safety is elimination of hazards at the source. In the case of WMSDs, the major leading causes are awkward postures and repetitive work. Other components of work such as the fixed body positions, applied force, inadequate staffing, poor work layout, lack of job training and education and inadequate supply of tools and equipments are also contributing factors to WMSDs. Therefore the main effort to protect workers from WMSDs should focus on avoiding awkward postures and repetitive patterns of work through job design which may include mechanization, job rotation. Where elimination of awkward postures and repetitive patterns of work is not practical, prevention strategies involving workplace layout, tools and equipment design, job training and education and adequate staffing is needed. Work related musculoskeletal disorder is a dependent variable while the other variables are independent (Figure 4.1)

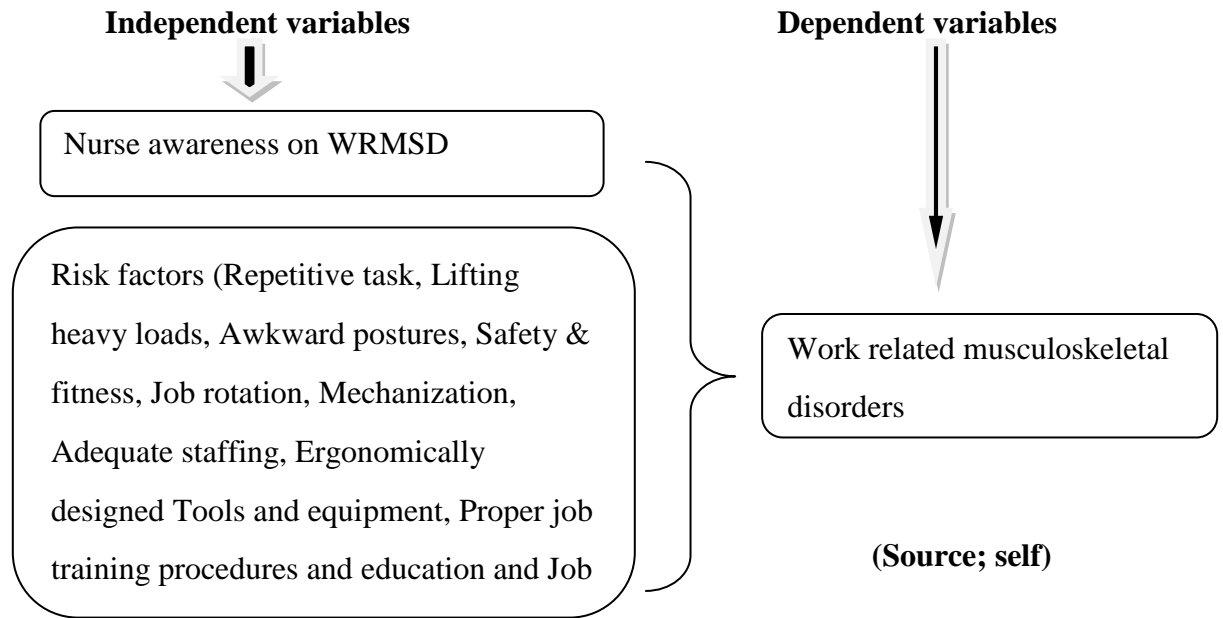


Figure 1.1: Conceptual frame work

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Work related muscular skeletal disorders

Poor working conditions and the absence of an effective work injury prevention program in high income countries has resulted in a very high rate of WRMSD (Holder *et al.*, 2009). Risk factors of WRMSDs are known to include workplace activities such as heavy load lifting, repetitive tasks and awkward working postures, while demographic characteristics and psychosocial factors are also known to be important predictive variables. Exposure to risk factors for WRMSDs is likely to result from patient care activities that include lifting patients, transferring patients and the performance of manual therapy. Each activity involves the application of relatively high levels of force and each activity may have to be performed in hazardous postures. Patient handling has been consistently associated with WMSD in nurses and biomechanical studies have demonstrated very high associated loads. Nurses have one of the highest rates of nonfatal occupational musculoskeletal injuries (Hoskins, 2004). The need to improve working posture has been documented in a number of studies which have shown a relation between stressful postures at work and functional disturbance or pain in various parts of the musculoskeletal system. The effect of poor postures will continue unless proactive steps are taken to evaluate and reduce the problem. More suitable working postures may have a positive effect on workers' musculoskeletal systems and may allow for more effective control of work performance and reduction in the number of occupational injuries (Trinkoff *et al.*, 2009).

2.1.1 Symptoms of WMSDs

Pain is the most common symptom associated with WMSDs. In some cases there may be joint stiffness, muscle tightness, redness and swelling of the affected areas (Tinubu *et al.*, 2010). Some workers may also experience sensations of "pins and needles," numbness, skin colour changes and decreased sweating of the hands. The WMSDs may progress in stages from mild to severe. Aching and tiredness of the affected limb occur during the work shift but disappear at night and during days off work. These symptoms

are experienced in the first stage and this does not lower the work performance. Aching and tiredness occurring early in the work shift and persist at night are felt in the intermediate stage which reduce capacity for repetitive work. Aching, fatigue and weakness persisting at rest are felt in the last stage and result to inability to sleep and to perform light duties. Not everyone goes through these stages in the same way (Tinubu *et al.*, 2010). In fact, it may be difficult to say exactly when one stage ends and the next begins. The first stage pain is a signal that the muscles and tendons should rest and recover. Otherwise, an injury can become longstanding and sometimes, irreversible. The earlier people recognize symptoms, the quicker they should respond to them (Silverstein *et al.*, 2010).

2.1.2 Ways of recognizing WMSD

The evaluation of WMSDs includes identifying workplace risks. Evaluation begins with a discussion of the person's employment and requires a detailed description of all the processes involved in a typical workday. Consideration is given to the frequency, intensity, duration and regularity of each task performed at work (Varmazyar *et al.*, 2009). Diagnosis of WMSDs is confirmed by performing laboratory and electronic tests that determine nerve or muscle damage. One such test, electron-euro-myography (ENMG), encompasses two areas: electromyography (EMG) and nerve conduction velocity (NCV). Magnetic resonance imaging (MRI), an alternative to x-rays, provides images of tendons, ligaments, and muscles and improves the quality of the diagnostic information (Trinkoff *et al.*, 2002).

2.2 Treatment of WMSDs

Treatment of WRMSDs involves several approaches including, restriction of movement, application of heat or cold, exercise, medication and surgery. The first approach to management of WRMSDs is to avoid the activities causing the injury and it may lead to treatment. This often requires work restrictions, in some cases, transfer to a different job should be considered. A splint can also be used to restrict movements or to immobilize the injured joint. However, the use of splints in occupational situations

requires extreme caution. If used inappropriately, splints can cause more damage than good. Splints are usually used to mechanically support a joint where an excessive load on the joint is anticipated and to restrict the movement of the injured joint. In the occupational context, splints should not be used as a mechanical support for the joint. Instead, the job should be redesigned to avoid the extreme load on the worker's joint in the first place. To be effective, the use of splints to immobilize an affected joint also requires that the work activity that caused the injury be stopped or changed. If injurious work continues, then the worker is exposed to risk of injury to other joints that have to compensate for the one that is splinted (Vingard, 2006).

In addition, applying heat or cold seems to relieve pain and may accelerate the repair process. Heat is recommended for pain relief of minor injuries. It is not recommended for injuries with significant inflammation and swelling. Heat increases the flow of blood and increases swelling while ice reduces pain and swelling. Furthermore, Stretching is beneficial because it promotes circulation and reduces muscle tension. However, people suffering from WMSDs should consult a physiotherapist before exercising. Stretching or exercise programs can aggravate the existing condition if not properly designed. The last remedy for treating WMSDs is the use of anti-inflammatory drugs which may reduce pain and inflammation. The doctor may try more elaborate treatments or even surgery if all other approaches fail (Trinkoff *et al.*, 2009).

2.3 Prevention of WMSDs

Hazards are best eliminated at the source. This is a fundamental principle of occupational health and safety. In the case of WMSDs, the prime source of hazard is the repetitiveness of work. Other components of work such as the applied force, fixed body positions and the pace of work requiring repetition of the same movements over and over again, are also contributing factors to WMSDs. Therefore the main effort to protect workers from WMSDs should focus on avoiding repetitive patterns of work through job design which may include mechanization, job rotation, job enlargement and enrichment or teamwork (NIOSH, 2007). Where elimination of the repetitive patterns of work is not

practical, prevention strategies involving workplace layout, tool and equipment design as well as work practices should be considered. One way to eliminate repetitive tasks is to mechanize the job (Inyang, 2007). Where mechanization is not feasible or appropriate, other alternatives should be explored as much as possible when available. Job rotation is one possible approach. It requires workers to move between different tasks, at fixed or irregular periods of time. But it must be a rotation where workers do something completely different (Retsas *et al.*, 2009). Different tasks must engage different muscle groups in order to allow recovery for those already strained. However, job rotation alone will not be effective in reducing WMSDs if not combined with the proper design of workstations. And it will not be effective while the high pace of work persists (NIOSH, 2007; Retsas *et al.*, 2009).

The guiding principle in workplace design is to fit the workplace to the worker. Evaluation of the workplace can identify the source of WMSDs. Proper design of the workstation decreases the effort required of the worker to maintain a working position. Ideally, the workstation should be fully adjustable, providing a worker with the options to work in standing, sitting or sitting-standing positions, as well as fitting the worker's body size and shape (NIOSH, 2007). Proper design of tools and equipment significantly decreases the force needed to complete the task. Providing the worker with the proper springs or fixtures for tasks that require holding elements saves a lot of muscular effort in awkward positions. Proper tools, maintained carefully and where necessary frequently changed, can also save a lot of muscle strain (Tateda, 2008; WHO, 2010). In addition a well-designed job, supported by a well-designed workplace and proper tools, allows the worker to avoid unnecessary motion of the neck, shoulders and upper limbs. However, the actual performance of the tasks depends on individuals. Training should be provided for workers who are involved in jobs that include repetitive tasks. Workers need to know how to adjust workstations to fit the tasks and their individual needs. Training should also emphasize the importance of rest periods and teach how to take advantage of short periods of time between tasks to relax the muscles, and how to consciously control muscle tension throughout the whole work shift (Amick *et al.*,

2009). Another method employers use to reduce the occurrence of work-related musculoskeletal disorders and injuries is stretching and flexibility exercise programs (Drennan *et al.*, 2006). Stretching is a form of physical exercise in which a specific skeletal muscle is deliberately elongated to its fullest length in order to improve the muscle's felt elasticity. Benefits of stretching may include increased flexibility, improved range of motion within joints, improved circulation improved posture, and stress relief. It is commonly believed that stretching before or after physical activity can reduce the chance of a strain or sprain injury by increasing the flexibility of muscles, tendons and ligaments, which in turn increases the range of motion in a joint or group of joints. Advocates of workplace stretching programs claim that these programs have reduced and prevented sprain and strain injuries (Mehrdad, 2008; Amick *et al.*, 2009).

2.4 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 Ramazzini's study of the ill-effect posture and poorly designed tools on the health of workers in the early 1700s (Tayyan & Smith, 2007). The overall goal of ergonomics is to maximize workers capabilities while concurrently ensuring their safety, comfort, efficiency and effectiveness (Oslo, 1999). 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

2.5 A case study of WMDs among nurses in Egypt

A study by Josephson *et al.*, (1997) was designed to investigate the relation between WMSDs, job demand and burnout among nurses working in emergency departments in Egypt. The study findings indicate an increased prevalence of WMSDs, along with increased job demands, with about two fifths of the sample participants having a high level of burnout. Through multivariate analysis, it was found that increased job demands and a feeling of more severe low back pain positively predict the score of burnout. The finding led to acceptance of the study hypothesis that increased job associated with of WMSDs and consequently high levels of burnout. About two thirds of the studied nurses had some type of WMSDs. This is commensurate with the type and nature of physically demanding work in emergency departments (Josephson *et al.*, 1997).

A study in Nigeria found WRMSD to be positively and significantly correlated to the score of the job demand. A similarly increased prevalence of WMSDs was reported in a recent study in Nigeria, where the prevalence of WMSDs was 78% compared with 63.8% in our sample. This finding is also congruent with the figures reported in USA and Chinese studies (Smith *et al.*, 2004).

A study done in Philippines by Smith, (2004) showed that lower back was specifically the most commonly reported body site for pain, affecting nearly three fourths of the nurses. The finding is plausible and might be due to the work conditions with increased manual handling tasks, long standing hours, and awkward positions and movements during care provision. Added to this is the prevalence of overweight and obesity in half of the sample and which is considered a risk factor for low back pain. Similarly, more than three fourths of the participants in Philippines experienced back pain.

In a study done by Trinkoff, (2009) showed that, neck and shoulder pain was second to lower back pain among nurses, each affecting about one half of the sample. However, the severity index was slightly higher for shoulder pain, which might be explained by the recurrent lifting of heavy weights that these nurses experience in emergency situations while helping patients to be positioned on examination tables or preventing their falls. Similar figures were reported in previous studies (Zurbrügg, 2004; Trinkoff, 2009). Concerning burnout, there was an increased prevalence among emergency nurses. In agreement with these findings, a French study found that approximately one third of the critical care nurses had a high level of burnout (Embriaco *et al.*, 2007), which is quite close to our finding. Similarly, higher levels of burnout among nurses working in emergency departments were reported in recent studies (Popa *et al.*, 2010).

Embriaco *et al.*, (2007) in his study showed that, there was a positive correlation between work demand and the severity of low back pain. These findings are quite possible because the feeling of greater work demands would increase the stress among the nurse. When a nurse experienced low back pain, this leads to a feeling of lack of

control over the job. The interaction of this increased workload and a feeling of incapability may explain the higher levels of burnout. In line with these findings, WMSDs were associated with job stress and consequently burnout (Jourdain *et al.*, 2010). Job demands were the most important determinants of burnout (Sundin, 2009). More recently, a study done in China found that work overload had the greatest association with occupational stress (Wu *et al.*, 2011).

CHAPTER THREE

3.0. RESEARCH METHODOLOGY

3.1 Research Design

A descriptive cross –sectional research design was used in this study. This is because the research was a fact finding survey and this type of research design is the most recommended (Wiegmann *et al.*, 2007). Nurses working at selected private and public hospitals in Mombasa County took part in the study, from April to July 2013.

3.2 Study Site and

Mombasa County, is the smallest county in the former coast province, covering an area of 229.7 Km² excluding 65 Km² of water mass. The county is situated in the South Eastern part of Coast Province. It borders Kilifi County to the North, Kwale County to the South West and the Indian Ocean to the East. According to the 2009 Census report; Mombasa county population stood at 939,370 (KNBS 2009).

3.3 Target Population

The study was based in both private and public hospitals and targeted the nurse's population. The target population was the nurses working in both private and public hospitals in the County. The nurses who were willing to participate in the study were selected.

3.4 Sampling Design

Identification of the hospitals in which to carry out the research was identified using purposive sampling. Stratified sampling method was used in this study; whereby the selected hospitals each made a stratum, then nurses were picked randomly from each hospital to participate in the study. In each hospital different number of nurses was selected to participate in the study depending on the total population of nurses per stratum. Nurses were assigned roman numbers randomly and those who picked odd numbers were selected until the required sample size per site was achieved. A pre- test was done before the required sample size of nurses was sampled entirely. A ratio was

used to get the sample size for each hospital guided by the sample size determined for each hospital.

3.5 Sample Size Determination

3.5.1 Sample size

Bartlett *et al.* (2001) table was used to determine the sample size (Figure 3.1). Categorical data which assume alpha levels of 0.10, 0.05, or 0.01 was used in this study. The margins of error used in the table are .05 (Bartlett *et al.*, 2001). The total population of nurses working in selected hospital in Mombasa County is 385; hence from the table a sample size of 169 nurses participated in the study (Appendix 4).

Table 3.1: Sample size distribution in the hospitals

	Hospital	Target population	Sample size
1.	Port reitz district hospital	93	31
2.	Tudar sub district hospital	24	18
3.	Aga khan hospital	118	40
4.	Pandya hospital	113	38
5.	Jocham hospital	37	12
	Totals (5)	385	169

3.6 Data Collection Tools

A self-administered questionnaire was distributed randomly to individual nurses and then collected immediately after completion. The following information were gathered; Personal data; age, sex, duration of employment, total working time in weeks. The standardized Nordic questionnaire consists of a general questionnaire and a more detailed body-part-specific questionnaire (Appendix 3). The general questionnaire depicts a body map divided into nine anatomic regions and asks about the presence of physical disorders including ache, pain and discomfort, for the past 12 months and in each of the body areas. The study was conducted between April and September 2012. Questioners on risks factors that may contribute to development of work-related

musculoskeletal disorders, general observation of the working environment and use of photographs formed part of the data collection tools.

3.7 Administrative and Ethical Considerations

Official approvals were obtained from the head of research and development Medical Services Coast Province and directors of all the hospitals before the beginning of the research study (Appendix 2). The researcher met with the nurses individually to explain the purpose of the study and obtain consent of participation. They were informed about their rights to refuse or withdraw from the study. They were also assured of the confidentiality of the information collected and that they were to be used only for the purpose of scientific research. In addition, they were not required to fill their names on the questioners.

3.8 Data Analysis

Statistical analysis was done using SPSS software package and Excel. Data was presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables. Multiple linear regression analysis was used for the assessment of quantitative variable interrelationships. Significance was considered at $p \leq 0.05$.

CHAPTER FOUR

4.0. RESULTS AND DISCUSSION

4.1 Social demographic characteristic of the participants

4.1.1 Respondents

A total of 169 questionnaires were distributed to the participants of whom 130 completed the questionnaire giving a response rate of 76.9%. Akello (2013) in a similar study at Kenyatta National hospital reported an overall response rate of 77.7%. This response rate is considered reasonably adequate because from these results, the purpose of the research which was to recognize the magnitude of WMSDs and identify the risk causing factors were achieved. 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; a response of 80% and above is excellent”.

4.1.2 Gender of the participants

Majority of nurses were female (76.9%) while male nurses were few (23.1%) as shown in Table 4.1. From this study it is clear that nursing as a profession attract mostly females than the male counterparts in Mombasa County although there were those who did not return questionnaires who could be either gender. The Pearson chi square test shows that there was significant association between the female gender and nursing profession ($p=0.00$) while male gender had no significant association with the profession ($p>0.05$). It was relevant to understand the importance of gender in WMSD. Nursing profession is very demanding jobs because it deals with patients which some are very sick hence requiring virtues like sympathy, perseverance and tolerance which most male lack. A similar study done by Derek *et al.* (2003) on Musculoskeletal disorders among staff in South Korea’s largest nursing home reported almost similar results in that majority participants were female (80.2%).

Meanwhile, the study demonstrated that nurses' gender has an influence on the perception of workload and demand. Male gender was found to predict an increased

perception of work demand. This might be attributed to the fact that the nursing profession has been, for centuries, linked to feminine gender. Therefore, female nurses may better cope with work situations, as they may be more convinced with their duties and responsibilities, which may give them a feeling of satisfaction with what they do and this may help alleviate some of the job stress perceived. It is also possible that male nurses were assigned or accepted heavier work assignments because of a perception that males can provide more labour-intensive care. These findings highlight the importance of job demand as a risk factor for the development of WMSDs, which consequently lead to burnout. Job demand was associated with WMSDs. The other socio-demographic characteristics of nurses had no influence on the number of WMSDs reported, as has been previously shown in a Korean study on emergency nurses (Kee *et al.*, 2007).

Table 4.1: Gender of the participants

Gender	Frequency (n)	Percent (%)	p-value
Male	30	23.1	0.15
Female	100	76.9	0.00
Total	130	100.0	

4.1.3 Age of the participants

The average age of the nurses was 35 years and standard deviation of 8.076 (35±8.07). All the male nurses who participated in the study were in the age bracket of less than 30 years old. There could be several reasons to explain this but the study did not determine the reason why all the participant male nurses were below the age of 30 years. The study sampled only those who were willing to take part in the study therefore only below 30 years male nurses were willing to participate. Majority (40%) old nurses were female since nursing profession in the past attracted mostly the female gender, although even at present the male gender in this profession are still few as evidence elsewhere in this study. The new generation has attracted both the male and female gender. The age

of workers is very important since, the old workers are prone to diseases. Employees who have worked for many years are exposed to different kind of disease causing agents, including occupational diseases. The results of Derek *et al.*, (2003) are almost similar with the result of this study in that they reported an average age of 47.0 years with a standard deviation of 8.0 and an age range of 27 to 62 years. A study on work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria reported an average age of 36.4 ± 7.75 years (Tinubu *et al.*, 2010). According to the results of this study there was no significant association between any age category and the gender as well as nursing profession ($p>0.05$) any association seen could be by chance. The results are as shown in Table 4.2.

Table 4.2: Age categorization of the participants

Age	Male (%)	Female (%)	p-value
< 30 years	100.0	22.0	0.40
>30-35 years		19.0	0.14
>35-40 years		19.0	0.08
> 40 years		40.0	0.06
Total	100.0	100.0	

4.1.4 Working experience in terms of years

Regarding work experience, 49.2% of the nurses in the study had a work experience of between 1-5 years, 15.4% of them had 5-10 and more than 20 years of work experience, respectively while the remaining 20% of them had the experience between 10-20 years (Table 4.3). The nurses awareness of WMSD and its association with working for many years was high (51% and above). This clearly indicates that nurses who have worked for many years are more knowledgeable in terms of their profession and how it could affect them in terms of WRMSD and other associated risk. The young nurses are flexible than the old especially while performing activities like carrying and transferring patients from bed to bed. Pearson chi square test showed that there was statistical

significant association ($p=0.00$) between the number of years in the profession and the frequency of the nurses per category of work experience. Employees who are not familiar with the work process and procedures are prone to accidents and near miss. On the other hand employees who have worked for many years also are prone to occupational diseases such WRMSDs, especially if they are exposed to disease causing agents for many years. The result of this study concurs with that of Akello (2013) at KNH; he reported that more than half of the nurses (55.8%) had a work experience of 3 to 12 years.

Table 4.3: Number of years in nursing employment and awareness on WRMSD

Time in employment	Frequency (n)		Percent (%)			
1-5 years	64		49.2			
>5-10 years	20		15.4			
> 10-15 years	13		10.0			
> 15-20 years	13		10.0			
> 20 years	20		15.4			
Total	130		100.0			
Nurses awareness level on work related musculoskeletal disorders						
Work experience in years	1-5	>5-10	>10-15	>15-20	>20	p-value
Aware	10.0%	25.0%	51.0%	70.0%	95%	0.00
Not aware	90.0%	75.0%	49.0%	30.0%	5.0%	
Total	100%	100%	100%	100%	100%	

Report of other studies showed that none of the socio-demographic characteristics of the nurses had a significant effect on the burnout score. This might be explained by the stronger influence of workload and back pain than that of the socio-demographic characteristics. However, in disagreement with this, other studies showed a decline in burnout among nurses as they mature in age and a decrease of job stress level with increasing age (Elkahlout *et al.*, 2003). Also, found an association between burnout and sex and experience years. However, these factors may be confounders (Iglesias, 2010).

A high percentage of the nurses reported increased job demands and greater workloads. These findings are expected, given the nature of emergency work (Adriaenssens *et al.*, 2011).

4.2 Awareness of work related musculoskeletal disorders among the nurses

4.2.1 Number of Working Days in a Week

Awareness level of work related musculoskeletal disorders was rated as low, moderate and high (0%-30%, 31%-55% and 56% and above, respectively). This study showed that 12.3% of the nurses were working for 4 days in a week, 35.4% were working for 5 days in a week and 46.2% were working for 6 days in a week while 6.2% were working for 7 days in a week (Table 4.4). Since nurses are usually under staffed, they are forced to work extra days in a week. Level 4-5 hospitals have to operate twenty four hours seven days in a week (MOH, 2007).

Table 4.4: Nurses number of working days per week

Number of working days in a week	Frequency (n)	Percent (%)
4 days	16	12.3
5 days	46	35.4
6 days	60	46.2
7 days	8	6.2
Total	130	100.0

4.2.2 Number of Working Hours in a Day

From the study 53.8% of the nurses worked for 6-8 hours in a day while 46.2% worked for more than 8 hours in a day (Table 4.5). The p-value for daily working hours and the WMSD was 0.02 hence there was statistical significant association at 95% confidence interval. Those working for long hours could be due to some local arrangements with their colleagues so that they can extend their off days. Performing similar task over and over again for long hours predispose workers to WMSDs; for example carrying out injections by nurses while standing causes WMSDs. Under the Regulation of Wages

(General) order, subsidiary to the Regulations of Wages and Conditions of Employment Act, the general working hours are 52 per week, but the normal working hours usually consist of 45 hours of work per week, Monday to Friday 8 hours each, 5 hours on Saturday under the special Orders for different sectors subsidiary to the Regulations of Wages and Conditions of Employment Act 2007 laws of Kenya (Kenya Constitution 2010). Collective agreements may modify the working hours, but generally provide for weekly working hours of 40 up to 52 hours per week. Nurses who took part in the study reported that after long working hours they normally feel totally exhausted and their alertness is decreased and hence they cannot work properly (OSH, 2007). Munabi *et al.* (2014) in their studies on musculoskeletal disorder risk factors among nursing professionals in low resource settings in Uganda found out that the average working hours per week was 43.7 (SD 18.9) hours. In this study 52.4% of the nurses worked for an average of 42 hours and above. Nurses working more than 12 hours at a time have a significantly greater risk of bearing a work-related injury (Lockley *et al.*, 2007). Working long hours with little break time between (to see friends and family) has negative mental effects. A study done by Beecroft *et al.* (2008) found that nurses who have control over their working hours experience more job satisfaction, while a study done by Akello (2013) showed that long working hours had a significant negative impact on mental well-being of the nurses.

This clearly indicates that nurses working in Mombasa County will suffer from burnout and fatigue at the end of a long shift and the nurses were very much aware of this risk. It also supports the high cases of WMSDs reported in this study. Since majority of nurses in the study preferred working for 12-hour shifts, it is likely that they will suffer from burnout and other occupational diseases such as WMSDs. In order to reduce the harm they can cause to patients because of loss of concentration and fatigue, introduction of breaks during working long shifts is very crucial in this profession. It reduces the chance of making errors and improves their work productivity and efficiency. Taking tea breaks and lunch breaks is very important and nurses working during the night should take nap breaks. Munabi *et al.* (2014) in their study on

musculoskeletal disorder risk factors among nursing in Uganda found that on average respondents had 1.5 (SD 1.3 breaks) during the course of their working day, however 60% of them reported that their breaks were insufficient and they were not rested after the breaks and this significantly contributed to their MSD. Their results concur with the current study.

Table 4.5: Awareness level of WRMSD verse number of working hours in day

Awareness level on work related musculoskeletal disorders verse daily working hours				
No of work hours per day	Low	Moderate	High	p-value
6-8	25.0%	51.0%	56.0%	0.00
>8	5.0%	49.0%	78.0%	

4.2.3 Number of Patients attended to In a Day

From this study 9.2% of the nurses attended to patients between 0-5 patients in a day, 18.5% attended to 5-10 patients in a day, 6.2% attended to 10-15 patients in a day while 66.2% attended to more than 15 patients in a day (Table 4.6). Since nurses work for long hours, it is likely that they will attend to a large number of patients in a shift. Attending to large number of patients and working in the same posture has a direct relationship to WMSDs among the employees. Tinubu *et al.* (2010) in their study found that attending to high number of patients in one day (44.9%) were the most perceived job risk factors for WMSDs among the nurses in Nigeria.

Table 4.6: Number of patient attended to in a day

Number of patient attended to in a day	Frequency (n)	Percent (%)
Below 5	12	9.2
>5 -10	24	18.5
Below 15	8	6.2
Above 15	86	66.2
Total	130	100.0

4.1.4 Number of Nurses Who Work In Other Fields that Could Cause WMSD

In this study 6.9% of the nurses were working in other fields that could cause WMSD while 93.1% were not (Figure 4.1). They further stated that long working shifts could not allow them to work in other fields because of exhaustion and fatigue after work. Majority of nurses reported that after long shift they just take a shower and retire to bed till the next day to work. Due to economic status of the county and low salary, a few (6.9%) nurses might be forced to work in other fields to generate extra income for sustaining their families which may cause WMSDs other than their profession. This could be confounding factors for WMSDs among the few nurses who do other jobs. A similar study by Woolf and Pflieger, (2003) showed that 48.7% of nurses reported that circumstances in their private lives significantly affected their work and may lead to WMSDs. Adegoke *et al.* (2008) posited that work may only be a contributory factor in the aetiology of musculoskeletal disorders among workers and that it may be difficult to distinguish between WMSDs and musculoskeletal disorders since their consequences in response to work demands may be similar.

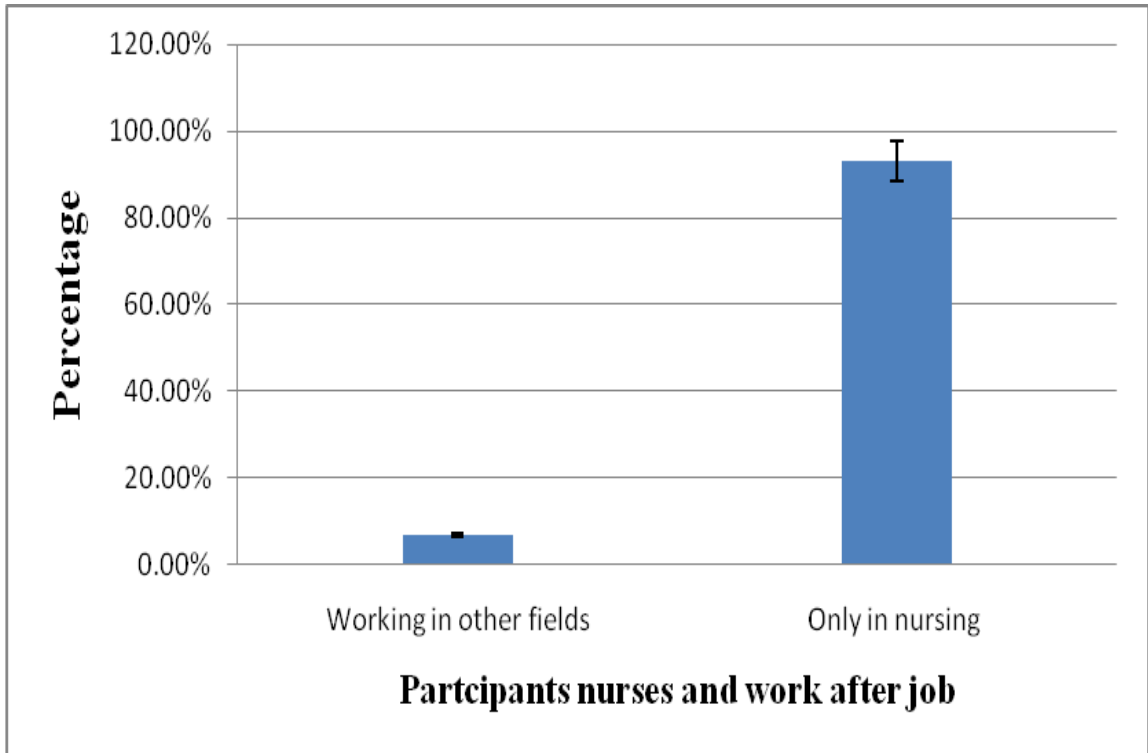


Figure 4.1: Nurses working in other fields that could cause WMS

4.3 The prevalence and impact of WMSD on nurses productivity

4.3.1 Work Activities and Pain in Different Body Parts

The prevalence of body pains investigated was 70.8% in total. The following were the body parts where pain was investigated in the study; neck pain, shoulder pain, elbow pain, wrists/ hands, upper back, lower back, hips, thighs or buttocks, ankles and feet. The impacts of WMSD on different body parts due to repetitive activities, awkward postures, long working hours, treating excessive number of patients, lifting or transferring dependant patients and inadequate training on injury prevention may lead to pain in different regions of the body. The results of this study concur with a study done in Nigeria which showed that 84.4% of the respondents reported that they had experienced work-related musculoskeletal pain or discomfort at some time in their occupational lives. The respondents reported a 12-month prevalence rate of WMSDs at anybody region to be 78% (Tinubu *et al.*, 2010).

4.3.2 Neck, Shoulder and Elbow Pain

Regarding Neck Pain, 53.8% of the nurses had experienced pain in their necks compared to 46.2% who affirmed that they had not experienced pain in their necks (Table 4.6). This shows that neck pain is a very common problem among nursing professionals. Work-related musculoskeletal disorders WRMSD of the neck and shoulders are common among nursing personnel and are the second most common WRMSD after low back pain (ILO, 2007). They make a major contribution to the cost of work-related illness in developed countries in USA, Europe and Australia (Smedley *et al.*, 2008). Neck WRMSD rate was 36.9% which was almost similar to a United States study (35.1%) (Trinkoff, 2002), but lower than those reported among European and Asian nurses with rates between 40% and 71.6% respectively (Smith 2004). Akello (2013) in his study at KNH reported that 20.4% suffered from neck and shoulder pains while Tinubo *et al.* (2010) reported a prevalence of 28.0% of neck pain among the nurses. Regarding shoulder pain, 48.5% of the nurses in the study had shoulder pains while 51.5% did not experience shoulder pains. Nurses usually suffer from shoulder pain because of the nature of their work, which involve a lot of lifting of heavy loads, such as transferring patient from one bed to another one. Nurses needs to be train on proper ways of lifting patients or use machinery to reduce these injuries. Popa *et al.* (2010) reported a very low prevalence (12.2%) of shoulder pain among nurses under investigation. The prevalence of elbow pain among the nurses in this study was very low compared to other WRMSD. Those who had experienced elbow pains were 30.8% while 69.2% had not experienced elbow pains. Tinubu *et al.* (2010) reported a very low prevalence (7.1%) of elbow pain among nurses under investigation. In agreement with the above assertions, sleeping problems and somatic symptoms such as headache and stomach ache also occurred among Swedish emergency care personnel. These psychosomatic disorders among emergency nurses have been attributed to work-time demands (Adriaenssens *et al.*, 2011).

4.3.3 Wrist/Hand pains

Regarding wrist/Hand pains, 46.9% of the nurses in the study agreed that they had pain in their wrists/ hands while 53.1% disagreed that they had had pain in their wrists/ hands (Table 4.6). The results of this study does not concurs with that of Inyang *et al.* (2007) who reported a very low prevalence (16.2%) of wrists/Hand pain among nurses under investigation. Wrist/ hands are used to perform almost all function by nurses, for instance carrying out injection procedures, dressing, transferring and lifting of patients from one bed and many others and hence the nurses are likely to experience this pain though.

4.3.4 Upper and Lower Back Pain

Regarding upper back pain, 47.7% of the nurses in this study admitted to having experienced pain in their upper back while 52.3% denied having experienced pain (Table 4.6). Since nurses carry out most of their work procedures with twisted motion and poor posture doing it over and over, this is the leading cause of upper back pain. It is very common for a nurse to injure their upper back when carrying patients, bending or twisting. The study observed that the nurses were assuming twisted and poor posture while carrying out their duties. Sitting at a poor designed chair for a prolonged time can cause upper back muscles to tighten and become stiff, which is very common for nurses since they are not provided with ergonomically designed chairs to suit their work as observed in the current study.

Lower Back pain: From this study, 76.9% of the nurses agreed that they had pain in their lower backs compared to 23.1% who disagreed to having experienced pain in their lower backs. The high incidence of LBP may be caused by nurses spending long periods of time standing, lifting and moving of patients. Work related musculoskeletal disorders and in particular low back pain (LBP), pose a major health and socioeconomic problem in modern society (WHO, 2007). It has been shown that 60–80% of the general population suffers from LBP at some time during their lives. Among nurses the lifetime prevalence was found to be slightly higher, varying between 56% and 90 % (Knibbe,

1996). Low Back Pain (LBP) is a regular occupational problem for nurses worldwide and has been previously reported at rates between 45% in England (Smedley *et al.*, 2000), 63% in Australia (Lusted, 2009) and 64% in Sweden (Josephson, 1997). Research from Hong Kong and China has also shown that LBP may affect between 40.6% (Yip, 2001) and 56% (Smith, 2004) respectively. African studies report LBP rates between 44.1% and 79.4% (Fabunmi, 2008; Tinubu, 2010). Plate 4.1 shows a photo taken in one of the hospital selected.



Plate 4.1: Poor sitting position predisposing an individual to WMSD

4.3.5 Hips, Thighs or Buttocks pains

Regarding Hips, Thighs or Buttocks pains, 38.5% of the nurses agreed that they had pain in both of their hips, thighs or buttocks while 61.5% disagreed of having experienced pain in these parts of their bodies (Table 4.6). Sitting on poorly designed chairs might be the leading cause of hips, thighs or buttocks. Lockley *et al.* (2007) in their study reported a very low prevalence (3.4%) of Hips, Thighs or Buttocks pains. Plate 4.2 shows a picture of a stool. (Photo taken in one of selected hospital)



Plate 4.2: Unergonomically designed stool provided for nurses

4.3.6 Ankles and Feet

Ankles and Feet: Nurses who agreed that they had had pain in both of their ankles and feet were 48.5% while those who disagreed were 51.5% (Table 4.6). Nurses carry out most of their duties while standing for long hours and hence this may be a contributing cause of ankles and feet pains. Plate 4.3 is a photo of a chair taken in one of selected hospital.



Plate 4.3: Unergonomically designed provided chair for nurses
(Photo taken at Jocham hospitals)

4.3.7 Response on WMSD and pain control/prevention

According to this study all (100.0%) the nurses who had experienced pain in their necks during and after work took analgesics drugs (Table 4.7). A similar study by Lambert, (2009) showed that of all the respondents with WMSDs, only 30.3% reported that they had treated themselves or had sought treatment from other health practitioners for WMSDs. Fabunmi, (2008) in another study showed that the respondents who reported WMSDs, a variable number reported having visited a health practitioner for treatment, with 40% of those with shoulder, 60.0% of those with upper back, 40.4% of those with low back, 50.0% of those with wrists/hands, 25.0% of those with knees, and 25.0% of those with ankles/feet problems respectively (Fabunmi, 2008). Workers performing strenuous work are often advised to prevent problems and to cope with musculoskeletal symptoms by changing their working technique, using lifting equipment, taking breaks and avoiding strenuous work tasks (King, 1993; Lambert, 2009; Vilkari, 1997). This is also similar to the submission of Linton *et al.* (2011) on methods for fostering effective coping strategies of WMSD among nurses.

In general the 12 months prevalence of work related muscular skeletal disorder among nurses was 70.8% across all the age categories had; neck, shoulder, elbow, wrists, hands, upper back, lower back, hips, thighs, buttocks, ankles and feet pains while 29.2% had not experienced pains in these areas. Compared to another study which was carried out in Nigeria by Tinubu *et al.* (2010) the 12-months prevalence rate of WMSD at anybody region was 78%. The WMSD occurred mostly in low back (44.1%), neck (28.0%) and knees (22.4%). The results of this study shows clearly that majority of nurses had experience WMSD and this is an indication that urgent measures of prevention need to be put in place to reduce the high prevalence of the disorder. It also reveals that WMSD is major challenge affecting nurses in Africa (WHO, 2007).

The highest prevalence of 12 months period of WMSD in nurses according to body sites in this study was the low back (79.9%), followed by the neck (53.8%) then ankles\feet

(48.5%), upper back (47.7%), wrist\hands (46.9%), buttocks and elbow (38.5%) and (30.8%), respectively. Previous studies conducted in other countries have revealed various rates of work-related low back pain (LBP) in nurses, for instance in Nigeria 79.4%, Sweden 64.0%, Australia 59.0%, England 45.0%, France 41.1%, USA 29.0% and Korea 19.8% (Knibbe, 2009).

Table 4.7: Prevalence of WMSD in the different body regions of the nurses

Work activities and Pain in different body parts	Yes (%)	No (%)	Total (%)
Taking breaks between attending to patients	30 (23.1)	100 (76.9)	130 (100)
Working in a field other than nursing that can cause WMSD	9 (6.9)	121 (93.1)	130 (100)
Diagnosed with any MSDs such as arthritis	0 (0)	130 (100)	130 (100)
Pain experienced in the neck	70 (53.8)	60 (46.2)	130 (100)
Shoulder pain	63 (48.5)	67 (51.5)	130 (100)
Elbow pain	40 (30.8)	90 (69.2)	130 (100)
Wrist/ Hands	61 (46.9)	69 (53.1)	130 (100)
Upper back	62 (47.7)	68 (52.3)	130 (100)
Lower back	100 (76.9)	30 (23.1)	130 (100)
Both hips/ thighs/ buttocks	50 (38.5)	80 (61.5)	130 (100)
Both Ankles/ feet	63 (48.5)	67 (51.5)	130 (100)

Analysis of the region of the body and the pains using Parsons Chi square test shows that there was statistical significant association ($p < 0.05$). All the p-values are 0.00 showing that there is a strong relationship between all the pains and the effects on work performance among the nurses in the study (Table 4.8).

Table 4.8: Analysis of Pain Experienced 3 or more times in the last 12 months

Pain	Experienced	How did these pains affect your work	Yes (%)	No (%)	p-value
Pain experienced in the neck	Yes	Had to take analgesics	100.0		0.00
		Had to visit a physiotherapist		54.5	
Shoulder pain	Yes	Had had difficulty sleeping		45.5	0.00
		Had to take analgesics	100.0	24.1	
Elbow pain	Yes	Had to visit a physiotherapist		41.4	0.00
		Had to take analgesics	100.0	57.7	
Wrist/Hands	Yes	Had to visit a physiotherapist		23.1	0.00
		Had difficulty sleeping		19.2	
Upper back	Yes	Had to take analgesics	100.0	29.0	0.00
		Had to visit a physiotherapist		38.7	
Lower back	Yes	Had difficulty sleeping		32.3	0.00
		Had to take analgesics	100.0	26.7	
Both hips/thighs/buttocks	Yes	Had to visit a physiotherapist		40.0	0.00
		Had difficulty sleeping		33.3	
Both Ankles/feet	Yes	Had to take analgesics	76.1		0.00
		Had to visit a physiotherapist	13.0		
Experienced any of the above in the last 12 months 3 times or more	Below 30 years	Had difficulty sleeping	10.9		0.00
		Had to take analgesics	100.0	47.6	
	30-35 years	Had to visit a physiotherapist		28.6	0.00
		Had difficulty sleeping		23.8	
	35-40 years	Had to take analgesics	100.0	24.1	0.00
		Had to visit a physiotherapist		41.4	
	Over 40 years	Had difficulty sleeping		34.5	0.00
		Had to take analgesics	100.0		
			100.0		
			100.0		
			100.0		
			5.0	95.0	

4.4 Risk Factors Contributing to Development of WMSD

4.4.1 Performing the Same Task Over And Over

On performing same task repeatedly, 3.1% of the nurses had no problem when performing the same task over and over, 23.1% had minimal or moderate problem while 73.8% had major problem when doing that (Figure 4.2). This clearly indicates that performing a given task over and over again is a major cause of WMSD among nurses. Preventative measure need to be put in place to reduce the risk of this disorder such as job rotation and taking breaks between shifts. Nurses usually perform their daily task for instance, carrying out injection procedures, taking weights and body measurements doing it over and over as observed in this study. These are related to WMSD especially if it done in an awkward/poor posture. Lifting patients in bed, transferring patients out of bed and lifting patients from the floor were the job activities most commonly reported as sources of back pain among nurses (Smedley *et al*, 2008).

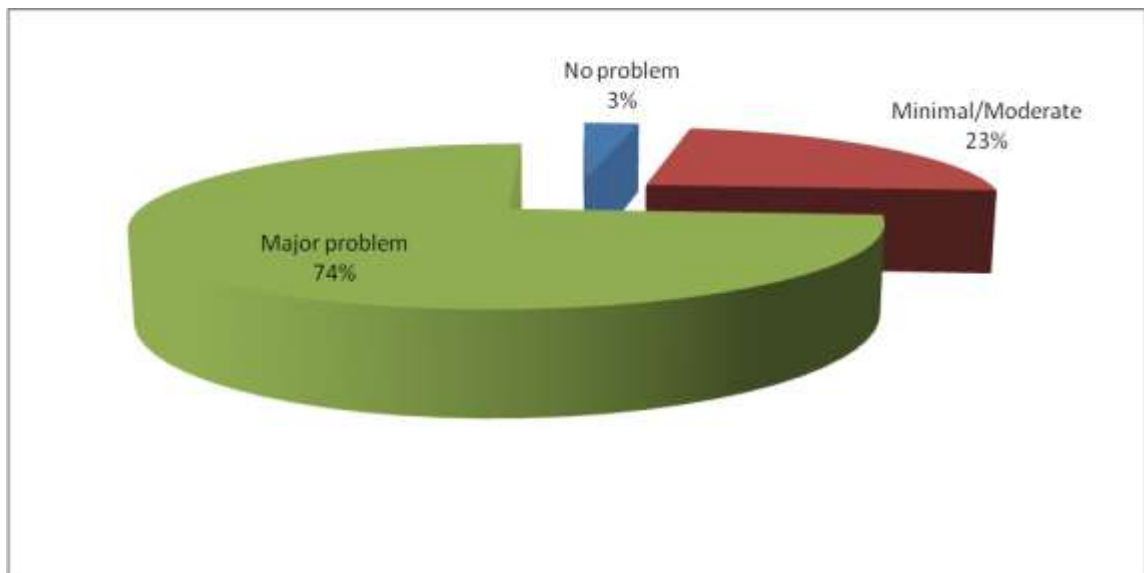


Figure 4.2: Performing the same task over and over again

4.4.2 Treating high number of patients and performing manual orthopaedic technique

The study showed that, 3.8% of the nurses were found to be having no problem, 19.2% had minimal or moderate problem while 76.9% had major problems when attending to high number of patients and performing manual orthopaedic technique, respectively in a single day (Table 4.9). There was significant association between treating excessive number of patients and performing manual orthopaedic technique, respectively and the WMSD among the study participants ($p < 0.05$). Treating excessive number of patient is a risk factor exposing nurses to WMSD. It is the responsibility of the hospitals to ensure that they employ adequate number of nurses to serve the increasing number of patients. Most hospitals especially public hospitals attend to a large number of patients in the county. In contrary to that, the number of nurses employed in these hospitals is usually very low and hence nurses are forced to work for long shifts seeing a lot of patients at the end of a single day. Performing manual orthopedic technique was a risk factor exposing nurses to WMSD. Manual orthopedic technique usually take long hours and it involve a lot of bending and awkward postures to carry out these procedures hence prone to causing WMSD among the nurses. Patients are often at some degree of dependence and can offer limited, if any, levels of assistance in moving themselves (Nelson, 2003) or may have limited ability to comprehend instructions and to cooperate hence predisposing nurses to WMSD. These findings are consistent with previous reports indicating manual patient handling, transferring or moving as important predictors of musculoskeletal disorders and low back pain among nurses (Smith & Leggat, 2004; Yip, 2001).

Almost on daily basis a nurse have to lift and transfer patients manually and this is the leading cause of LBP among the nurses. 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. Wilkinson *et al.* (1992) implicated lifting patients especially the confused ones

as the most common mechanism for musculoskeletal disorders among nurses because they are unable to support themselves.

Almost all procedures carried out by nurses in Hospitals involve carrying, lifting or moving heavy materials or equipments. For instance, transferring patients or changing dependant patients. It is very difficult for nurses with low weight to lift heavy weight patients or equipments. At the end of the shift nurse will have used a lot of energy and strain their bodies. Nurses routinely perform activities that require lifting heavy loads, lifting patients, working in awkward postures, and transferring patients out of bed and from the floor. These work tasks put nurses at high risk for acute and cumulative WMSDs (Silverstein *et al.* 2010). Munabi *et al.* (2014) reported that pushing and pulling of heavy load mostly affected the neck, elbows and the lower back. This differed with Smedley *et al.* (2003) who observed that pushing/pulling seemed to be harder on subjects' shoulders than on their backs.

Table 4.9: Treating high number of patients/performing manual orthopaedic technique

Factors contributing to development of WMSD	N P (%)	M or M (%)	M P (%)	p-value
Treating excessive number of patients in one day	5 (3.8)	25 (19.2)	100 (76.9)	0.00
Performing manual orthopaedic technique	6 (4.6)	52 (40.0)	72 (55.4)	

Key: NP- No problem, M or M-Minimum or Moderate problem, M P- Major problem

4.4.3 Enough Breaks or Pauses during Working Hours

Regarding pausing or having enough breaks during working hours, 18.5% of the nurses in the study had minimal or moderate problem when they did not had enough breaks or pause during working hours while 81.5% had major problem when they did not do that (pause or break) as shown in Table 4.10. This risk factor contributes to high prevalence

rate of WMSD among nurses and hence is mandatory for hospitals administrator to introduce tea, lunch and nap break during night shift. There was significant association between not having enough breaks or pauses during working hours and the WMSD among the study participants ($p < 0.05$). Breaks also improve nurses' concentration while carrying out their procedures and reduce the level of making errors during operations. Since majority of nurses have a lot work load to cover and seeing a lot of patients in a single long shift, because of under staffing this contribute to high incidence rate of WMSD among nurses in Mombasa County. In a similar study number of hours per week and daily breaks in direct patient care had no significant association with WMSD among the nurses ($p = 0.262$) (Stubbs 2004).

4.4.4 Poor and Cramped Position

On poor and cramped positions, 1.5% of the nurses in the study had no problem when working in awkward and cramped position, 23.1% had minimal or moderate problem while 75.4% had major problem when doing that (Table 4.10). There was significant association between working in awkward and cramped position and the WMSD among the study participants ($p < 0.05$). Almost all procedure carried out by nurses involves awkward and cramped position for instance, dressing of wounds and assisting mothers to give birth. These positions contribute much to causing WMSD among nurses in this study. About 0.8% of the nurses had minimal or moderate problem when working in the same position against 89.2% who had major problem while doing that. Working in the same position with awkward postures contribute also to high rate of WMSD among nurses. For instance, when carrying out orthopedic procedures. Silverstein *et al.* (2010) reported repetitious movement, awkward postures and high force levels as the three primary risk factors that have been associated with WMSDs.

4.4.5 Bending or Twisting the Back in Awkward/poor Postures

Of the nurses who participated in the study, 4.6% of them had no problem when bending or twisting their back in awkward way on the line of their duties, 26.2% had minimal or moderate problem while 69.2% had major problem when doing that (Table

4.10). The study was asking the participants about their posture for the last one year. There was significant association between bending or twisting the back in awkward/poor postures and the WMSD among the study participants ($p < 0.05$). Bending or twisting once back in poor postures contributes to high incidence rate of LBP among nurses especially while performing long procedural work (WHO, 2007). Smedley *et al.* (2008) in their studies reported that the nurse population working for long periods in a slightly bent position remained significant after adjusting for all the other variables. Nurses sometimes are forced by circumstances to work in poor/awkward posture in order to be able to reach the specific body part and in the process they have to bend or twist their body. This normally put them at risk of developing WMSD, for instance when carrying out episiotomy procedure (Lambert & Lambort 2008).

Table 4.10: Factors contributing to development of WMSD

Factors contributing to development of WMSD	N P (%)	M or M (%)	M P (%)	p-value
Not enough breaks or pause during working hours	0 (0)	24 (18.5)	106 (81.5)	0.00
Awkward and cramped position	2 (1.5)	30 (23.1)	98 (75.4)	
Working in the same position	0 (0)	14 (10.8)	116 (89.2)	
Bending or twisting your back in awkward way	6 (4.6)	34 (26.2)	90 (69.2)	

Key: NP- No problem, M or M-Minimum or Moderate problem, M P- Major problem

4.4.6 Continuing to work while injured or hurt

On working while injured or hurt, 6.2% of nurses had no problem when continuing to work while injured or hurt, 26.2% had minimal or moderate problem while 67.6% had major problem when doing that (Table 4.11). The injury can extend depending on the nature of the work and its position in the body. There was significant association between working while injured or hurt and the WMSD among the study participants ($p < 0.05$). This exposes them to WMSD since they cannot work properly. Ando *et al.*

(2000) also suggested that musculoskeletal pain among hospital nurses may have associations with some actual tasks and items related to work postures, work control and work organization as well as working while injured.

4.4.7 Unanticipated Sudden Movements or fall of Patients

Regarding fall or unanticipated sudden movement of patients, 3.1% of the nurses had no problem, 26.2% had minimal or moderate problems while 70.8% had major problems when these events occurred (Table 4.11). There was statistical significant association between unanticipated sudden movements or fall of patients and development of WMSD among the nurses ($p=0.00$). Unanticipated sudden movement or fall of patients cause the nurses to bend or twist their bodies and if done over and over will automatically cause WMSD. Most hospitals do not have patient lifting equipment therefore patients have to either be lifted or be pushed on mal-functioning trolleys to and from theatre, emergency and in between other hospital departments.

4.4.8 Assisting Patients during Gait Activities

Of those assisting patients during gait activities, 3.1% of the nurses had no problem, 26.2% had minimal or moderate problems while 70.8% had major problems when these events occurred (Table 4.11). There was statistical significant association between assisting patients during gait activities and development of WMSD among the nurses ($p=0.00$). Nurses usually play a major role in the rehabilitation process of patient affected with severe injuries, for instance they assist patient who were had broken their limbs to walk again. In this process the nurse may hurt themselves or strain their bodies a lot and in the process put them at high risk of suffering from WMSD.

Table 4.11: Working while injured, assisting/transferring patients and carrying heavy equipments

Factors contributing to development of WMSD	N P (%)	M or M (%)	M P (%)	p-value
Continuing to work while injured or hurt	8 (6.2)	34 (26.2)	88 (67.6)	0.00
Lifting or transferring dependent patient	0 (0)	28 (21.5)	102 (78.5)	
Heavy material/ equipment	2 (1.5)	22 (16.9)	106 (81.5)	
Sudden movement or fall of patient	4 (3.1)	34 (26.2)	92 (70.8)	
Assisting patient during gait activities	2 (1.5)	42 (32.3)	86 (66.2)	

Key: NP- No problem, M or M-Minimum or Moderate problem, M P- Major problem

4.4.9 Work Schedule

Regarding work schedule, 26.9% of the nurses had minimal or moderate problems when work schedule (overtime, irregular shifts and length of workday) was extended while 73.1% had major problems when these long work schedules (Table 4.12). There was significant association between irregular work schedule and job satisfaction among the study participants ($p < 0.05$). Work schedule of nurses involve a lot of activities and procedures to be carried out at the end for the shift. These procedures sometimes are very strenuous and need a lot of concentration and energy. For instance nurses working at maternity ward over and over again assist mothers to give birth. These processes involve bending and awkward postures which expose the nurses to suffer from WMSD. Studies elsewhere noted that there has been increasing interest in the impact of resident-physician and nurse work hours on patient safety. The evidence demonstrates that work schedules have a profound effect on providers' sleep and performance, as well as on their safety and that of their patients (Collins *et al.*, 2002). Nurses working shifts greater

than 12.5 hours are at significantly increased risk of experiencing decreased vigilance on the job, suffering an occupational injury, or making a medical error (Evanoff *et al.*, 2003). Physicians-in-training working traditional > 24-hour on-call shifts are at greatly increased risk of experiencing an occupational sharps injury or a motor vehicle crash on the drive home from work and of making a serious or even fatal medical error (Collins *et al.*, 2003). As compared to when working 16-hours shifts, on-call residents have twice as many attentional failures when working overnight and commit 36% more serious medical errors. They also report making 300% more fatigue-related medical errors that lead to a patient's death (Lockley, 2007).

4.4.10 Inadequate Training on Injury Preventions

Regarding training on injury preventions, 1.5% of the nurses had no problem with inadequate training on injury prevention, 5.4% had minimal or moderate problems while 93.1% had major complain that they had little knowledge on injuries prevention techniques because most of them were not trained on injury prevention measures at work place. There was significant association between inadequate training on injury preventions and the WMSD among the study participants ($p < 0.05$). This problem is a major risk factor exposing nurses to high incidence rate of WMSD. Poor knowledge on injury prevention and work procedure increase the chances of nurses making error and causing injuries. Furthermore these may result in nurses using a lot of energy and over straining their body muscles especially when lifting heavy loads. In the process also they may injure their patients.

Inadequate training on injury prevention was the most job risk factor perceived by nurses to be causing WMSD in this study, followed by working in the same positions for long periods, then carrying /lifting or moving heavy materials or equipments and not taking enough breaks or pauses during working days were also perceived to be in top three risk factors causing WMSD. Transferring dependent patients, treating excessive number of patients, working in awkward cramped position and performing the same task over and over followed respectively. In addition the nurses who participated in the

study agreed that the following factors posed the major problems to them, performing manual orthopedic technique, bending or twisting their back in awkward way on the line of their duties, Working near or at their physical limits, reaching or working away from their body, Continuing to work while injured or hurt, Working with confused or agitated patients, unanticipated sudden movements or falling of patients, assisting patients during gait activities and work schedule (overtime, irregular shifts, and length of workday). The Kenyan health system needs to train and create a culture that encourages injury and potential safety violation reporting so incidents can be prevented. Hospitals too should create a culture of safety whereby everyone in the facility is looking for ways to decrease injuries and improve safety. Nurses should report potential risks, make sure that all serious injuries are reported, and occupational health teams are formed in hospitals to improve safety. Nursing training curricula must address safe body mechanics, injury prevention, and safety improvement (Akello, 2013; Munabi, 2014). The results are as shown in Table 4.12.

Table 4.12: Inadequate training and work schedule contributing to WRMSD

Factors contributing to development of WMSD	N P (%)	M or M (%)	M P (%)	p-value
Sudden movement or fall of patient	4 (3.1)	34 (26.2)	92 (70.8)	0.00
Work schedule	0 (0)	35 (26.9)	95 (73.1)	
Inadequate training on injury prevention	2 (1.5)	7 (5.4)	121 (93.1)	

Key: NP- No problem, M or M-Minimum or Moderate problem, M P- Major problem

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From this study it is clear that nursing as a profession attract mostly female population (76.9%) than the male counterparts (23.1%) in Mombasa County. This is because the female participants were many as compared to the male participants hence more female are likely to be affected by WRMSD.

The level of awareness of ergonomic hazards among the nurses was generally moderate (31% - 55%) to high (56% and above). Inadequate training on injury prevention was the most job risk factor perceived to cause WMSD.

Over 70% of nurses who took part in the study reported cases of WMSD at any of the body part in the 12 months prevalence, with the low back pain leading (76.9%). This shows that nursing as a profession is a risk factor to WRMSD although there could be confounders.

The study concludes that working in the same positions for long periods, treating a high number of patients and carrying or transferring dependent patients were risk factors of WMSD identified. There was significant association ($p \leq 0.05$) between these variable and WRMSD in this study.

5.2 Recommendations

1. Nurses need to be trained on proper handling and lifting of patients and loads, modification of work procedures to reduce injuries.
2. In addition, change on their working technique, using lifting equipment, interchange task regularly, reduce the excessive number of patient treated in one day, take breaks, and avoid awkward cramp position, repetitive work and strenuous tasks.

3. However, these prevention measures would be successful if the government and hospitals administrator assist in implementing these measures.
4. Reducing the prevalence of WMSD among the nurses in hospitals will improve their efficiency, productivity in their work and improves their quality of life.
5. A prospective cohort study design with larger sample size is warranted in the future to provide more sound research evidence on WMSDs and healthy survivor effects among nurses in Kenya.

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APPENDICES

Appendix 1: Written Consent Form

Dear respondent,

Hallo to you. My name is **Betty Chebet Tanui** a master's student at Jomo Kenyatta University of Agriculture and Technology. The results obtained are only for academic purposes and will be made confidential. Your participation will be highly appreciated.

Title of the Study

‘Assessment of Work-Related Musculoskeletal Disorders among Nurses in Mombasa County - Kenya’

Purpose

It is to collect and analyze information about the Work-Related Musculoskeletal Disorders and health awareness among the nurse in Mombasa County both private and public hospitals. This is in order to ensure that they have a safe and healthy working environment like every other employee as stipulated by the Occupational Safety and Health Act 2007 (OSHA, 2007).

Inconveniences or risks

You will be inconvenienced with your time since the researcher will need you to respond to some questions on a questionnaire. It will take about 10 - 15 minutes at a convenient time to allow minimal interruption in doing your work. No other potential risks are foreseen.

Benefits: You will not get direct benefit as an individual however your participation will contribute to the improvement of occupational safety and health provisions in your work place. **Alternatives:** Your participation in this study is voluntary. You are free to ask questions to the main researcher before you consent to participate or any other time at will as they arise. You are also free to withdraw from the study if necessary without any consequences. However, it will be useful to complete it.

Confidentiality: All the information in the questionnaire and files will be held in confidence. At the end of the study there will be no way to link your name with the data. It will be labeled by study code number and kept in lockable cabinets and only the

research staff will have access. Any additional information will be provided to you including the final results.

Costs: There is no financial cost to participate in this study.

Questions: If you have any questions, you can ask at the moment; -----

If you do not have any question at the moment and yet a question may arise later; I do hereby provide you with the contacts that you can use to have any arising matters solved.

Contact:

If you get any questions or concerns about the study or in the event of the study: please contact the principal investigator and/or the representative on; Telephone numbers: 0720303789; P. O. Box 80341-00100, Mombasa; email address: tanuibetty@yahoo.com

For any questions concerning your rights as a research participant, please contact: The Secretary, JKUAT Ethics Review Committee, P. O. Box 62000- 00200, Nairobi; Telephone numbers:

Should you agree to participate in this study, then I do request you to fill a questionnaire attached. It includes; personal information regarding your area of work either, management, workshop etc.

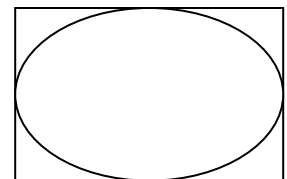
If you are in agreement to participate in this study, please sign your name below, indicating that, you have read and understood the nature of the study, your responsibilities as a study participant, the inconveniences associated with voluntary participation in the study as well as an indication that all your concerns regarding the study have been addressed satisfactorily.

Subject's statement

I have been clearly explained to about this study of and I volunteer to participate in it. I have a chance to still ask questions about it in future if I get any using the contacts I have been given.

I do accept to participate in this study

Name and Signature of study participant and Date



Name and Signature of person obtaining Consent and Date

Thumbprint of

participant

Appendix 2: Coast Province Medical Services Research Ethics Approval Letter

**MINISTRY OF MEDICAL SERVICES
OFFICE OF THE PROVINCIAL DIRECTOR OF MEDICAL SERVICES**

Telegrams: "PROVMED", MOMBASA
Telephone: Mombasa 041-2319819
Fax: 2220161
Email: pdmscoast@gmail.com
pdms.coast@yahoo.com
When replying please quote



OFFICE OF
THE PROVINCIAL DIRECTOR OF
MEDICAL SERVICES
COAST PROVINCE
P. O. BOX 91040 - 80103
MOMBASA

Ref. PDMS/ADM.1/37/VOL.1/81

Date: 1st July, 2013

To Whom It May Concern

RE: DECISION RESEARCH ETHICS REVIEW

The submitted proposal entitled "Assessment of work related musculoskeletal disorders affecting nurses in Mombasa County", on 30th June, 2013, has been reviewed.

The study topic is important to document work related musculoskeletal disorders affecting nurses in Mombasa County.

Findings will inform effective interventions to enhance prevention of work related musculoskeletal disorders. Moreover, the measures proposed to guarantee confidentiality, analysis of information and dissemination of the study findings is adequate, though any rising issues can be resolved through the support of the supervisor. Therefore there is no objection against the implementation of the study.

On completion of the research, you are expected to submit a copy of the study report to this office and disseminate the findings to enhance evidence based practice in healthcare.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Benard Nyaribo".

DR. BENARD NYARIBO
HEAD, RESEARCH & DEVELOPMENT
FOR: PROVINCIAL DIRECTOR OF MEDICAL SERVICES
COAST PROVINCE

Appendix 3: Questionnaire

You are hereby invited to participate in a study designed to obtain information on work-related musculoskeletal disorders among nurses in Mombasa County. The study hopes to investigate job-related factors leading to musculoskeletal disorders in nursing practice, its prevalence and to determine the impact of WMSD on nurses' productivity in the hospitals. The findings from this study may help to understand prevention and coping strategies for musculoskeletal disorders among nurses in order to reduce the rate of occupation hazards and also improve patients' care. All information obtained is for research purpose only and will be treated with utmost confidentiality. Your participation in this study is voluntary and your signed consent is required, you also have the right to withdraw from the study at any time you choose to.

We will greatly appreciate your help in responding to participate in this study.

Thank you for your cooperation and assistance.

SECTION A

Date...

1. Gender: Male Female

2. Age: less than 30 yrs

 30–35 yrs

 35–40 yrs

 More than 40

3. Time in employment.....

4. Numbers of: Working days per week days

Working hours per day:.....hr/hrs

5. Numbers of patients treated per working day/s:

 1–5 patients

 6–10 patients

 11–15 patients

 More than 15 patients

6. Do you take a break between patients? Yes No

If yes, please give the duration of breaks between Patientsminutes

7. How much time do you spend on each patient appointment?

30 min

30–60 min

More than 60 min

8. Do you work in other field/s that could affect your musculoskeletal system outside the field of nursing? No Yes

9. Which neck and back position do you mostly maintain while working?

A: bending forward, backward or laterally never/ rarely.....

Sometimes.....

Most of the time.....

B: twisting never/ rarely

Sometimes

Most of the time

C: A and B together never/rarely.....

Sometimes.....

Most of the time.....

10. Do you have any diagnosed musculoskeletal disease such as arthritis? Yes No

SECTION B: Tick yes if you have experience pain in given body parts

<p>Neck</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/></p>	<p>Neck</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/></p>	<p>Neck</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/></p>
<p>Shoulder</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right shoulder</p> <p> <input type="checkbox"/> in the left shoulder</p> <p> <input type="checkbox"/> in the both shoulders</p>	<p>Shoulder</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right shoulder</p> <p> <input type="checkbox"/> in the left shoulder</p> <p> <input type="checkbox"/> in the both shoulders</p>	<p>Shoulder</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right shoulder</p> <p> <input type="checkbox"/> in the left shoulder</p> <p> <input type="checkbox"/> in the both shoulders</p>
<p>Elbows</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right elbow</p> <p> <input type="checkbox"/> in the left elbows</p> <p> <input type="checkbox"/> in the both elbows</p>	<p>Elbows</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right elbow</p> <p> <input type="checkbox"/> in the left elbows</p> <p> <input type="checkbox"/> in the both elbows</p>	<p>Elbows</p> <p>No Yes</p> <p><input type="checkbox"/> <input type="checkbox"/> in the right elbow</p> <p> <input type="checkbox"/> in the left elbows</p> <p> <input type="checkbox"/> in th e both elbows</p>
<p>Wrist/hands</p> <p>No Yes</p>	<p>Wrist/hands</p> <p>No Yes</p>	<p>Wrist/hands</p> <p>No Yes</p>

<input type="checkbox"/> <input type="checkbox"/> in the right wrist/hand <input type="checkbox"/> in the left wrist/hand <input type="checkbox"/> in the both wrists/hands	<input type="checkbox"/> <input type="checkbox"/> in the right wrist/hand <input type="checkbox"/> in the left wrist/hand <input type="checkbox"/> in the both wrists/hands	<input type="checkbox"/> <input type="checkbox"/> in the right wrist/hand <input type="checkbox"/> in the left wrist/hand <input type="checkbox"/> in the both wrists/hands
Upper back No Yes <input type="checkbox"/> <input type="checkbox"/>	Upper back No Yes <input type="checkbox"/> <input type="checkbox"/>	Upper back No Yes <input type="checkbox"/> <input type="checkbox"/>
Lower back (small of the back) No Yes <input type="checkbox"/> <input type="checkbox"/>	Lower back (small of the back) No Yes <input type="checkbox"/> <input type="checkbox"/>	Lower back (small of the back) No Yes <input type="checkbox"/> <input type="checkbox"/>
One or both hips/thighs/buttocks No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both hips/thighs/buttocks No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both hips/thighs/buttocks No Yes <input type="checkbox"/> <input type="checkbox"/>
One or both Knees No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both Knees No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both Knees No Yes <input type="checkbox"/> <input type="checkbox"/>
One or both Ankles /Feet No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both Ankles /Feet No Yes <input type="checkbox"/> <input type="checkbox"/>	One or both Ankles /Feet No Yes <input type="checkbox"/> <input type="checkbox"/>

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11. Over the last 12 months, did you experience any of the symptoms listed above 3 times or more No Yes

12. If yes, how often did this happen?

Continuously

Every day

Once a week

6 months

13. How did these pains affect your work?

I had to take analgesics

I had to visit a physiatrist or physiotherapist

I had difficulty sleeping

I was forced to reduce my working hours or days

Once a month

Once every 2 months

Once every 6 months

14. How many times did you have to visit a doctor in the last year because of these problems?

Never

Once

2–5 times

More than 5 times

15. Do you adopt any special behaviour to prevent this form of disorder?

No

Yes

I do an exercise (regular and/or ergonomic exercises) taught to me by physiotherapist

I have a regular exercise routine (such as fitness swimming, e.t.c)

SECTION C: job risk factors that may contribute to development of work-related musculoskeletal disorders

Listed below are 17 conditions and tasks at work that could contribute to job-related problems. Please indicate, on a scale of 0 to 10, how much of a problem (if any) each item is for you by circling the appropriate number." A score of 0 to 1 was equivalent to a job factor being "no problem," a score of 2 to 7 was rated as a "minimal to moderate problem," and a score of 8 to 10 indicated that a job factor was considered a "major problem.

Job risk factor

-

16. Performing the same task over and over

0	1	2	3	4	5	6	7	8	9	10

17. Treating an excessive number of patients in one day

0	1	2	3	4	5	6	7	8	9	10

18. Performing manual orthopaedic techniques

(Joint mobilizations, soft tissue mobilization)

0	1	2	3	4	5	6	7	8	9	10

19. Not enough rest breaks or pauses during the workday

0	1	2	3	4	5	6	7	8	9	10

20. Working in awkward and cramped positions

0	1	2	3	4	5	6	7	8	9	10

21. Working in the same positions for long periods

(Standing, bend over, sitting, kneeling)

0	1	2	3	4	5	6	7	8	9	10

22. Bending or twisting your back in an awkward way

0	1	2	3	4	5	6	7	8	9	10

23. Working near or at your physical limits

0	1	2	3	4	5	6	7	8	9	10

24. Reaching or working away from your body

0	1	2	3	4	5	6	7	8	9	10

25. Continuing to work while injured or hurt

0	1	2	3	4	5	6	7	8	9	10

26. Lifting or transferring dependent patients

0	1	2	3	4	5	6	7	8	9	10

27. Working with confused or agitated patients

0	1	2	3	4	5	6	7	8	9	10

28. Carrying, lifting, or moving heavy materials or
equipment (e.g., continuous passive motion machines)

0	1	2	3	4	5	6	7	8	9	10

29. Unanticipated sudden movement or fall by patient

0	1	2	3	4	5	6	7	8	9	10

30. Assisting patients during gait activities

0	1	2	3	4	5	6	7	8	9	10

31. Work scheduling (Overtime, irregular shifts,
length of workday)

0	1	2	3	4	5	6	7	8	9	10

34. Inadequate training on injury prevention

0	1	2	3	4	5	6	7	8	9	10

Appendix 4: Table for sample size determination

Table 1: Table for Determining Minimum Returned Sample Size for a Given Population Size for Continuous and Categorical Data

Population size	Sample size					
	Continuous data (margin of error = .03)			Categorical data (margin of error = .05)		
	alpha = .10 t = 1.65	alpha = .05 t = 1.96	alpha = .01 t = 2.58	p = .50 t = 1.65	p = .50 t = 1.96	p = .50 t = 2.58
100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	382
1,000	77	106	173	213	278	399
1,500	79	110	183	230	306	461
2,000	83	112	189	239	323	499
4,000	83	119	198	254	351	570
6,000	83	119	209	259	362	598
8,000	83	119	209	262	367	613
10,000	83	119	209	264	370	623

NOTE: The margins of error used in the table were .03 for continuous data and .05 for categorical data. Researchers may use this table if the margin of error shown is appropriate for their study; however, the appropriate sample size must be calculated if these error rates are not appropriate. Table developed by Bartlett, Kotrlík, & Higgins.