SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG WORKERS OF ABOSSEY OKAI AUTOMOBILE SPARE PARTS MARKET

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT FOR THE AWARD OF THE MASTER OF PUBLIC HEALTH DEGREE

JULY, 2018

DECLARATION

I, Eunice Ohene Darko, hereby declare that apart from references to other people‟s work which have been duly acknowledged, this proposal is as a result of my own independent work and has not been submitted for the award of any degree in any institution.

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DEDICATION

I dedicate this dissertation to the Lord Jesus Christ and Myself.

ACKNOWLEDGEMENT

I thank God Almighty for His Grace that saw me through this academic journey.

My sincerest gratitude goes to my academic supervisor, Dr. Emilia Asuquo Udofia of the School of Public Health, the University of Ghana for her guidance, corrections, support and mentorship. Mr. and Mrs. Boakye Amoateng, thank you so much, I more than grateful for your help. My sincere gratitude also goes to the leaders and all workers of Abossey Okai automobile spare parts market especially David for your support. I am most grateful to Miss Golda Ataa Akuffo for her support and accommodating all my tantrums, thank you, dear friend, for having my back. My appreciation also goes to my lovely family; mum, dad and siblings. A very big thank you goes to Mr. Kofi Agyabeng for all the help and advice. Thank you, Mrs. Fatimah Ayete-Larbi and Mrs. Delali Pearl Afi Asubonteng for your encouragement and support. I wish you two ladies the best in your dissertations too.

ABSTRACT

Background: Abossey Okai situates the central market for automobile spare parts in Accra, Ghana. The market lacks formal structures for work supervision thus exposing workers to various hazards. The most commonly encountered are mechanical hazards. Mechanical hazards could result in a high prevalence of various forms of occupational injuries and disorders.

Objective: This study assessed the factors that influence work-related musculoskeletal disorders (WRMSDs) among the garage workers of Abossey Okai automobile spare parts market.

Method: The study was a cross-sectional study. Two hundred and fifteen (215) workers of big axles and engine spare parts shops at Abossey Okai completed a 66-item questionnaire. Study participants were selected using a simple random sampling technique. STATA software version 15 was used for data analysis. Multiple logistic regression, Chi-square, Mann-Whitney and Fisher's exact tests were carried out to measure the relationship between WRMSDs and the explanatory factors with a confidence level of 95%. The explanatory factors were socio-demographic characteristics, occupational health and safety (OHS) knowledge level and work demands.

Results: The mean age of participants was 33.1 ±8.5 years and the mean work experience was 9.4±6.5 years. About seventy percent (70.2%) of participants recorded fair knowledge in OHS. The prevalence of WRMSDs among participants was 71.6% with the low back (38.1%) being most affected body part.

The chi-square test demonstrated a significant relationship between participants‟ age and WRMSDs (X^2 = 13.02; P = 0.001). The Mann-Whitney test also showed an association between work experience and WRMSDs (Z= -2.92; p = 0.004). The unadjusted regression analysis yielded significant association of WRMSDs with two variables: age (UOR =2.09: 95 % CI = 0.99, 4.43) and work experience (UOR = 1.08; 95 % CI = 1.02, 1.14). These variables however lost statistical significance in the adjusted regression analysis.

Conclusion: The study recorded a high prevalence of WRMSDs among the garage workers of the big axles and engines spare parts shop in Abossey Okai. The age and work experience tends to be associated with the development of WRMSDs among the garage workers but this may require further investigation.

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LIST OF ABBREVIATIONS

AAWL	Arthritis-attributable work limitations
AIDS	Acquired Immune Deficiency Syndrome
EPA	Environmental Protection Agency
HIV	Human Immunodeficiency Virus Infection
ICLS	International Conference of Labour Statisticians
ILO	International Labour Organization
NMQ	Nordic Musculoskeletal Questionnaire
MSD	Musculoskeletal Disorders
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
WFC	Work Family Conflict
WHO	World Health Organization
WRMSDS	Work Related Musculoskeletal Disorders

OPERATIONAL DEFINITION OF TERMS

Ergonomics

Ergonomics is the science of fitting working environment conditions and work demands to the ability of the working populace to decrease stress and remove injuries and disorders associated with bad posture, overuse of muscles and repeated activities.

Garage Workers

Permanent employee of big axles and engine automobile spare parts shop at Abossey Okai.

Hazard

A source of exposure to danger or harm.

Informal sector

Informal sector used in this context was defined as an institution where workers are not entitled to annual, sick or maternity leave and employment agreement was not established with written contract but rather verbal communication.

Occupational hazard

It is workplace features (physical or psychosocial) that have can cause harm or produce unwanted effect on the workers, neighbours, clients and visitors. Examples of occupational hazards of the automobile spare parts work are; poor ergonomic designs, engine oils, lifting of heavy metals, noise, limited work stations, lack of organizational structures and stress.

Occupational Health and safety

It is the promotion and maintenance of the highest degree of the physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.

Work Experience

Years of service or engagement in a particular job.

Work-related musculoskeletal disorders

A group of painful conditions involving the muscles, tendons and nerves owing to a peoples‟ work environment and activities. Sciatica, adhesive capsulitis, carpal tunnel syndrome, tendonitis, thoracic outlet syndrome and spondylosis are examples. Mostly affecting the hand, wrist, elbow, neck, shoulder and back.

CHAPTER ONE

INTRODUCTION

1.1 Background

There has been an upsurge of vehicles in Ghana owing to population growth, urbanization and advanced technology. These vehicles are often poorly maintained and affected by the bad roads in the country. Furthermore, most people purchase fairly used vehicles which are relatively affordable to the lower and middle socio-economic class. Consequently, these vehicles often need spare parts for maintenance and the Abossey okai market, is the hub of the automobile spare parts in Accra and Ghana.

The Abossey Okai market, though considered part of the informal sector lacking a formalized structure with adequate monitoring, is known to be instrumental in the reducing the employment burden on the government by providing a greater share of employment in Ghana. It is reported that 90% of the nation's workforce are in the informal sector (Osei-Boateng & Ampratwum, 2011). The automobile spare parts work demands repetitive movements, manual handling of light and heavy vehicle parts, sustaining postures for an extended time period and exposing them to various hazards. The market is minimally regulated by organizations responsible for the welfare of workers in Ghana, thus workers are exposed to poor work environment, low wages and capital, use of simple tools and poor ergonomic practices which are the factors that undermine OHS in the informal sector (Hasle & Limborg, 2006).

These factors expose the workers to various forms of work-related ill-health including Work – related musculoskeletal disorders (WRMSDs). WRMSDs are a range of conditions that affect the muscles, bones and joints. WRMSDs have been established to be linked with various

occupational risk factors such as unbalanced force, awkward posture, repetitive movements and vibrations, psychological stressors and individual factors which are present in the day to day activities of the Abossey Okai workers. The severity of WRMSDs varies. It can affect shoulders, arms, elbows, wrists, hands, back, legs and feet. Symptoms include tenderness, aches and pains, tingling, stiffness and swelling (Luttmann, Alwin, Jager, Caffier, Liebers, 2003). Pain and discomfort may interfere with everyday activities imposing physical and financial burden on the individual, establishments and healthcare system. Early diagnosis is the key to ease pain while potentially decreasing further bodily damage. Occupational health and safety knowledge is a key factor that can help workers detect WRMSDs early.

1.2 Statement of the Problem

According to article 24(1) of the 1992 constitution of Ghana, every person has the right to work in safe and healthy environments. In an era of advancement in technology, increasing urbanization and modernization, employees, globally, spend less time at home than at the workplaces and Ghana, is no exception. The health and safety of every worker are, also a vital human right thus a worker must not work at the risk of his or her health.

The Labour Department of Ghana 2000 annual report shows a total of 8,692 work-related accidents reported to the Department for compensation claims, while in 1999, the total stood at 4,088. In 2016, 1,096 workplace accidents as against 2,697 workplace accidents in 2015 were recorded. These values were derived from reports submitted by some formal institutions (mainly state-owned) while reports on workplace accidents and the extent of injury from both formal (especially private institutions) and informal sectors were lacking. A hazardous and unhealthy work environment can be very disturbing for a Ghanaian worker because of the disparity between the average minimum earnings and the average cost of treatment (Mock et al., 1999) especially when the employer does not ensure the provision of quality medical care to employees.

Globally, protection of workers against occupational hazards and accidents has been of great concern over the years for the International and Local Labour Organizations, policymakers, employees, and employers as well as the general public. This is because exposure to these occupational hazards does not only affect the physical, mental and social well-being of the workers but also leads to high cost of medical bills, increased compensation paid to victims of these accidents, increased lost time at work, loss of experienced personnel, low productivity, among others.

The lack of substantive national OHS policies, the high cost of ergonomic interventions and safety measures, negligence, malleable and corrupt attitudes of the few regulatory agencies etc. account for the increasing number of occupational hazards and WRMSDs in developing countries (Alfers, 2010). A study of artisans at Kokompe revealed there was lack of collaboration between the artisans and relevant stakeholders which in turn affected the occupational health and safety practice by workers (Appiah, 2014). Studies undertaken by Tawiah, Oppong-Yeboah, & Bello (2015) and Abledu and Offei (2015) reported prevalence of 85.5% WRMSDS among mining workers and 78.5% WRMSDS among nurses respectively which makes it an alarming health issue of public health concern. The limited research available on WRMSDs among informal workers in Ghana necessitated the present study which sought to investigate WRMSDs among Abossey Okai. It further aimed to address some of the gaps in research on WRMSDs in relation to OHS in the informal sector. This study can also serve as a basis for planning and designing interventions to reduce the incidence of WRMSDs among informal workers in Ghana. Consequently, enhancing productivity and economic growth.

1.3 The Conceptual framework of the study

The conceptual framework (Figure 1) shows the likely relationship between some risk factors of MSDs and WRMSDs among the garage workers of Abossey Okai automobile spare part market. This framework was adapted from the National Research Council (2001)

Occupational health and safety knowledge help workers make informed choices at the workplace which influence their work activities thus preventing injuries and tissue damage. A research by Appiah (2004) among some informal workers at Kokompe-Accra reported the high risk of injuries and MSD among the workers owing to their poor knowledge in occupational health and safety. Therefore, it could be inferred that poor level of OHS knowledge could precipitate high prevalence of WRMSD among the workers whereas high OHS knowledge could also precipitate the reduction in the prevalence of WRMSD.

High manual work poses mechanical load on the musculoskeletal system and provokes responses which in turn cause stress and fatigue in the tissues. A chronic exposure of a worker to a highly physically demanding work eventually results in MSD which when ignored could lead to disability and sometimes death. A study of WRMSD among some selected Australian Physical

therapists showed that the performance of manual therapy, posture when working and workload concerns related MSDs symptoms in the lower back, neck, upper back, and the wrists, hands, and thumbs (Cromie, Robertson, & Best, 2000). Another study conducted among the staff of the Anglo-Gold Ashanti Mines reported a high prevalence of WRMSDs and established a correlation between WRMSDs and employees task demands (Tawiah, Oppong-Yeboah, & Bello, 2015).

Factors such as sex, age, educational status, work experience, working hours and marital status are known risk factors of WRMSD. More men than women are seen to be engaged in manual work owing to their biological processes and social gender role differentiation. It has been reported that in most studies, women were more predisposed to MSD than men. Women react more to stress and mechanical strain because of their morphology and hormonal responses. They, therefore, report more MSD than men. A study reported females doing office jobs are more at risk of developing WRMSD than men (Roquelaure et al., 2009). Family roles and work are sometimes unharmonious and negatively influence each other resulting in work-family conflict (WFC). Stress from spouses such as high financial demands can trigger psychological responses and fatigue which produces MSD on prolonged exposure. Stress from family issues sometimes causes workers to be absent-minded and careless at work thus perform activities leading to injuries.

The educational status of a worker may influence their occupational health and safety knowledge. A worker who cannot read or write may be exposed to many hazards at the workplace without notice. They may ignorantly ignore warnings and may have little understanding of occupational health issues. Higher education influences an individual's decision about their own health and so people are able to avoid occupational hazards which results in

MSDs and injuries. This assertion is supported by a research that evaluated the relationship between workers characteristics, workplace factors and WRMSDs among construction workers in Nigeria (Ekpenyong & Inyang, 2014).

Musculoskeletal disorders occur over prolonged exposure to the risk factors. This cumulative effect of exposure of workers to risk factors may result from repetitive activities, years of work and working hours. The impact of load on the muscles, connective tissues, cartilages, bones and meniscus change over years of work and provokes biomechanical or physiological responses. These responses cause stress and later tissue fatigue. A long time exposure eventually results in WRMSDs. A number of studies outcomes supported the correlation between years of work and WRMSDs. this, therefore, could be a pointer that incidence of WRMSDs is a function of exposure time to risk factors of WRMSDs during job execution. A study among quarry workers which found the association between work experience and WRMSDs is one typical example (Egwuonwu, Abidemi, Aiyejunsunle, Ezeukwu, & Auwal, 2013).

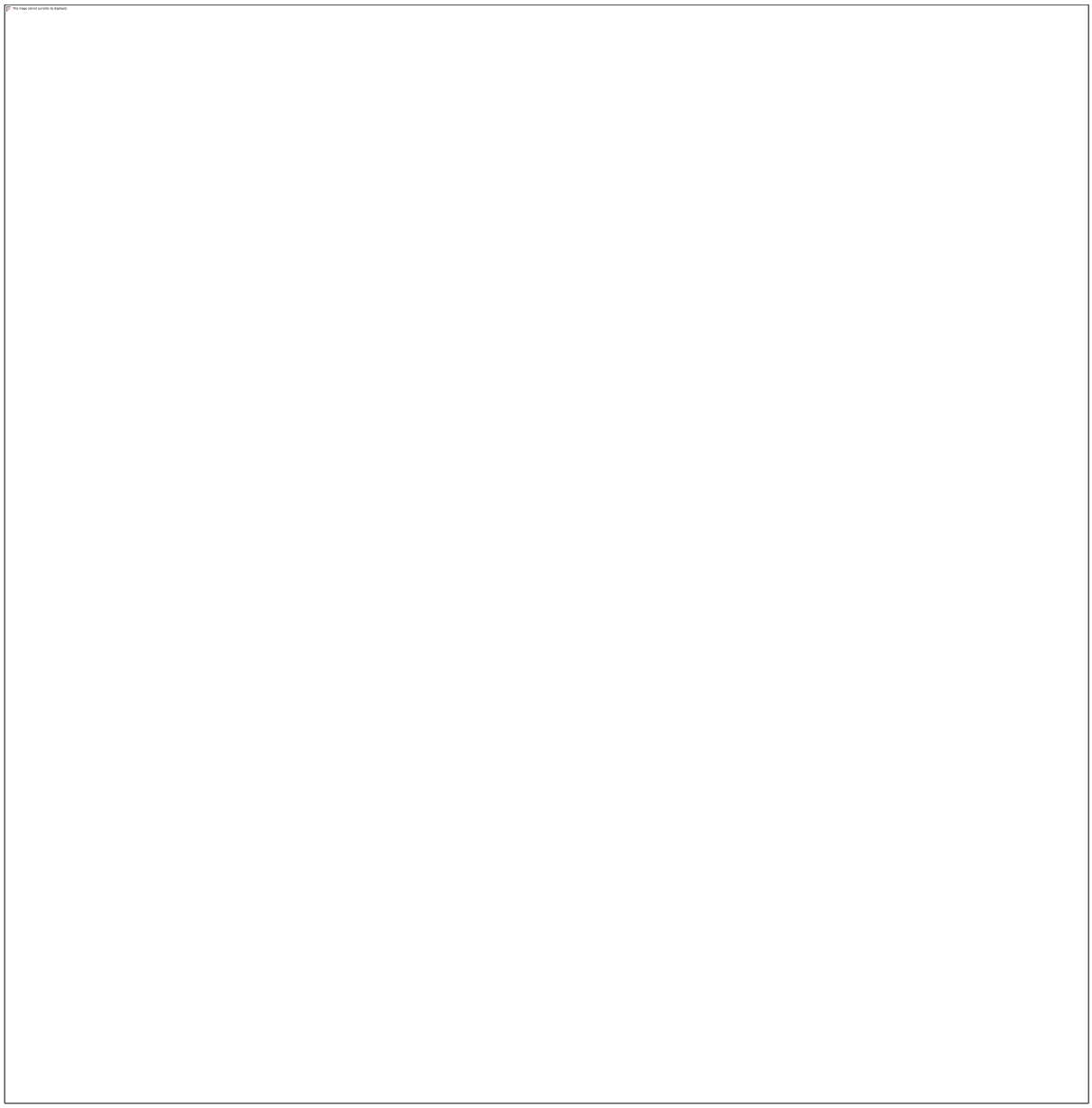

Figure 1: Conceptual Framework of the study adopted from the National Research Council (2001)

1.4 Justification

Most informal workers have poor awareness of their occupational hazards and also proper protection from these hazards. The unstructured nature of the informal economy creates a virtually impossible situation for governments to conduct census needed to take appropriate actions against these hazards. Most informal works are situated in obscure areas which lack demarcation and/or identifiable addresses hindering inspectorates from investigating working conditions to initiate corrective action where required and the Abossey Okai automobile spare parts market is no exception.

The Abossey Okai work usually involves lifting of heavy materials. A repetition of these activities could lead to MSDs. MSDs can also results in disability or death and its effect transcends beyond the individual involved to the entire population. When self-sufficient individuals are deprived of their ability to earn, they become reliant on families, government services and public support for health care, housing and food. The need for self-actualization and security is affected which in turn can affect the productivity of the individual, the organization and the nation as a whole. WRMSDs is, therefore, a public health concern that must be considered with keen interest.

A few studies have looked at the occupational health and safety and WRMSDs among informal workers, especially artisans, but there is a limited information on workers in the garages and scrapyards (e.g. Abossey Okai. This present study seeks to ascertain the OHS knowledge and the prevalence of WRMSDs among these workers. It will identify and inform them about WRMSDs they are at risk of developing so that they can comply with safety measures and ergonomics. The study will also inform the public the impact of OHS practices in WRMSDs in the scrapyards and improve the quality of life of the workers. Furthermore, the findings and recommendations of the

study will help policymakers to make informed decisions on interventions to reduce WRMSDs among informal workers.

1.5 Research Questions

1. What is the prevalence of work-related musculoskeletal disorders among the garage workers?

2. Is there an association between work-related musculoskeletal disorders and the work demands of the garage workers?

3. Do workers‟ occupational health and safety knowledge level influence the development of work-related musculoskeletal disorders among the workers?

4. Is there a relationship between work-related musculoskeletal disorders identified with the automobile spare parts garage workers and their socio-demographic characteristics?

1.6 Study Objectives

1.6.1 General Objective

To assess the factors that influence work-related musculoskeletal disorders among the garage workers of Abossey Okai automobile spare parts market.

1.6.2 Specific Objectives

1. To ascertain the prevalence of work-related musculoskeletal disorders among the garage workers.

2. To measure occupational health and safety knowledge level among the garage workers and assess its relationship with work-related musculoskeletal disorders.

3. To assess the effect of the risk factors (work demands) associated with the work of the garage workers on work-related musculoskeletal disorders.

4. To assess the relationship between socio-demographic characteristics of the garage workers and work-related musculoskeletal disorders.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents a review of related literature on the subject. The chapter covers, the informal sector in Ghana, work-related musculoskeletal disorders and occupational health and safety.

2.1 Search Strategy

This chapter reviews the supporting literature for the study to be conducted. The electronic search engines used for the review comprised of Science direct, PubMed, Google and Google Scholar. Hand search for articles was also done. The search terms used were "musculoskeletal disorders" OR "work-related musculoskeletal disorders", "occupational health and safety" AND "work-related musculoskeletal disorders", "informal economy" AND "Ghana" OR "developing countries". The years 2000-2017 was added to the search to obtain current literature. The library of the University of Ghana, School of Public Health was visited for related dissertations and four were found to be related to the study. Twenty-two journals were identified during the review process but nineteen were used for the literature review on account of its relevance to the topic under review. Some of the journals where substantial information was obtained were American Journal of Industrial Medicine, South African Medical Journal, Spine and Ergonomics.

2.2 The Informal Sector in Ghana

The informal economy refers to activities and earnings that are partly or completely outside the government directive, taxation, and surveillance (Benjamin, Beegle, Recanatini, & Santini, 2014). The ILO also describes the informal economy as "…*economic activities by workers and economic units that are in law or in practice – not covered or insufficiently covered by formal*

arrangements. Their activities are not included in the law, which means that they are operating outside the formal reach of the law; or they are not covered in practice, which means that – although they are operating within the formal reach of the law, the law is not applied or not enforced; or the law discourages compliance because it is inappropriate, burdensome or imposes excessive costs" (ILO, 2002).

The Seventeenth International Conference of Labour Statisticians (17th ICLS) held in 2003 also interpreted the Informal engagement as: *"Work in an institution where employees were not eligible to waged holidays or leave, sick or maternity leave and where there was no oral or transcribed contract at the time the person commenced work. One or more of these three conditions had to be satisfied in order for an individual to be categorized as working in the informal sector* (Alli, 2009).

Employment in the formal sector is often limited, especially in many developing countries like Ghana. Therefore, the majority of the nation's workforce is compelled to work in the informal sector to earn an income. According to the Institute for Statistical, Social and Economic Research, the main source of employment for many Ghanaians is the informal sector which provides employment opportunities for about 90% of the labour force. The informal sector in Ghana are classified into two broad sectors; the rural informal sector and urban. (Osei-boateng & Ampratwum, 2011).

2.2.1 Urban Informal Sector

Employment in this sector can be put into three groups i.e. services, construction and manufacturing. These workers are usually low-wage earners, ill-equipped, without social security protection, lack job security and opportunities for career advancement.

People in the service category offer services to their customers in the form of goods, food and skill. The Abossey Okai workers are found in this category because they offer services in the form of goods (auto spare parts) and skills (vehicle repair). Other occupations in this category include: foodstuff traders, food vendors, street hawkers, wholesalers and retailers, bakers, caterers, chemical traders, drugstore retailers, embalmers, waste collectors, traditional/herbal healers, some traditional birth attendants, domestic labourers, appliance repairers, auto mechanics, sprayers, welders, auto electricians, hairdressers/beauticians, barbers, private security men, drivers, seamstress/tailors, cobblers etc. The skill providers normally acquire their skills through years of apprenticeship.

Workers in the construction category are involved in building roads, edifices, schools, hospitals, apartments and all other infrastructure. Examples are steel benders, masons, painter, carpenters, plumbers and electricians. Skills are commonly acquired through apprenticeship.

The last group is the manufacturing category with principal activities of food processing, shoes and textiles making, wood processing, beads making, soap making and metal works. The traineeship is the commonest form of skill acquirement and engagement in this category.

2.2.2 Rural Informal Sector

Labour in the rural informal sector is grouped according to the employment contract. There are four categories under this sector. They are the family labour, casual labour and permanent labour.

The establishment under the family labour is mainly family business where employees are usually family members. It is deemed essential for the existence and sustainability of the venture. It is sometimes a means of preparation for the transmission of skills across generations. It spreads throughout all areas of informal institutions, especially agriculture.

Casual labour employs temporal workers which are locally known as "by day" workers. Workers here are hired and paid on a daily basis as its local jargon tells. Payment is in cash but can also be in kind. It is prevalent in the food and cash crop sub-sector where it is needed to carry out work including land clearing, preparation of mounds, planting, weeding, fertilizer and chemical application and harvesting.

The permanent labour constitutes a relatively small proportion of the rural labour force. The size of the establishment, such as a farm, and the degree of permanence of the crop type, determine the permanence of labour to a large extent. Perennial tree crops like cocoa, oil palm, coconut and rubber produce permanent workers.

2.3 Work-Related Musculoskeletal Disorders

Work-related musculoskeletal disorders (WRMSDs) are sometimes known as Repetitive motion injuries, Repetitive strain injuries or Cumulative trauma disorders (Miller, McAtmaney, Hogan, & Mallet, 2006). WRMSDs are a group of conditions that affect the joints, muscles, ligaments, bursa and tendons of people owing to the environment, postures and schedules at their workplace and they commonly affect the hands, wrists, elbows, neck and shoulders because the upper limbs

are involved in most work activities (Luttmann, Alwin, Jager, Caffier, Liebers, 2003). The back especially low back is sometimes affected owing to wrong and prolonged static postures as well as repetitive activities. The hips, thighs, knees, legs, ankles, and feet are occasionally affected. Examples of WRMSDs are spondylosis, carpal tunnel syndrome, thoracic outlet syndrome, trigger finger, adhesive capsulitis, lumbago, tendonitis and tension neck syndrome.

About 70 million visits to the physicians in the United States annually is as a result of musculoskeletal disorders. Musculoskeletal disorders also account for an estimated 130 million total health care encounters including outpatient, hospital, and emergency room visits in the United States (Barondess. A. et al., 2001). Persons who are limited in their work by arthritis are said to have Arthritis-attributable work limitations (AAWL). AAWL affects one in 20 working-age adults (aged 18-64 years) in the United States and one in three working-age adults with self-reported, doctor-diagnosed arthritis (Theis, Murphy, Hootman, Helmick, & Yelin, 2007). In Great Britain, 507,000 workers reported WRMSDs and 8.9,000,000 working days were lost to WRMSDs in 2016/17 with the agriculture, forestry, construction, fishing, storage, transportation, health and social work institutions recording the highest prevalence of WRMSDs over a 3-year period, 2014-2016 (Health and Safety Executive, 2017).

The prevalence of WRMSDs observed in a study among hairdressers in Surulere and Mushin Local Government Areas of Lagos State, Nigeria was 81% (Aweto, Tella, & Johnson, 2015). Another study by (Tawiah, Oppong-Yeboah, & Bello, 2015) also found the 12-month prevalence of WRMSD to be 85.5% and low back was reported 178 (30%) as the most affected body segment among miners in Ghana.

2.3.1 Risk Factors for Work-Related Musculoskeletal Disorders

The development of WRMSDs is associated with a combination or interaction of factors at the workplace (Da Costa & Vieira, 2010). Some of these factors are: persistent repetition of movements, force focused on small parts of the body, such as the hand or wrist, fixed or awkward postures, a pace of work that does not allow adequate recovery between activities, material handling, mechanical compression, vibrations, extreme temperature (hot and cold), duration of exposure and inadequate lighting. Psychosocial factors such as institutional culture, the health and safety environment and human factors at work may also cause WRMSDs to develop. Many of these factors are found to be present in the daily work of the Abossey Okai automobile parts workers. A study conducted on occupational health and safety among Kokompe workers (a similar spare parts place in Accra) revealed that their work entails improper sitting posture, lifting of heavy objects and generally working without any safety measures (Appiah, 2014). Thus, exposing these workers to a higher risk of suffering work-related musculoskeletal disorders.

Employees in the informal economy are much more likely to be exposed to poor work environments, low safety and health standards, occupational hazards and to suffer WRMSD or injury than workers in the formal sector. Most informal workers have little or no knowledge of occupational health and safety and ergonomics. Most informal work takes place in homes, obscures places, streets and the like, making it impossible for inspectorates to investigate work conditions and give the appropriate advice to those who need it (Benjamin, 2001).

Part-time workers may not be covered by safety and health provisions. The accident rate of contract workers is on average twice that of permanent workers (Benjamin, 2001). Many employers seem to believe that by subcontracting certain tasks, they subcontract their safety

responsibilities which may result in injuries and WRMSDs. In the Abossey Okai automobile spare parts market, the part-time workers are mostly the loading personnel (locally known as the „truck pushers'). They are contracted for a day's work to help offload the auto spare parts and pack them without any safety cover.

Some literature reveals that women are at higher risk of developing work-related musculoskeletal disorders than men. For instance, one systematic review by (Treaster & Burr, 2004) revealed that women have a higher prevalence of upper limb WRMSDs than men. In another study, prevalence ratios for musculoskeletal symptoms were observed to be consistent across a range of job tasks and were roughly 50% higher for women regardless of the tasks that workers performed (Cavallari, 2017). As people become older, their likelihood of suffering from musculoskeletal disorders increases and quality of life deteriorates (Gcelu & Kalla, 2015). The aging workforce tends to have a higher risk of developing musculoskeletal disorders than the young adults owing to their lax and weak muscles.

Work experience may also be explained to mean some kind of short-term work placement in an organization where one will be assigned to work on junior-level tasks in order to get hands-on skills and understanding of the employment sector. It is believed that people with high work experience will be able to manage stress than those with low working experience. The ability to use past working experiences to manage new work stress according to is termed “stress inoculation.” Typically, more experienced workers may transfer their experiences to less experienced workers through constant interaction and practice

2.3.2 Signs and Symptoms of Work-Related Musculoskeletal Disorders

Pain is the most common symptom associated with WRMSDs. In some cases, there may be joint stiffness, muscle tightness, redness and swelling of the affected area. Some workers may also experience sensations of "pins and needles," numbness, skin colour changes and decreased sweating of the hands. WRMSDs maybe intermittent or chronic in duration and progress in stages from mild to severe, however not all individuals go through the stages as anticipated. The symptoms of MSD are grouped into three stages i.e. the early stage, intermediate stage and the late stage (Health and Safety Executive, 2017).

Early Stage: This stage is characterized by discomfort but continual exposure leads to a higher level of discomfort, pain and tiredness during work. The pain disappears at night and during days off work. It does not affect work performance.

Intermediate Stage: It is characterized by pain which is present at certain times at work especially early in the work shift and continual exposure produces the symptoms even at rest. Aching and tiredness persist even at night. Pain at this stage causes reduction capacity for repetitive work.

Late Stage: It is characterized by pain, fatigue and weakness which persist at rest. It disturbs sleep and affects the performance of light duties. Continuous exposure to the hazard leads to after effect.

2.3.3 Prevention of Work-Related Musculoskeletal Disorders

Interventions such as adjusting seat height and curved seat pan chairs have been effective in preventing neck and shoulder pain in seated manual workers (Rempel et al., 2007). Other

ergonomic interventions may also be of value in preventing neck pain and upper limb conditions (Driessen et al., 2008). In designing tools and workplaces, attention to human factors can help prevent many injuries.

According to the National Institute for Occupational Safety and Health (2015), a five-tier hierarchy of controls is widely accepted as an intervention strategy for reducing, eliminating, or controlling workplace hazards, including ergonomic hazards.

Figure 2: Hierarchy of controls adapted from NIOSH (2015)

2.3.3.1 Elimination

This approach is grounded on complete removal of a material or process causing a hazard. Elimination is the most effective of the five members of the hierarchy of hazard controls in

protecting workers, and where possible should be implemented before all other control methods. Elimination is often the most difficult control to achieve, but addressing it at the start of a project allows designers and planners to make large changes much more easily and cost-effective without the need to retrofit or redo work. Elimination can, nevertheless, be unsuccessful as an approach if the harmful procedure or material is introduced again at an advanced phase of the project.

2.3.3.2 Substitution

This is a line of approach where substances or procedure is substituted by an alternative that is not as much dangerous as the previous one. Substitution is the second best approach of the five members of the pyramid of exposure controls in shielding employees. Hazard substitutions can include not only exchanging one chemical for a new one but also utilizing the same chemical in a less harmful phase. In the process of a substitution, the harmful content of the new substance or procedures should be deliberated and examined, so that a new risk is not unintentionally introduced thus causing the approach to flaw.

2.3.3.3 Use of Engineering Controls

Here, the ideal strategy to intercept and regulate WRMSDs is to design the work considering the competences and incapacity of the labour force. For instance, changing the mode of transportation of supplies and products and utilizing power-driven devices to alleviate hefty weightlifting and carrying jobs or using handles. An additional example is altering the workspace design, which might embrace utilizing height-adjustable worktables or positioning apparatuses and supplies within arm's length.

2.3.3.4 Use of Administrative Controls

This encompasses modifications in work operations and administrative strategies. They help decrease WRMSD risk but they do not remove the occupational hazards. It can also be helpful as provisional processes until engineering controls can be affected or when engineering controls technically impracticable. Examples of employing administrative controls are by decreasing shift period or regulating overtime; alterations in work guidelines and processes like programming more breaks and rotating employees through jobs that are physically strenuous.

2.3.3.5 Use of Personal Protective Equipment

Personal Protective Equipment (PPE) largely offers a barricade between the employee and the source of the hazard. Examples of PPE are respirators, helmets, ear plugs, safety goggles, chemical aprons and safety boots. The use of orthotic devices such as braces, wrist splints, back belts and similar devices for protection against ergonomic hazards is still being argued. Even though these devices may, in some circumstances, lessen the period, occurrence or strength of exposure, evidence of their efficiency in injury decrease is unsettled.

2.4 Occupational Health and Safety

Health is defined by the WHO, as not just the absence of disease or infirmity, but the state of complete physical, mental and social well-being (WHO, 1986). The International Labour Organization (ILO) and WHO clearly states that occupational health should aim at: *"...the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the workers in an occupational environment adapted to their physiological and psychological capabilities; and, to summarize : the adaptation of work to man and of each man to his job*" (WHO, 1994)

"A safe workplace is, therefore, an environment where, to the highest degree, workers' well-being- physical, mental and social- is promoted and maintained (Chen et al., 2006).

In developed countries, people are becoming aware of work-related stress, occupational safety and health, prevention and management of disorders that are work related (WHO, 2006; WHO, 2008) but this situation are yet to be the case in developing countries. People in developing countries have to deal with increasing work-related stress owing to globalization and its resultant changes in the nature of work (Houtman, Jettinghoff, & Cedillo, 2007). Due to lack of knowledge and information, workers may not necessarily be aware of the risk they face, they may not know how to protect themselves and tend to manifest the consequence of the risk. The common factors that undermine workplace safety in the informal sector are poor working conditions, poor legal regimes to regulate health, safety and labour issues, low levels of capital, use of simple tools and techniques and the tendency to innovate or take short-cuts for increased

productivity (Hasle & Limborg, 2006). While innovation may be necessary for the survival of any establishment, it can be hazardous to workers when it is not properly thought through before being implemented.

Despite significant improvements in health and safety measures in many parts of the world over the past several decades, the global challenge of providing for workers health and safety is ever greater today (International Labour Office, 2005). The majority of the developing countries has a very poor investment in research and still has many unsolved problems particularly in the area of OHS and the changing nature of work (Houtman, Jettinghoff, & Cedillo, 2007). This explains the dearth of generating proper data and evaluating the impact of the changes at work.

Globally, over one million injuries and 2.3 million cases of ill health occur; where about 40 million working days are lost and over 25,000 individuals lose their jobs because of injury or ill health ((Benjamin, 2001). In sub-Saharan Africa, 54,000 workers die each year and 42 million work-related accidents take place that causes at least three days' absence from work (ILO, 2003). Back problems affect millions of people worldwide, i.e. 70-80% of people during their lifetime (van Vuuren, Zinzen, van Heerden, Becker, & Meeusen, 2007). Neck pain occurs in 15-44% of the general community (Hush, Michaleff, Maher, & Refshauge, 2009) whereas carpal tunnel syndrome, one of the disabling WRMSDs, affect about 25% of active workers (Turner et al., 2007).

2.4.1 International Policy on Occupational Health and Safety

ILO request that affiliate countries must ensure the institution of safety and health management systems that will safeguard and support workers‟ health, by reducing workplace hazards thus promoting individual and national economic productivity. A general discussion was held by the

ILO members, who caused the embracing of a resolution (ILO, 2002) in 2002 and formed a foundation for a future strategy.

The Resolutions and Commendations on OHS aid numerous purposes. They may act as important ideologies to guide policies for advancement, endeavor and management and general security measures. They also guard against particular risks, impede occupational cancer; regulate air pollution, noise, and vibration in the work setting and presents initiatives to warrant safety in the usage of chemicals, comprising the deterrence of extensive industrialized accidents. Additionally, are responsible for the organizational course of actions concerning labour surveillance or compensation for work-related injuries and diseases.

2.4.2 Policies on Occupational Health and Safety in Ghana

In Ghana, two main employee safety legislation responsible for promoting OHS are the Factories, Offices and Shops Act of 1970 (Act 328), and the Labour Act of 2003 (Act 651). The two Acts are primarily responsible for protecting the employee from any hazards at the workplace. The enforcement of these acts is the sole responsibility of the Factories Inspectorate Department of the Ministry Of Employment And Labour Relations.

2.4.2.1 Factories, Offices and Shop Act of 1970 (Act 328)

The Factories, Offices and Shops Act 1970 (Act 328) provides for the registration of industrial units, offices, shops and other places, and matters related therewith. The Act has 11 parts made of 88 sections. The parts that are crucial for regulating employee safety include:

Part 4 of the Act – Notification of Accidents: Section 10 (1), expresses that accident in any workplace which causes the death of an individual employed there or disables any employee for more than three days from receiving salaries where she/he was employed should be reported in

writing with all appropriate documentation to the district inspection officer or the chief inspection officer.

Part 5, of the Factories Act discusses and specifies employee's health and welfare. Among other things, this part specifies that a state of cleanliness is supposed to be maintained in a factory. Provision of amenities such as washrooms, good lighting system, clean floors and environment, safe drinking water, restrooms is an obligation. It further elaborates that, other facilities like personal protective equipment, noise and vibration modulation, barring of lifting extreme loads, first aid services should be provided. Precautionary measures such as risk assessments, medical surveillance system and hazards control are not considered in the Act.

2.4.2.2 Industrial Relation Act of 2003 (Labour Act, 651)

Another important Act which provides some form of safety legislation in Ghana is the Labour Act of 2003 also known as Act 657. Part XV of the Labour Act 651, covers Occupational Safety, Health and Environment. Section 118 of the General Health and Safety conditions states among other things the duty of the establishment to guarantee the safety of persons employed. Additionally, the employer is obligated to offer suitable safety devices, fire-fighting appliances, and PPE. They must also instruct, inform and teach the employees regarding the use of the appliances and devices.

2.4.3 Management of OHS in Ghana: Challenges

The management of OHS in Ghana currently is not coordinated and Alfers (2010), has argued that the autonomous development of these different statutes has ensued in disintegration, intersecting areas of authority and irregularities in the different laws on OHS functioning in the

country. These have in utmost cases led to a confusion between the various enforcement agencies. Alfers, (2010) also found that in Ghana, the most prevalent occupational hazards and risks among the artisans are of an organizational, hygienic or ergonomic nature, indicating that many hazards could be avoided by behavioural change as well as putting in place proper structures, policies and the inculcating in the workers a need to adopt safety procedures when working.

Alfers (2010) also found that a major deficiency in the present OHS management system is the lack of a national policy on OHS defining the responsibility of the stakeholder partners– government, employers/ owners and employees- as well as the operational jurisdiction of the enforcement agencies. This has also resulted in inadequate coverage of all economic activities by the existing statutes. Furthermore, existing statutes do not provide solutions to emerging hazards such as ergonomic problems and they do not require proactive management of hazards at the workplaces. This is revealing because, comparing the situation in Ghana with that of developing countries like Uganda, Kenya and Zambia which have adopted national policies on OHS, Ghana is lagging behind.

OHS services provided in the informal sector in contrast with those approved by the ILO Convention No. 161 on Occupational Health Services are very restricted, supplying rudimentary remedial care and first aid All-inclusive occupational health protective actions are obviously deficient (Puplampu, 2012).

2.5 Conclusion

The purpose of this review was to understand the informal sector in Ghana, OHS problems in Ghana and WRMSDs and the risk factors that account for its development. It is evident from the

literature reviewed that, musculoskeletal disorders are a complex and multifactorial phenomenon and accounts for decreased productivity in the work environment. Most of the pieces of literature reviewed were from developed countries and few from Africa and Ghana. Most of the unindustrialized countries have a pitiable investment in research and still has numerous unanswered problems predominantly in the area of OHS and the transforming nature of work. This describes the scarcity of producing accurate data and assessing the effect of the variations at work. The literature reviewed recommended the hierarchy of controls as the best practice for preventing or reducing WRMSDs among workers. There is a need for further studies into the OHS practices and other work-related diseases among the workers of Abossey Okai automobile spare parts market.

CHAPTER THREE

RESEARCH METHODS

3.1 Overview of the Study Area

The Abossey Okai automobile parts market is situated in Accra, 0.8km away from the Obetsebi Lamptey roundabout on the Aplaku road. It is referred to as the heart of the spare parts business in the country. Information gathered from some shop owners disclosed that the market houses over 2,000 shops with about 163 shops dealing in big axles and engines and each shop had about 3 permanent workers. The population of the big axles and engines workers was estimated to be about 489. The market also accommodates people of various vocations such as food vendors, mechanics, hairdressers etc. The entire population estimated according to some spare parts dealers may be about 10,000.

Source: (maparabic.com, 2010)

Figure 3: A sectional map of the Greater Accra Region showing Abossey-Okai

3.2 Study Design

The study was a quantitative cross-sectional survey which assessed prevalence of work-related musculoskeletal disorders and factors that influence among the garage workers of Abossey Okai automobile spare parts market. The socio-demographic, occupational health and safety knowledge level and work demand factors were also assessed.

3.3 Study Population

The study involved all workers of big axles and engine spare parts shops in Abossey Okai automobile spare parts market, Accra.

3.3.1 Inclusion Criteria

A permanent big axles and engine shop worker who was at least 18 years old and had a minimum of one-year work experience.

3.3.2 Exclusion criteria

A permanent worker of big axles and engines shop who was 18 years of age with a minimum work experience of one year who has retired from active service, not present at the time of the study or did not give consent to participate in the study.

3.4 Variables of interest

3.4.1 Dependent Variable

Prevalence of work-related musculoskeletal disorders among the workers.

3.4.2 Independent Variables

1. Occupational health and safety knowledge level
2. Work Demands of their work
3. Socio-demographic characteristics

3.5 Recruitment and training of research assistants

Three research assistants were recruited and trained on the questionnaire and its administration protocols. They were also trained to conform to the ethical guidelines of the study. The research assistants had a tertiary education with an experience in research.

3.6 Sample size estimation and sampling

3.6.1 Sample size calculation

The (Krejcie & Morgan, 1970) sampling size determination table was used in determining a representative sample size for the study. The maximum sample size was calculated using the following formula:

$S = \{ X^2NP(1-P)\} \div \{(d^2)(N-1)+X^2 P(1-P)\}$ Where:

S = required sample size.

X^2 = 1 degree of freedom at 95% confidence level (1.96x 1.96 =3.841).

N = the study population of 489.

P = the population proportion of 0 .50 since this provided the maximum sample size.

d = the degree of accuracy was placed at 0.05

Table 3.1 The Krejcie and Morgan's Table for Determining Sample Size from a Given Population

N	S	N	S
400	196	500	217
420	201	550	226
440	205	600	234
460	210	650	242
480	214	700	248

N = Population size; S = Sample size determined

Based on the table and the calculation, a sample size of 215 was considered for the study.

3.6.2 Sampling method

Simple random sampling technique was used to recruit participants for the study. The 163 shops dealing in axles and engines were identified and given serial numbers (1-163) by the principal investigator and the research assistants. Eighty random numbers from one to one hundred and sixty-three were generated using the Google Random Number Generator. Shops whose serial numbers were part of the 80 numbers generated were considered for the study. Three workers at each of the shop selected that met the inclusion criteria for the study were recruited. In a shop where there were more than three workers, coins were tossed to select participants. When workers from a shop on the list refused to partake in the study, we moved to the next shop on the random numbers generated list till all 215 participants were randomly recruited for the study.

3.7 Data collection

Questionnaires were administered by the principal investigator and the research assistants to participants. The three research assistants helped in assigning serial numbers to the shops, coding, administration of questionnaires and entering the information into Microsoft Excel (version 2010). The principal researcher and research assistants visited the market to administer questionnaires to participants personally.

3.7.1 Questionnaire

The questionnaire was pretested at Kokompe, a mini automobile spare parts market in Accra to check for its feasibility and ability to answer the research questions. The questionnaire contained 61 closed-ended simple questions and 5 open-ended questions. It had four sections A-D.

The first section, „A', collected information on socio-demographic data and had closed-ended questions on sex, marital status and educational status with five opened ended question on age, years of work, hours spent at work, secondary jobs and hours spent at the other job.

The Section „B' collected data on the work demands of work carried out by the workers. It contained 11 closed-ended questions. It was adapted from a questionnaire used in assessing the validity of a questionnaire measuring physical demands of work (Pope, Silman, Cherry, Pritchard, & Gary, 2009)

Section C was a body mapping questionnaire adapted from the Health and Safety Executive (2007). This tool was used to measure musculoskeletal disorders among the workers. It is a standard tool for assessing work-related musculoskeletal disorders. It contained 36 closed-ended questions to measure a three-month body distribution of MSD symptoms from the neck to the ankle/feet.

The last section „D" was a researcher self-designed Likert-scale questionnaire on occupational health and safety (OHS) knowledge and contained ten questions. Each question had a score of 1-5. Respondents could attain total scores ranging between 1 and 50 (i.e. the sum of individual scores made from answering question 1 to 10). An individual who scored a total of 1-17 was rated as having a poor knowledge of OHS, a respondent who also had a total score of 18-34 was rated as having fair knowledge of OHS and a participant with a total score of 35-50 was rated as having a good knowledge level of OHS. Finally, the total number of participants in each knowledge category was obtained.

3.8 Data Storage and Protection

All research record and data were protected against inappropriate use, disclosure and accidental loss or destruction in order to protect the confidentiality of the participants. Electronic information obtained was stored on two separate laptops for comparability. Both laptops were password protected and the password known only to the principal investigator. However, hard copies will be destroyed after the study has been concluded and the results have undergone review. Routine electronic back up was done during data collection.

3.9 Data Analysis

The completed questionnaires were coded and entered into Microsoft Excel. Data from the Microsoft excel were transferred to Stata Version 15 for cleaning, merging and analysis. Cleaning of the data was done by running frequencies of the variables. This checked inconsistently coded data. Inconsistently coded data were double checked with raw data from the questionnaires.

Means and standard deviations (SD) were calculated for continuous variables such as the age of participants (in this study). Proportions were calculated for categorical variables such as level of education, sex, marital status etc. These were presented in the form of tables.

Chi-square test was used to measure associations between prevalence of MSDs and the OHS knowledge level, work demands and the socio-demographics (with the exception of sex and work experience). Fisher's exact test was carried out to measure association between sex and MSDs whereas, Mann -Whitney test was performed to test association between work experience and MSD. Multiple logistic regression was also carried out to establish a relationship between the prevalence of MSDs and the independent variables (socio-demographic characteristics, knowledge on occupational health and safety and work demands). A confidence level of 95% was used to show a significant relationship between the dependent and the independent variables.

3.10 Ethical Issues

Ethical clearance (GHS- ERC018/04/18) was approved by the Ghana Health Service Ethics Review Committee before the commencement of the study. Permission was sought from the leaders of the Abossey Okai automobile spare part market and participants preceding the study. Participation in the study was voluntary and participants were duly informed of their right to withdraw from the study at any time without suffering any consequences. Anonymity was ensured by maintaining codes during data entry instead of names, contact numbers and other cues that could lead to the identification of participants.

3.10.1 Description of the subject involved in the study

The permanent workers of big axles and engines spare parts shops at Abossey Okai automobile market were the subjects of the study. They were termed „Garage workers" in this study. They

are usually involved in packing, unpacking and off-loading the spare parts. A pictorial view of the garage workers at work can be found in Appendices C, D and E.

3.10.2 Description of Consenting Process

A consent form was administered to participants before the study and a copy of the form was given to participants. Where the participant was unable to read and write, an interpretation of the written consent was done by a third party and participant together with the third party thumb printed or signed. All questions were addressed before the study. Information about the study and the significance of the data collected were made known to participants prior to the interview.

3.10.3 Confidentiality

Participant information was known only to persons directly involved in the fieldwork i.e. the researcher and research assistants under conditions of shared confidentiality.

3.10.4 Possible benefits

The auto spare parts market leaders would be informed of the outcome of the study and their support solicited to limit further harm to workers in the market. A measure to help reduce the high prevalence of WRMSDs among the workers is being discussed with some of the leaders of the market. Health talks will be scheduled and provided on-site once every two weeks for three sessions after the study has been reviewed. It will include general ergonomic and occupational safety information of which the work plan and sample information leaflet is found in APPENDIX F. All workers at post will benefit from this intervention.

3.10.5 Compensation

The subject of the study did not receive any monetary benefit from participating in the study.

3.10.6 Protocol Amendment

In the event that any section of the protocol has to be changed/amended ethical clearance would be sought from the Ghana Health Service Ethics Review Committee before such amendments would be made to the study.

3.10.7 Declaration of Conflict of Interest

There is no conflict of interest.

3.10.8 Protocol Funding Information

The study was solely self-funded by the principal investigator

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the findings of the study in accordance with the stated objectives and is organized into seven sections. The first section presents the socio-demographic characteristics of the respondents. The second and third sections address the work demands of the workers and the

prevalence of work-related musculoskeletal disorders (WRSMDs) among the respondents respectively. The fourth section also addresses the level of knowledge of occupational health and safety. The fifth, sixth and seventh sections address the relationship between all the independent variables and the dependent variable (WRSMDs).

4.2. Socio-demographic characteristics of Respondents

Table 4.1 presents the socio-demographic characteristics of respondents in the study. A total of 215 participants were surveyed. The minimum and maximum ages were 18 years and 53 years respectively. Additionally, respondents‟ work experience recorded a minimum of 1 year and a maximum of 28 years. The findings also show that respondents‟ engaged in secondary jobs spend a minimum of 1 hour and a maximum of 8 hours at these jobs. All the findings of the socio-demographic characteristics recorded in the study are demonstrated on Table 4.1.

Table 4.1: Socio-demographic Characteristics of Respondents

Variable	Frequency (N)	Percent (%)
Age in years: Mean ± SD	33.1±8.5	
Years of work: Mean ± SD	9.4 ± 6.5	
Hours of work: Mean ± SD	8.9 ±1.6	
Sex		
Male	211	98.1
Female	4	1.9
Marital status		
Single	77	35.8
Married	120	55.8

Divorced	18	7.9
Educational level		
None	18	8.4
Basic	88	40.9
Secondary	100	46.5
Tertiary	9	4.2
Secondary jobs		
Yes	21	9.8
No	194	90.2

Secondary= junior and senior secondary, vocational, technical schools

4.3 Respondents' work demands

One hundred and one (47.0%) respondents reported lifting a weight with only one hand of which the mean of the heaviest object often lifted is 20.2 (SD=10.7) kg. Sixty-three (29.3%) respondents reported that they lift, carry or move objects weighing about 100kg at work. More than half of respondents, 137 (63.7%) also stated they carry weights on their shoulders, while 189 (87.9%) respondents reported lifting weights above the shoulder level. Additionally, 136 (63.3%) of the respondents reported pushing weights and 196 (91.2%) reported pulling weights. The other demands of their work characteristics are summarized in Table 4.2.

Table 4.2: Work demands of the respondents

Variable	Frequency(N)	Percent (%)
Do you lift/carry weights with one hand?		
Yes	*101*	*47.0*
No	*114*	*53.0*
Do you lift, carry or move objects weighing about 100kg at work?		
Yes	*63*	*29.3*
No	*152*	*70.7*
Do you carry weights on your shoulder?		
Yes	*137*	*63.7*
No	*78*	*36.3*
Do you lift weights above shoulder level?		
Yes	*189*	*87.9*
No	*26*	*12.1*
Do you push weights?		
Yes	136	63.3
No	79	36.7
Do you pull weights?		
Yes	196	91.2
No	19	8.8
Do you perform the same task over and over?		
Yes	196	91.2
No	19	8.8
Do you work bending and twisting your back?		
Yes	209	97.2
No	6	2.8
Do you work in the same positions for long periods		
Yes	168	78.1
No	47	21.9
Do you have enough rest or breaks when working?		
Yes	132	61.4
No	83	38.6
Do you continue to work while injured or have pains or discomfort?		
Yes	115	53.4
No	100	46.6

4.4. Prevalence of work-related musculoskeletal disorders

One hundred and fifty-one respondents reported of experiencing pain or symptoms of MSD in one or more body part. The overall 3-months prevalence of WRMSDs recorded among respondents was 71.6%.

Table 4.3 shows the various body distributions of WRMSDs experienced by the participants. Eighty-two (38.1%) respondents experienced aches in the lower back during the last 3 months, while 54 (25.6%) reported the same during the preceding 7 days. However, 21 (9.9%) respondents were prevented from carrying out normal activities due to lower backache in the last 3 months. Additionally, during the last 3 months, 18.2% of respondents reported the lower backache was caused by their work and 8.1% reported work made the pain worse.

Twenty-seven (12.6%) respondents reported feeling pain or discomfort in their neck during the last 3 months. Only 15 (10.8%) reported this during the preceding seven days. However, 12 (5.9%) stated the aches in the neck was caused during the last three months by the job, while 4 (2.0%) stated work made it worse. Similarly, 31 (14.5%) of the participants reported discomfort in the shoulder during the last 3 months and 14 (5.9%) reported same during the last seven days preceding the study. Similar observations were made for the rest of the body parts. Overall, participants reported more discomfort or aches in the lower back (38.1%) followed by the upper back (17.2%), shoulders (14.5%), neck (12.6%) and the least being the ankles/feet (2.3%) during the last 3 months.

Variable (body part)	Have you at any time during the last 3 months had trouble (such as ache, pain, discomfort) in N (%)		Have you had this trouble during the last seven days? N (%)		During the last three months has this trouble prevented you carrying out normal activities N (%)		During the last three months has this trouble been caused or made worse by your job? N (%)	
	Yes	No	Yes	No	Yes	No	Yes	No
Neck	27 (12.6)	187 (87.4)	15 (7.4)	187 (92.6)	5 (2.5)	198 (97.5)	16 (7.9) Caused: 12(5.9) Mw: 4(2.0)	187 (92.1)
Shoulder	31 (14.5) RO: 9(4.2) LO: 7(3.3) B: 15(7.0)	184 (85.6)	14 (6.9) RO: 4(2.0) LO: 2(1.0) B: 8(3.9)	189 (93.1)	8 (3.9) RO: 2(1.0) LO: 1(0.5) B: 5(2.4)	195 (96.1)	20 (12.0) Caused: 10(5.0) Mw: 10(5.0)	181 (90.1)
Elbows	11 (5.1) RO:	203 (94.9)	6 (2.5) RO: 4(2.0)	200 (97.5)	2 (14.9) RO: 2(1.0)	202 (99.0)	5 (2.5) Caused: 3(1.5)	199 (97.5)

8(3.7)

Table

Variable (body part)	Have you at any time during the last 3 months had trouble (such as ache, pain, discomfort) in N (%)	Have you had this trouble during the last seven days? N (%)	During the last three months has this trouble prevented you carrying out normal activities	During the last three months has this trouble been caused or made worse by your job?
	LO: 2(0.9) B: 1(0.5)	LO: 0(0.0) B: 1(0.5)	LO: 0(0.0) B: 0(0.0)	Mw: 2(1.0)

4.3A: Body distribution of Work-related musculoskeletal disorders among respondent

RO=Right only; LO=Left only; B= Both, right and left and Mw=made worse

					N (%)			N (%)
	Yes	No	Yes	No	Yes	No	Yes	No
Wrists/ Hand	17 (7.9)	197 (92.1)	6 (3.0)	197 (97.0)	13 (5.9)	196 (97.0)	11 (5.4)	192 (94.6)
	RO: 13(6.1) LO: 2(0.9) B: 2(0.9)		RO: 4(2.0) LO: 1(0.5) B: 1(0.5)		RO: 4(2.0) LO: 1(0.5) B: 1(0.5)		Caused: 7(3.4) Mw: 4(2.0)	
Upper back	37 (17.2)	178 (82.8)	18 (8.8)	186 (91.2)	9 (4.4)	197 (95.6)	26 (12.6)	180 (87.4)
							Caused: 13 (11.2) Mw: 3(1.4)	
Lower back	82 (38.1)	133 (61.9)	54 (25.6)	157 (74.4)	21 (9.9)	191 (90.1)	55 (26.3)	154 (73.7)
							Caused: 38(18.2)	

Mw:

17(8.1)

Table 4.3B: Body distribution of Work-related musculoskeletal disorders among respondent

RO=Right only; LO=Left only; B= Both, right and left and Mw=made worse

Table 4.3C: Body distribution of Work-related musculoskeletal disorders among Respondents`

Variable (body parts)	Have you at any time during the last 3 months had (such as ache, pain, discomfort) in N (%)		Have you had this trouble during the last seven days? N (%)		During the last three months has this trouble prevented you carrying out normal activities N (%)		During the last three months has this trouble been caused or made worse by your job? N (%)	
	Yes	No	Yes	No	Yes	No	Yes	No
Hips/ Thighs	8 (3.8) RO: 1(0.5) LO: 6(2.8) B: 1(0.5)	20 (96.2)	4 (2.0) RO: 2(1.0) LO: 2(1.0) B: 0(0.0)	201 (98.0)	3 (1.5) RO: 1(0.5) LO: 3(1.0)	201 (98.5)	4 (2.0) Caused: 1(0.5) Mw: 3(1.5)	201 (98.0)
Knees	12 (5.6) RO: 4(1.9) LO: 2(0.9) B: 6(2.8)	201 (94.4)	10 (4.9) RO: 3(1.5) LO: 2(1.0) B: 5(2.4)	194 (95.1)	5 (2.4) RO: 1(0.5) LO: 1(0.5) B: 3(1.4)	200 (97.6)	9 (4.4) Caused: 5(2.4) Mw: 4(2.0)	196 (95.6)
Ankles /feet	5 (2.3) RO: 3(1.4) LO: 1(0.5) B: 1(0.5)	209 (97.6)	3 (1.5) RO: 3(1.5) LO: 0(0.0) B: 0(0.0)	201 (98.5)	3 (1.5) RO: 2(1.0) LO: 1(0.5) B:0(0.0)	202 (98.5)	3 (1.5) Caused: 2(1.0) Mw: 1(0.5)	202 (98.5)

RO=Right only; LO=Left only; B=Both right and left and Mw=made worse

4.5 Occupational health and safety knowledge Categories

Figure 4 and Table 4.4 present the assessment of respondents' knowledge of occupational health and safety. Out of the 215 respondents, 151 recorded to have fair knowledge in occupational health and safety issues, 55 had good knowledge in occupational health and safety and only 9 recorded poor knowledge. The lowest knowledge score recorded was 16 and the highest was 48. The overall knowledge levels of the respondents in occupational health and safety among respondent is illustrated by Figure 4.

Figure 4: Occupational health and safety knowledge categories

4.5.1. Responses to Occupational Health and Safety Knowledge Questions

Table 4.4 gives a summary of participants' response to questions on occupational health safety. Sixty-one (28.7%) workers disagreed that occupational hazards are absent at their workplace. However, 120 (57.4%) workers disagreed that a worker who gets hurts from poor handling five times must be punished. Additionally, 136 (63.5%) of the participants disagreed that manual handling training programs are not necessary for their work. One hundred and seventy-seven (83.1%) workers agreed that the safe way to carry a load is by reaching for load and bending over to lift with two hands. However, 51.2% disagreed that the government does not have any responsibility towards the safety of workers.

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Table 4.4: Responses to occupational health and safety knowledge questions

Variable	Strongly Agree	Agree	Unsure	Disagree	Strongly disagree
Occupational hazards are absent in my workplace	29 (13.6)	22 (10.3)	101 (47.4)	24 (11.3)	37 (17.4)
A worker who gets hurts as a resulting from poor handling five times must be punished	63 (30.1)	22 (10.5)	4 (1.9)	46 (22.0)	74 (35.4)
Manual handling Training programs are not necessary for my work	57 (26.6)	19 (8.9)	2 (0.9)	43 (20.1)	93 (43.5)
Safe way to carry a load is by reaching for load and bending over to lift with two hands	126 (59.2)	51 (23.9)	17 (8.0)	12 (5.6)	7 (3.3)
The government does not have any responsibility towards the safety of workers	68 (31.9)	31 (14.6)	5 (2.4)	56 (26.3)	53 (24.9)
Frequent exposure to the oil from the spare parts cannot cause skin cancer	33 (15.6)	9 (4.3)	76 (35.9)	50 (23.6)	44 (20.8)
Wearing of Protective clothing must be based on only the worker‟s decision	124 (58.2)	27 (12.7)	4 (1.9)	38 (17.8)	20 (9.4)
Safety boots does not protect workers against slips, falls, ankle sprain, fracture and tetanus	11 (5.2)	6 (2.8)	15 (7.0)	78 (36.6)	103 (48.4)
Measures should not be taken against Noise produced at work that is irritating	80 (37.4)	36 (16.8)	6 (2.8)	42 (19.6)	50 (23.4)
Workers should not always report pains, accidents, hurts and injuries to the direct boss	25 (11.7)	24 (11.2)	2 (0.9)	38 (17.8)	125 (58.4)

4.6 Relationship between prevalence of musculoskeletal disorders and socio-demographic factors, work demands and occupational health and safety knowledge

The study findings showed there was a significant relationship between age and MSD with a p-value=0.01. The association between work experience and MSD was statistically significant with a p-value = 0.004. The prevalence of MSD did not show a statistically significant relationship with sex, marital status, educational status and hours of work. The relationship between respondents‟ knowledge of occupational health and safety and the prevalence of the musculoskeletal disorders did not attain statistical significance of $p<0.05$. The results are presented in Table 4.5.

Table 4.5: Relationship between prevalence of musculoskeletal disorders and socio-demographic characteristics, OHS knowledge and work demands

	work-related musculoskeletal disorder			
	No	Yes	chi-square	p-value
Age (years)			**13.02**	**0.001****
18-25	20(46.51)	23(53.49)		
26-35	27(29.35)	65(70.65)		
36-45	12(15.79)	64(84.21)		
Sex				**0.880¥**
Male	60(28.44)	151(71.56)		
Female	1(25)	3(75)		
Marital status			**1.14**	**0.565**
Single	25(32.47)	52(67.53)		
Married	32(26.67)	88(73.33)		
Divorced	4(22.22)	14(77.78)		
Educational status			**1.64**	**0.651**
No formal school	7(41.18)	10(58.82)		
Primary	25(28.74)	62(71.26)		
Secondary	26(26.26)	73(73.74)		
Tertiary	2(25)	6(75)		
Hours of work			**0.02**	**0.880**
5-8	30(28.04)	77(71.96)		
9-11	31(28.97)	76(71.03)		
OHS Knowledge level			**0.38**	**0.826**
Poor	3(33.33)	6(66.67)		
Fair	44(29.14)	107(70.86)		
Good	14(25.45)	41(74.55)		
Work demands			**1.91**	**0.385**
Low	1(14.29)	6(85.71)		
Moderate	23(25)	69(75)		
High	37(31.9)	79(68.1)		
Years of work :Median(LQ, UQ)	5(3,10)	8(5,15)	**-2.92**	**0.004*§**
Any other job			**1.47**	**0.226**
Yes	8(40.00)	12(60.00)		
No	53(27.18)	142(72.82)		

*p-value<0.05, **p-value<0.01, ***p-value<0.001, LQ: Lower quartile, UQ: Upper quartile, **¥:**p-value estimated from Fishers exact test, **§:** p-value estimated from Mann-Whitney test

4.7 Relationship between prevalence of musculoskeletal disorders and socio-demographic factors, OHS knowledge and Work demands using multiple logistic regression

There was a significant ($P < 0.05$) relationship between the age of the participants and the prevalence of the musculoskeletal disorder. The unadjusted regression analysis yielded a significant relationship between the age of respondents and MSD. The odds of a worker between the ages of 36-45 years experiencing MSD is 4.64 times more than the odds of a worker between 18-25 years. Additionally, the unadjusted odds ratio that showed a significant association was between the work experience and the prevalence of musculoskeletal disorders. The odds of having a musculoskeletal disorder is 1.08 times for each unit increase in years of work. These variables, however, lost statistical significance in adjusted analysis. The results are presented in Table 4.6.

Table 4.6 Relationship between prevalence of MSDs and socio-demographic factors, OHS knowledge and Work demands using multiple logistic regression

	Crude			Adjusted		
	UOR	95% CI	p-value	AOR	95% CI	p-value
Age			**0.002***			**0.061**
18-25	ref					
26-35	2.09	0.99 - 4.43		2.23	0.89 - 5.56	
36-45	4.64	1.96 – 10.96		4.54	1.29 - 15.97	
Sex			**0.880**			**0.855**
Male	ref					
Female	1.19	0.12 - 11.69		0.79	0.06 - 9.85	
Marital status		-	**0.567**			**0.241**
Single	ref			ref		
Married	1.32	0.71 - 2.47		0.50	0.22 - 1.13	
Divorced	1.68	0.50 - 5.64		0.49	0.12 - 2.01	
Educational status		-	**0.66**			**0.583**
No formal school	ref			ref		
Primary	1.74	0.59 - 5.07		2.03	0.62 - 6.65	
Secondary	1.97	0.68 - 5.7		2.28	0.66 - 7.79	
Tertiary	2.10	0.32 - 13.61		1.32	0.15 - 11.83	
Hours of work			**0.880**			**0.840**
5-8	ref			ref		
9-11	0.95	0.53 – 1.73		0.93	0.48 - 1.83	
Knowledge level			**0.826**			**0.895**
Poor	ref			ref		
Fair	1.22	0.29 - 5.08		0.77	0.16 - 3.63	
Good	1.46	0.32 - 6.65		0.89	0.17 - 4.79	
Work demands		-	**0.395**			**0.902**
Low	ref			ref		
Moderate	0.50	0.06 - 4.37		0.96	0.09 - 10.75	
High	0.36	0.04 - 3.06		0.82	0.07 - 9.24	
Work experience	**1.08**	**1.02 -1.14**	**0.005***	**1.06**	**0.98 - 1.14**	**0.134**
Secondary job			**0.231**			**0.084**
No	ref			Ref		
Yes	0.56	0.22 – 1.45		0.40	0.14 - 1.13	

*p-value<0.05, **p-value<0.01, ***p-value<0.001, UOR: Unadjusted odds ratio, AOR: Adjusted odds ratio, CI: Confidence interval, ref: reference category

Table 4.7: Summary of the relationship between independent variables and outcome variable

Variables	Age	Work experience	Sex	Marital status	Educational status	Work demands	OHS Knowledge
Work-related musculoskeletal disorders	+	+	-	-	-	-	-

+ shows there was statistical significant association between the independent and dependent variable whereas
- shows there was no statistical significant association between the dependent and independent variables

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the findings of the study in relation to the reviewed literature on the research topic. The findings are discussed in accordance with the stated objectives and research questions. The study sought to assess the factors that influence work-related musculoskeletal disorders among the garage workers of Abossey Okai automobile spare parts market.

5.2 Prevalence of Musculoskeletal disorders among garage workers

The findings of the study reported a high prevalence of work-related musculoskeletal disorders among the garage workers with the lower back, being most body part affected. The study also revealed that overall, 71.6% of the respondents reported pain or numbness in at least one body part among the nine demarcated body sections. Similar studies conducted in the United Kingdom and Bangladesh among workers with physically demanding jobs also reported high prevalence of MSD 79% and 77% respectively (Hussain, 2004; Akter, Rahman, Mandal, & Nahar, 2016).

The commonest complaints of musculoskeletal symptoms among the garage workers during the last three months were the lower back (38.1%) region, the upper back (17.2%), shoulders (14.5%), neck (12.6%) and least being the ankle (2.3%). The garage workers usually bend and lift heavy materials in their course of work. The consequences of these poor ergonomics practices could be associated with the high prevalence of low back pain among these workers. The findings were in agreement with similar studies carried out among manual workers in the United Kingdom (Hussain, 2004) though this current study recorded a lower prevalence of WRMSDs among respondents. The variations of the case definitions of musculoskeletal disorders, the study population, individual characteristics of respondents and the 3-month

prevalence considered in this study could account for the differences in the prevalence of work-related musculoskeletal disorders recorded in comparison with similar work.

5.3 Socio-demographic characteristics of Respondents

The majority (98.1%) of respondents were males. The skewed gender distribution suggests that the garage work is a male-dominated occupation which may due to the high-level manual energy involved in the automobile spare parts work. Appendices C, D, and E shows pictures of garage workers at post. The gender distribution was also observed in the Ghana Statistical service 2016 report which showed a majority of males' engagement in informal manual handling jobs.

The mean age of respondents was 33.1 ± 8.5 years. The age distribution also shows that the Abossey Okai work is dominated by the youth and required physical strength. A survey of Beverage Factory workers in Eastern Nigeria also reported an age distribution of similar findings (Abaraogu, Okafor, Ezeukwu, & Igwe, 2015). The report from the Ghana Statistical service, 2016 also showed, people employed in the informal sector in the Greater Accra region are between the ages of 25-44 years.

The primary level of education recorded the highest level of respondents (40.9%) which corresponded with the highest educational level attained by the Ghanaian population as reported again by the Ghana statistical service in 2016. The educational level of respondents suggests that the work of a garage worker does not demand high formal education.

The results indicated a significant relationship between WRMSDs and age and work experience. Studies carried out in Nigeria reported experience of back pain among the participants increased significantly with advancing age (U. O. Abaraogu, Okafor, Ezeukwu, & Igwe, 2015; Ukachukwu Okoroafor Abaraogu, Ezema, Igwe, Egwuonwu, & Okafor, 2016). It however, contradicts some

studies in Ghana among miners and fire-fighters (Matter, 2016; Tawiah, Oppong-Yeboah, & Bello, 2015). Literature shows that the musculoskeletal system wear and tear whereas functional capacity also reduces with increasing age. This could account for the findings of the study. On the other hand, repetitive tasks lead to overexertion of muscles and connective tissues (Soslowsky et al., 2000). The chronic exposure to these tasks especially over a long period can result in severe forms of MSDs and even death. This supports the findings of longer years of work having an influence on the development of MSDs among respondents.

There was no significant relationship however, between the prevalence of MSD and sex, marital status, educational status, hours of work and secondary jobs. The number of females was too small to produce any statistically significant relationship with WRMSDs though they recorded a higher prevalence of MSD. The primary and secondary school leavers recorded high prevalence of MSD because they were the majority (87.4%) of respondents.

5.4 The relationship between the knowledge on occupational health and safety on musculoskeletal disorders

The findings revealed that majority of the respondents had a fair knowledge of occupational health and safety issues though they lacked formal organizational supervision. They seemed to have learnt on the job, from experiences and colleagues as coping and protective tools against work-related injuries and diseases. A study conducted among automobile artisans by Appiah, (2014), reported similar findings to the outcome of this present study. The results of this study showed no significant relationship between the various knowledge level of the garage workers on occupational health and safety and musculoskeletal disorder. The data collected did not

support but contradicts that of a previous study where the relationship between ergonomic training program and MSD showed a significant relationship (Saeidi, 2014). Though there was no statistically significant relationship between the knowledge and MSD, the prevalence of MSD among the workers was high for the various degree of knowledge especially respondents with good knowledge of OHS. The possible factor may be a gap in translating the knowledge of occupational health and safety into a practical use among those workers as reported in the research on conformity to occupational safety and health regulations in small and medium enterprises (Deros, Ismail, & Mohd Yusof, 2012). A comprehensive narrative review of WRMSDs among Physical therapists also revealed that PTs, notwithstanding their in-depth knowledge in body mechanics and injury prevention is no exception to a high prevalence of MSD (Milhem, Kalichman, Ezra, & Alperovitch-Najenson, 2016).

5.5 The relationship between prevalence of musculoskeletal disorders and the risk factors (work demands) associated with the garage work

There was no statistically significant relationship between the prevalence of musculoskeletal disorders and work demands of the garage workers. The findings agree with a previous study on MSD among butchers in Nigeria which reported no association between the nature of the job and MSD (Kaka et al., 2016). However, some studies about MSD among physically demanding occupations established an association between MSD and the nature of work (Engholm & Holmström, 2005; Hossain et al., 2018). The different settings and study population could account for this variation.

MSDs have multiple risk factors, both job-related and non- work-related. Apart from work demands, activities of daily living, such as sports, entertainment and housekeeping may also present physical stresses to the musculoskeletal system. These risk factors can also be influenced by socio-demographic characteristics, socioeconomic status, obesity, lifestyle and race. It has been observed across populations that not everybody with MSD has ergonomic exposures at work and not every person exposed at work also develops MSD (Punnett & Wegman, 2004). These reasons could account for the high prevalence of MSD recorded even though the physical demands showed an unclear influence in the development of MSD among the workers.

This study, however, showed respondents usually engaged in less physically demanding activities reported a high prevalence of MSD. This could be as a result of various coping mechanisms and precautionary measures adopted by workers with high physically demanding jobs.

5.6 Limitations of the study

This study had some limitations. The first was recall bias. There could be recall bias since respondents were required to give information on musculoskeletal disorders experienced in the past three months. Secondly, since the focus of this study was on garage workers at Abossey Okai, the conclusions drawn from this study cannot be generalized. However, it can be extended to garage workers that share similar characteristics.

5.7 Revisiting the study framework

The study found that age and work experience influence WRMSDs among workers, thus the Figure 5.0 below, illustrates the actual frame for the findings of the study.

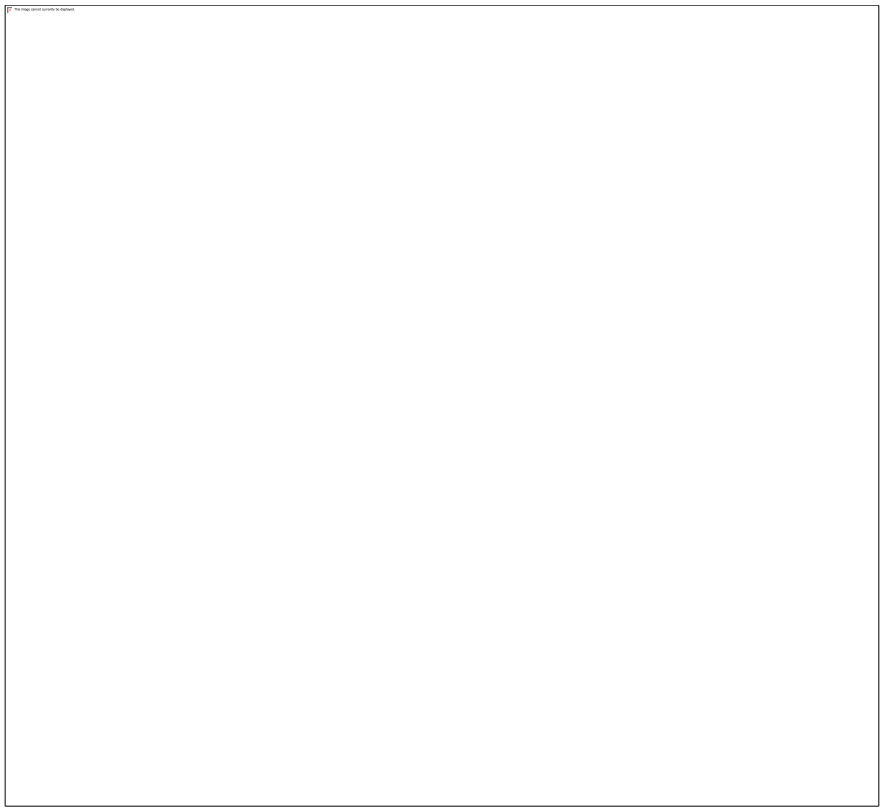


Figure 5: The conceptual framework after the study illustrating age and work experience as the risk factors of MSD among the garage workers.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter is in two sections. Section one presents conclusion of the study whereas section two presents the recommendations of the study.

6.2 Conclusion

The study revealed that musculoskeletal disorders were high among the garage workers at Abossey Okai. The prevalence of low back pain was the commonest musculoskeletal disorder among the body parts. This suggests that low back pain is an important public health problem

that needs attention. Additionally, musculoskeletal disorders tend to be related to the age and work experience of the garage workers but needs further investigations.

6.3 Recommendations

Based on the findings from this research, the following recommendations were made:

6.3.1. Recommendations to stakeholders

The high prevalence of musculoskeletal disorders among the garage workers calls for risk assessment of the workers and the market through the collaborative effort of all stakeholders involved i.e. the Department of Factories Inspectorate, Ministry of Employment and Labour Relations, Ghana Labour Commission and the leaders of Abossey Okai automobile spare parts market. There is also a need for these stakeholders to institute preventive strategies and monitor adherence of workers to safety guidelines to ensure the workers‟ safety and good health.

6.3.2. Recommendations to the Leaders of Abossey Okai automobile spare parts market

Though the workers had fair knowledge in OHS, this, did not reflect in their practice on observation during data collection. The leaders of the market should therefore, organize an intensive ergonomic and OHS training program for the workers. The training program could be done annually through a collaborative program between the Abossey Okai automobile spare parts leaders with the Ghana Health Service and Ghana Physiotherapy Association. An information package has been included (APPENDIX F) as a contribution towards this effort.

6.3.3. Recommendations to University of Ghana and other tertiary institutions

Tertiary institutions should collaborate with the research institutions to carry out future studies with an alternative design such as a qualitative study. This could help explore the in-depth causes of the high prevalence of MSD recorded among the Abossey Okai workers and other informal workers.

REFERENCES

Abaraogu, U. O., Ezema, C. I., Igwe, S. E., Egwuonwu, A. V., & Okafor, U. C. (2016). Work-related back discomfort and associated factors among automotive maintenance mechanics in Eastern Nigeria: A cross sectional study. *Work*, *53*(4), 813–823. https://doi.org/10.3233/WOR-162247

Abaraogu, U. O., Okafor, U. A. C., Ezeukwu, A. O., & Igwe, S. E. (2015). Prevalence of work-related musculoskeletal discomfort and its impact on activity: A survey of beverage factory workers in Eastern Nigeria. *Work*, *52*(3), 627–634. https://doi.org/10.3233/WOR-152100

Abledu, J. K., & Offei, E. B. (2015). Musculoskeletal disorders among first-year Ghanaian students in a nursing college, *15*(2), 445–447.

Akter, S., Rahman, M. M., Mandal, S., & Nahar, N. (2016). Musculoskeletal symptoms and physical risk factors among automobile mechanics in Dhaka, Bangladesh. *South East Asia*

Journal of Public Health, *6*(1), 8–13.

Alfers, L. (2010). *Occupational Health & Safety for Informal Workers in Ghana A case study of market and street traders in Accra*. University of KwaZulu-Natal, Durban. Retrieved from http://erd.eui.eu/media/2010/Alfers-201006.pdf

Alli, B. O. (2009). National Profile on Occupational Safety and Health MAURITIUS. Retrieved from http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/policy/wcms_356031.pdf

Ametepeh, R. S., Adei, D., & Arhin, A. A. (2013). Occupational Health Hazards and Safety of the Informal Sector in the Sekondi-Takoradi Metropolitan Area of Ghana, *3*(20), 87–99.

Appiah, S. O. (2014). Workplace Safety and Accidents among Artisans at Kokompe - Accra, Ghana by this thesis is submitted to the University of Ghana, Legon in Partial Fulfillment of the Requirements for the Award of PhD Sociology Degree. December, 2014, (10066900).

Aweto, H. A., Tella, B. A., & Johnson, O. Y. (2015). PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG HAIRDRESSERS, *28*(3), 545–555.

Barondess. A., J., Cullen R., M., Lateur de, B., Deyo A., R., Donaldson, K. S., Drury, C. G. … Manning, F. J. (2001). *Musculoskeletal Disorders and the Workplace*. https://doi.org/10.17226/10032

Benjamin, O. (2001). *Fundamental principles of occupational health and safety*. *Ilo*. Retrieved from http://univer.nuczu.edu.ua/tmp_metod/1058/FUNDAMENTAL PRINCIPLES OF OCCUPATIONAL HEALTH AND SAFETY.pdf

Benjamin, N., Beegle, K., Recanatini, F., & Santini, M. (2014). *Informal Economy and the World Bank*. Retrieved from http://documents.worldbank.org/curated/en/416741468332060156/pdf/WPS6888.pdf

Canadian Centre for Occupational Health and Safety. (2014). Work-related Musculoskeletal Disorders (WMSDs): OSH Answers. Retrieved April 9, 2018, from https://www.ccohs.ca/oshanswers/diseases/rmirsi.html

Cavallari, M. J. (2017). HHS Public Access, *21*(2), 129–139. https://doi.org/10.5588/ijtld.16.0716.Isoniazid

Cromie, J. E., Robertson, V. J., & Best, M. O. (2000). Work-related musculoskeletal disorders in physical therapists: prevalence, severity, risks, and responses. *Physical Therapy*, *80*(4), 336–51. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10758519

Chen, L., Evans, D., Evans, T., Sadana, R., Stilwell, B., Travis, P. … Wilmoth, J. (2006). *Working together for health*. WHO Press. Retrieved from http://www.who.int/whr/2006/whr06_en.pdf

Da Costa, B. R., & Vieira, E. R. (2010). Risk factors for work-related musculoskeletal disorders: A systematic review of recent longitudinal studies. *American Journal of Industrial Medicine*, *53*(3), 285–323. https://doi.org/10.1002/ajim.20750

Dembe, A. E., Erickson, J. B., Delbos, R. G., & Banks, S. M. (2006). Nonstandard shift schedules and the risk of job-related injuries. *Scandinavian Journal of Work, Environment and Health*, *32*(3), 232–240. https://doi.org/10.5271/sjweh.1004

Deros, B. M., Ismail, A. R., & Mohd Yusof, M. Y. (2012). Conformity to Occupational Safety and Health Regulations in Small and Medium Enterprises. *Occupational Safety and Health (NIOSH)*, *9*(1), 1–6.

Driessen, M. T., Anema, J. R., Proper, K. I., Bongers, P. M., van der Beek, A. J., Bongers - paulienbongers, P. M., & van der Beek -avanderbeek, A. J. (2008). BMC Musculoskeletal Disorders Stay@Work: Participatory Ergonomics to prevent low back and neck pain among workers: design of a randomised controlled trial to evaluate the (cost-) effectiveness. *BioMed Central*. https://doi.org/10.1186/1471-2474-9-145

Dutta Nirmalya. (2013). Do you have the right form and posture during weight training at the gym? - Read Health Related Blogs, Articles & News on Fitness at TheHealthSite.com. Retrieved from http://www.thehealthsite.com/fitness/do-you-have-the-right-form-and-posture-during-weight-training-at-the-gym/

Emia Vien. (2016). The Importance of Manual Handling. Retrieved from http://www.keepspace.com.au/importance-of-manual-handling/

Egwuonwu, V. A., Abidemi, T. B., Aiyejunsunle, C. B., Ezeukwu, O. A., & Auwal, A. (2013). A Cross-Sectional Survey Of Work Related Musculoskeletal Disorders Prevalence And Associated Risk Factors Among Quarry Workers In A South Eastern Nigerian Community. Retrieved from https://print.ispub.com/api/0/ispub-article/1598

Ekpenyong, C. E., & Inyang, U. C. (2014). Associations between worker characteristics, workplace factors, and work-related musculoskeletal disorders: A cross-sectional study of male construction workers in Nigeria. *International Journal of Occupational Safety and Ergonomics*. https://doi.org/10.1080/10803548.2014.11077057

Engholm, G., & Holmström, E. (2005). Construction workers Dose – response associations

between musculoskeletal disorders and physical and psychosocial factors among construction workers, *31*(2), 57–67.

Fitness body. (n.d.). Back Brace with Suspenders for Men, Support Belt for Lower Back Pain. Retrieved from https://fitness-body.net/product/back-brace-for-men-with-suspenders-support-for-lower-back-pain-gym-bodybuilding-weight-lifting-belt-training-work-safety-and-posture-neotech-care-tm-brand-black-color/

Gcelu, A., & Kalla, A. A. (2015). Musculoskeletal disorders ??? Disease burden and challenges in the developing world. *South African Medical Journal*, *105*(12), 1070–1071. https://doi.org/10.7196/SAMJ.2015.v105i12.10260

Hasle, P., & Limborg, H. J. (2006). A Review of the Literature on Preventive Occupational Health and Safety Activities in Small Enterprises, 6–12.

Health and Safety Executive. (2007). *Body mapping tool*. Retrieved from www.hse.gov.uk/campaingn/euroweek2007/pdfs/bodymapping.pdf

Hossain, M. D., Aftab, A., Hassan, M., Imam, A., Mahmud, I., Chowdhury, I. A … Sarker, M. (2018). Prevalence of work related musculoskeletal disorders (WMSDs) and ergonomic risk assessment among readymade garment workers of Bangladesh : A cross sectional study, *2*, 1–18. https://doi.org/10.1371/journal.pone.0200122

Houtman, I., Jettinghoff, K., & Cedillo, L. (2007). Raising awareness of stress at work in developing countries. *Protecting Workers' Health Series*, (6), 1–51. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Raising+Awareness+of+Stress+at+Work+in+Developing+Countries#1

Hush, J. M., Michaleff, Z., Maher, C. G., & Refshauge, K. (2009). Individual, physical and psychological risk factors for neck pain in Australian office workers: a 1-year longitudinal study. *Eur Spine J*, *18*(1532–1540). https://doi.org/10.1007/s00586-009-1011-z

ILO. (2002). *Joint Press Release ILO/WHO Number of Work related Accidents and Illnesses Continues to Increase ILO and WHO Join in Call for Prevention Strategies*. Retrieved from http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_005161/lang--en/index.htm

ILO. (2003). *Safety in numbers Pointers for a global safety culture at work*. Retrieved from http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_142840.pdf

Interrnational Labour Office. (2005). *A Global Alliance against Forced Labour*. Retrieved from http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/publication/wcms_081882.pdf

Kaka, B., Idowu, O. A., Fawole, H. O., Adeniyi, A. F., Ogwumike, O. O., & Toryila, M. T. (2016). An Analysis of Work-Related Musculoskeletal Disorders among Butchers in Kano Metropolis, Nigeria. *Safety and Health at Work*, *7*(3), 218–224. https://doi.org/10.1016/j.shaw.2016.01.001

Krejcie, R. V, & Morgan, D. W. (1970). DETERMINING SAMPLE SIZE FOR RESEARCH ACTIVITIES. *Educational and Psychological Measurement*. Retrieved from https://home.kku.ac.th/sompong/guest_speaker/KrejcieandMorgan_article.pdf

Kumar, S. (2001). Theories of musculoskeletal injury causation. [Review] [110 refs]. *Ergonomics*, *44*(1), 17–47.

Lovetere, R. (2016). How to change a Battery | YourMechanic Advice. Retrieved from https://www.yourmechanic.com/article/how-to-rebuild-a-car-engine

Luttmann, Alwin, Jager, M., Caffier, G., Liebers, F. (2003). Preventing Musculoskeletal Disorders in the Workplace. *World Health Organisation Report Geneva*, (5), 1–38lu. https://doi.org/http://www.who.int/iris/handle/10665/42651

Matter, W. E. (2016). *University of Ghana http://ugspace.ug.edu.gh Work-related Musculoskeletal Disorders among Firefighters : Do Task Characteristics and Work Experience Matter ?*

maparabic.com. (2010). Map of Abossey Okai Greater-Accra-Region Ghana. Retrieved March 27, 2018, from http://www.maparabic.com/place/Ghana/Greater-Accra-Region/7281067/Abossey-Okai survey. *World Health*, *77*, 955–964.

Milhem, M., Kalichman, L., Ezra, D., & Alperovitch-Najenson, D. (2016). Work-related musculoskeletal disorders among physical therapists: A comprehensive narrative review. *International Journal of Occupational Medicine and Environmental Health*, *29*(5), 735–747. https://doi.org/10.13075/ijomeh.1896.00620

Miller, P., McAtmaney, L., Hogan, A., & Mallet, K. (2006). *Work-Related Musculoskeletal Disease in Australia*. Retrieved from https://www.safeworkaustralia.gov.au/system/files/documents/1702/workrelatedmusculoskeltaldisorders_2006australia_2006_archivepdf.pdf

Mock, C. N., Abantanga, F., Cummings, P., Koepsell, T. D., Mock, N., & Koepsell, D. (1999). c.

Incidence and outcome of injury in Ghana: results of a community-based

National Institute for Occupational Safety and Health. (2015). Hierarchy of Controls. Retrieved April 9, 2018, from https://www.cdc.gov/niosh/topics/hierarchy/

Nunes, I. L., & Mccauley Bush, P. (2012). *Work-Related Musculoskeletal Disorders Assessment and Prevention*. (I. L. Nunes, Ed.) (Ergonomics). Florida. Retrieved from http://cdn.intechopen.com/books/ergonomics-a-systems-approach/Work_related_musculoskeletal_disorders_assessment_and_prevention

Osei-Boateng, C., & Ampratwum, E. (2011). *The Informal Sector in Ghana*. Retrieved from http://library.fes.de/pdf-files/bueros/ghana/10496.pdf

Patil Vaibhav. (2018). Posture Perfect: Are you standing the right way? | The Indian Express. Retrieved from http://indianexpress.com/article/lifestyle/fitness/posture-perfect-are-you-standing-the-right-way/

Pope, D. P., Silman, A. J., Cherry, N. M., Pritchard, C., & Gary, J. (2009). Validity of a self-completed questionnaire measuring the physical demands of work. *Scandavian Journal of Work, Environement and Health*, *24*(5), 376–385. https://doi.org/10.5271/sjweh.358

Punnett, L., & Wegman, D. H. (2004). Work-related musculoskeletal disorders: The epidemiologic evidence and the debate. *Journal of Electromyography and Kinesiology*, *14*(1), 13–23. https://doi.org/10.1016/j.jelekin.2003.09.015

Puplampu, B. B., Lg, P. O. B., & Africa, W. (2012). Key Issues on Occupational Health and Safety Practices in Ghana : A Review. *International Journal of Business and Social Science*, *3*(19), 151–156. https://doi.org/10.1016/j.shaw.2014.12.002

Rempel, D. M., Wang, P.-C., Janowitz, I., Harrison, R. J., Yu, F., & Ritz, B. R. (2007). A Randomized Controlled Trial Evaluating the Effects of New Task Chairs on Shoulder and Neck Pain among Sewing Machine Operators. *Spine*, *32*(9), 931–938. https://doi.org/10.1097/01.brs.0000261028.88020.fc

Saeidi, M. (2014). The Influence of Ergonomic Training on Low Back and Neck Pains in Female Hospital Personnel, *6*(3). https://doi.org/10.5812/jjhs.21722

Soslowsky, L. J., Thomopoulos, S., Tun, S., Flanagan, C. L., Keefer, C. C., Mastaw, J., & Carpenter, J. E. (2000). Overuse activity injures the supraspinatus tendon in an animal model: A histologic and biomechanical study. *Journal of Shoulder and Elbow Surgery*. https://doi.org/10.1067/mse.2000.101902

Tawiah, A. K., Oppong-Yeboah, B., & Bello, A. I. (2015). Work-related Musculoskeletal Disorders among Workers at Gold Mine Industry in Ghana: Prevalence and Patterns of Occurrence. *British Journal of Medicine & Medical Research Nigeria*, *9*(84), 1–9. https://doi.org/10.9734/BJMMR/2015/18747

Theis, K. A., Murphy, L., Hootman, J. M., Helmick, C. G., & Yelin, E. (2007). Prevalence and Correlates of Arthritis-Attributable Work Limitation in the US Population among Persons Ages 18–64: 2002 National Health Interview Survey Data. *Arthritis Rheum*, *57*(3), 355–363. https://doi.org/10.1002/art.22622

Treaster, D. E., & Burr, D. (2004). Gender differences in prevalence of upper extremity musculoskeletal disorders. *Ergonomics*, *47*(5), 495–526. UCLA Health and Safety. (2012).

UCLA Ergonomics - Body Stretches. Retrieved April 9, 2018, from https://ergonomics.ucla.edu/injuries-and-prevention/stretches/total-body-stretches.html https://doi.org/10.1080/00140130310001638171

Van Vuuren, B., Zinzen, E., van Heerden, H. J., Becker, P. J., & Meeusen, R. (2007). Work and Family Support Systems and the Prevalence of Lower Back Problems in a South African Steel Industry. *Journal of Occupational Rehabilitation*, *17*(3), 409–421. https://doi.org/10.1007/s10926-007-9092-1

WHO. (1994). Declaration on Occupational Health for All. *October*, (October), 10.

WHO. (1986). WHO | Constitution of WHO: principles. Retrieved April 9, 2018, from http://www.who.int/about/mission/en/

WHO. (1986). WHO | Constitution of WHO: principles. Retrieved April 9, 2018, from http://www.who.int/about/mission/en/

Yelin, E., Murphy, L., Cisternas, M. G., Foreman, A. J., Pasta, D. J., & Helmick, C. G. (2007). Medical care expenditures and earnings losses among persons with arthritis and other rheumatic conditions in 2003, and comparisons with 1997. *Arthritis & Rheumatism*, *56*(5), 1397–1407. https://doi.org/10.1002/art.22565

APPENDICES

APPENDIX A: Informed Consent Form

Title: Work-Related Musculoskeletal Disorders among Workers of Abossey Okai Automobile Spare Parts Market

Principal investigator: Eunice Ohene Darko

Address: Department of Biological, Environmental and Occupational Health, School of Public Health, University of Ghana, Legon.

General information about the research

This study is being carried out to find out how often you experience issues that influence your muscles, joints and bones owing to your work activities. It will include labourers at the Abossey Okai automobile spare part dealers‟ market. ‟The study will be for month i.e. June, 2018.

Purpose of the study

The research is entirely a school work and it is part of the investigator‟s necessities towards the award of a Master of Public Health Degree. This research try to find to whether nature of work, socio-demographic characterisitcs and occupational health and safety knowledge influence the work-related musculoskeletal disorders among automobile spare parts workers at Abossey Okai.

Data usage

All your information obtained, will be kept in locked files by the main interviewer with protected authorization codes. However, hard copies will be damaged after the schoolwork has been finished and the results have been assessed.

Confidentiality

The information from the participants will be made available only to the investigator and research assistants under circumstances of mutual privacy. All material shared will be private and would never be disclosed to anyone without your permission.

Potential risk/ benefits

There are no major risks associated with participating in this study. The procedure involved in this study is non-invasive and will not cause any physical discomfort to the participants. However identifying part of the body where one might have experienced pain might affect some individuals emotionally and when this occurs they would be given time to compose themselves before continuing with the interview.

The information gathered from the research could be used by stakeholders to draft policies to safeguard the workers. Public health practitioners would use the information in planning outreach and health education programs targeted at reducing musculoskeletal disorders among the Abossey Okai market.

At the end of this study, our research team will share what we observed with you in groups. All participants will benefit from health talks that will be held once every two weeks for three sessions at this work place after the study has been reviewed.

Compensation

Participants of the study would receive no monetary benefits for partaking in this study.

Voluntary withdrawal

Participating in this is entirely voluntary. Declining to enter the study or answer a question will have no negative consequences. Withdrawing from the study at any time is also acceptable and will have no negative consequences on you.

Enquiry

All questions you may have about this study can be directed to the ERC administrator or the researcher at the contact address below.

Hannah Frimpong (Administrator)

Ethics Review Committee

Ghana Health Service

Tel (mobile): 0507041223

Eunice Ohene Darko

Department of Biological, Environmental and Occupational Health

School of Public Health, University of Ghana, Lego

Tel (mobile): 0548969559.

Participant consent

The above document describing the benefits, risks and the procedures for the research "Work-Related Musculoskeletal Disorders among Workers of Abossey Okai Automobile Spare Parts Market" I have read / has been read and explained to me. I have been given the chance to ask questions and all the questions that I have asked about the research have been answered to my satisfaction. I consent voluntarily to participate as a subject in this study and understand that I have the right to withdraw from the study at any time without in any way it affecting my further medical care.

....

Date Signature or Thumbprint of Participant

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

....

Date Signature of Witness

The Interviewer should sign below:

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

....

Date Signature of Interviewer

APPENDIX B: Questionnaire

The questionnaire is made up of four different sections. In the first half, Section A collects data on your personal information. Section B is to identify some of your working conditions, number of years you have been and your involvement in other work apart from the present job.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Please UNDERLINE the appropriate answer

1. Sex: [1] Male [2] Female

2. Age:

3. Marital Status: [1] Single [2] Married [3] Divorced
   [4] Widowed

4. Educational Status: [1] No Formal Schooling [2] Primary
   [3] Secondary [4] Tertiary

5. Years of Work ……

6. How many hours in a day do you work at Abossey Okai?

……

7. Do you do other Jobs apart from the Abossey Okai job?

[1]YES ☐ [2] NO ☐

8. If you do other jobs apart from the Abossey Okai work, Please write it below

……

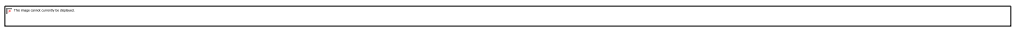
9. How many hours in a day do you do the other work? ……

SECTION B: NATURE OF WORK (TASK CHARACTERISITCS)

1. Do you normally **lift/carry** weights 5 kg or more with only **one hand at work?**

[1]YES **[2] NO**

1. Please put an X on the line below to estimate the heaviest weight you normally lifted with one hand.



0 5 10 15 20 25 30 35 40 45 50

Weight in kilograms

2. Do you often carry weights on your shoulder at work?

[1] YES [2] NO

3. Do you at work, usually lift weights above shoulder level?

[1]YES [2] NO

4. Do you push weights generally at work?

[1]YES [2] NO

5. Do you pull weights routinely at work?

[1] YES [2] NO

6. Do you usually perform the same task over and over?

[1] YES [2] NO

7. Do you typically work bending and twisting your back?

[1] YES [2] NO

8. Do you normally work in the same positions for long periods (e.g., standing, bending over, sitting and kneeling)?

[1] YES ☐ [2] NO ☐

9. Do you have enough rest or breaks regularly when working?

[1] YES ☐ [2] NO ☐

10. Do you mostly continue to work while injured or have pains or discomfort?

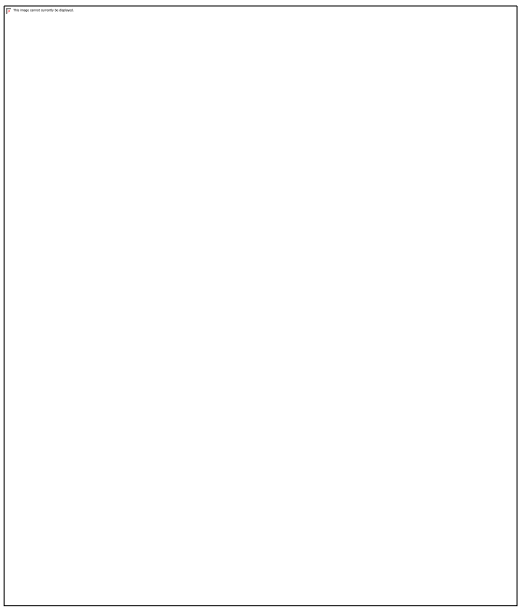
[1] YES ☐ [2] NO ☐

SECTION C: NORDIC MUSCULOSKELETAL QUESTIONNAIRE

This section asks about musculoskeletal disorders, such as aches or pains, you may have had recently. Please use the tick boxes - ☐- to answer each of the four questions for each part of the body shown in the picture on the right.

The picture shows how the body has been divided. The areas of the body are not sharply defined and some parts overlap.

You should decide for yourself which part



Have you in the past three months had an injury at work, experienced pain, discomfort, numbness, tingling sensation, pins, needles in any part of the body?

[1] NO ☐ **[2] YES** ☐

Have you at any time during the **last three months** had trouble (such as ache, pain, discomfort, numbness, tingling, or pins and needles) in your:		Have you had this trouble during the last **seven days**?	During the **last three months** has this trouble prevented you carrying out normal activities (e.g. job, Housework, hobbies)?	During the **last three months** has this trouble been caused or made worse by your job?
Neck	**1** No Yes 1□ 2□	**2** No Yes 1□ 2□	**3** No Yes 1□ 2□	**4** No Yes 1□ 2□Caused 3□Made worse
Shoulders	**5** No Yes 1□ 2□Right only 3□Left only 4□Both	**6** No Yes 1□ 2□Right only 3□Left only 4□Both	**7** No Yes 1□ 2□Right only 3□Left only 4□Both	**8** No Yes 1□ 2□Caused 3□Made worse
Elbows	**9** No Yes 1□ 2□Right only 3□Left only 4□Both	**10** No Yes 1□ 2□Right only 3□Left only 4□Both	**11** No Yes 1□ 2□Right only 3□Left only 4□Both	**12** No Yes 1□ 2□Caused 3□Made worse
Wrists / hands	**13** No Yes 1□ 2□Right only 3□Left only 4□Both	**14** No Yes 1□ 2□Right only 3□Left only 4□Both	**15** No Yes 1□ 2□Right only 3□Left only 4□Both	**16** No Yes 1□ 2□Caused 3□Made worse
Upper back	**17** No Yes 1□ 2□	**18** No Yes 1□ 2□	**19** No Yes 1□ 2□	**20** No Yes 1□ 2□Caused 3□Made worse
Lower back	**21** No Yes 1□ 2□	**22** No Yes 1□ 2□	**23** No Yes 1□ 2□	**24** No Yes 1□ 2□Caused 3□Made worse
Hips/ thighs/ buttocks	**25** No Yes 2□Right 1□ only 3□Left only 4□Both	**26** No Yes 2□Right 1□ only 3□Left only 4□Both	**27** No Yes 2□Right 1□ only 3□Left only 4□Both	**28** No Yes 1□ 2□Caused 3□Made worse
Knees	**29** No Yes 2□Right 1□ only 3□Left only 4□Both	**30** No Yes 2□Right 1□ only 3□Left only 4□Both	**31** No Yes 2□Right 1□ only 3□Left only 4□Both	**32** No Yes 1□ 2□Caused 3□Made worse

Ankles/ feet	**33** No 1□ Yes 2□Right only 3□Left only 4□Both	**34** No 1□ Yes 2□Right only 3□Left only 4□Both	**35** No 1□ Yes 2□Right only 3□Left only 4□Both	**36** No 1□ Yes 2□Caused 3□Made worse

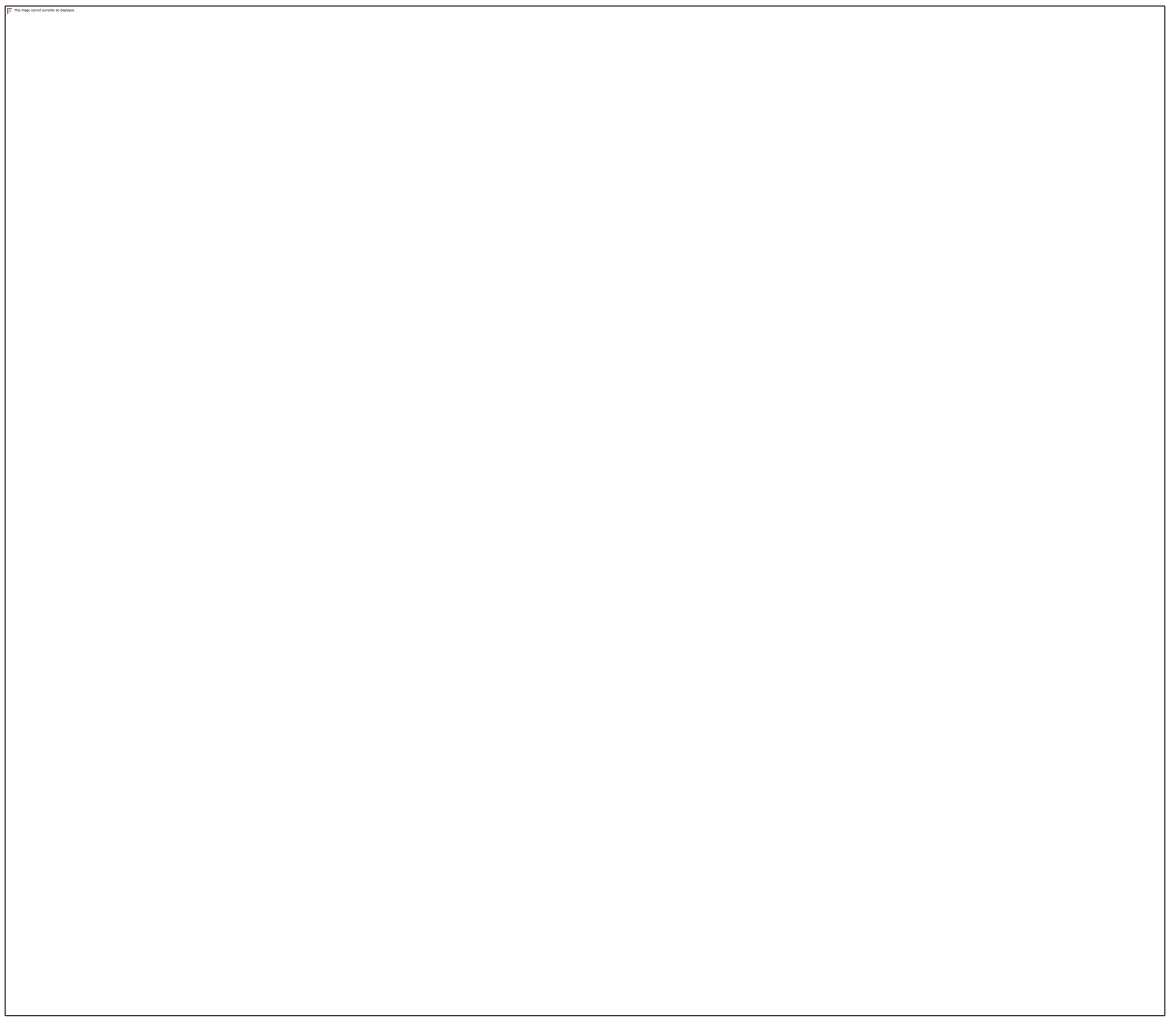
SECTION D: KNOWLEDGE IN OCCUPATIONAL HEALTH AND SAFETY

This section tests your knowledge in occupational health and safety. You fill this questionnaire by ticking inside one of the boxes by each statement.

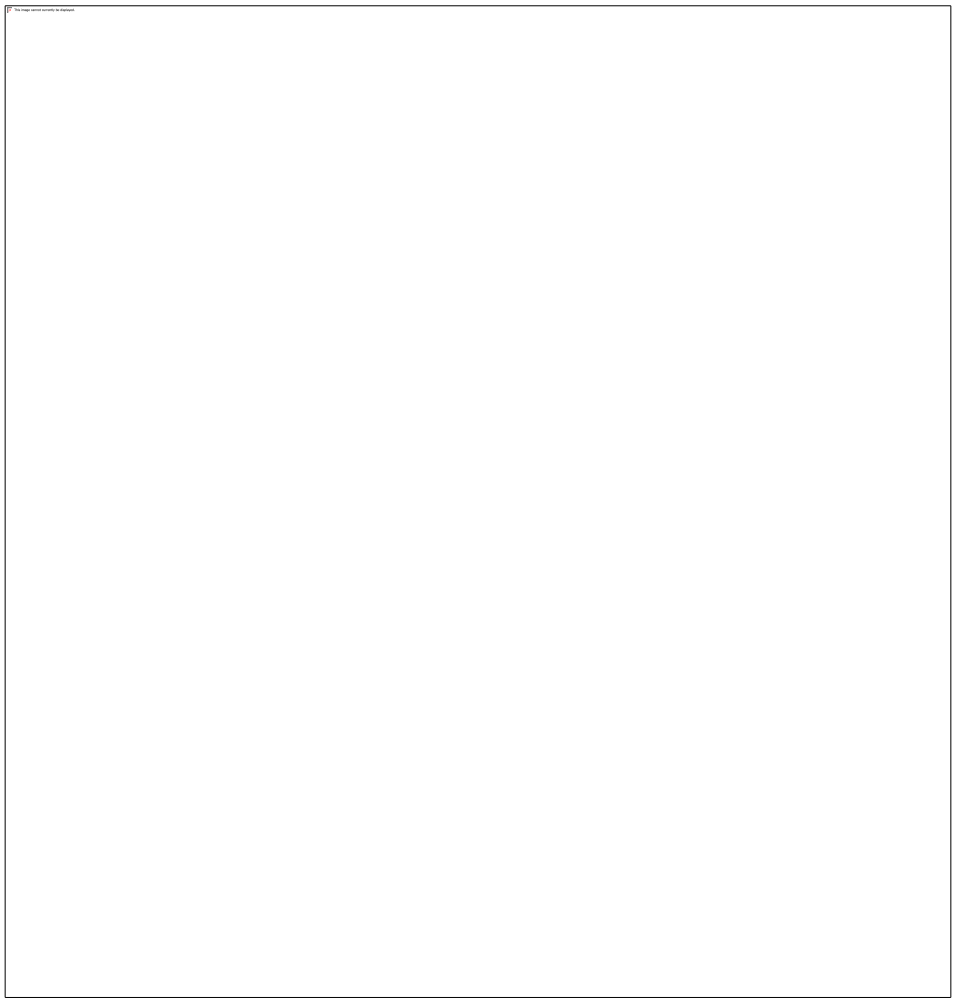
QUESTIONS	**Strongly Agree 1**	**Agree 2**	**Unsure 3**	**Disagree 4**	**Strongly Disagree 5**
1. Occupational hazards are absent in my workplace					
2. A worker who gets hurts as a result of poor manual handling skills five times must be punished					
3. Manual handling and safety training programs are not necessary for my work					
4. Safe way to carry a load is by reaching for load and bending over to lift with two hands					
5. The government does not have any responsibility towards the safety of workers					
6. Frequent exposure to the used engine oil from the spare parts cannot cause skin cancer					
7. Wearing of Protective clothing must be based on only the worker‟s decision					
8. Safety boots does not protect workers against slips, falls , ankle sprain, fracture and tetanus					
9. Measures should not be taken against noise produced at work that is irritating					
10. Workers should not always					

report pains, accidents, hurts and injuries to their direct boss					

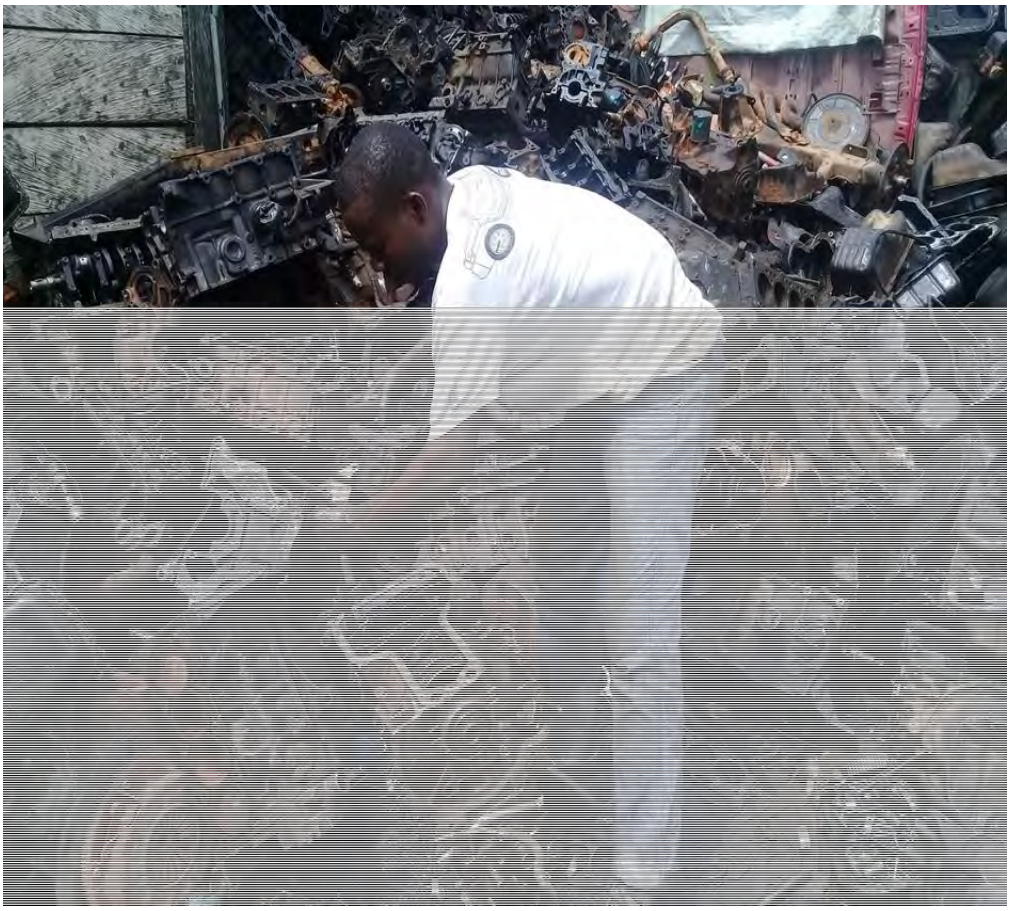
APPENDIX C: Pictorial view of the garage workers at work



APPENDIX D: Ergonomic posture assumed during work tasks



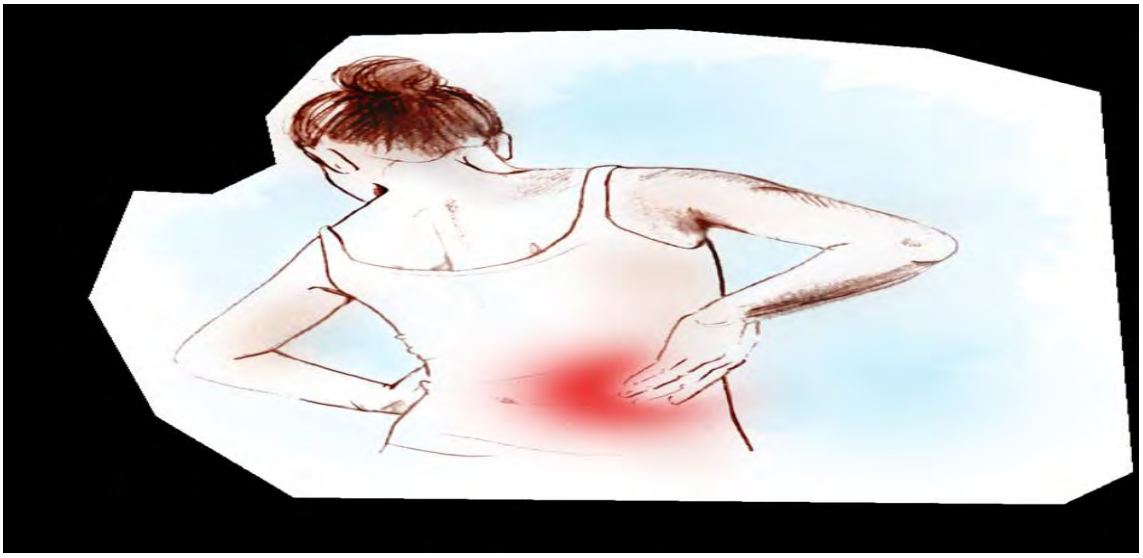
APPENDIX E: A garage worker working without PPE



APPENDIX F: Information Leaflet

This section contains information and work plan to educate workers about their health after the study as part of the benefit of the study.

I- ERGONOMIC MATERIALS



Spending long periods of time in abnormal positions such as bending and twisting the back is damaging to the back and the joints. This can cause the back to lose its normal curves and cause pain or sometimes paralysis.

It is sometimes obligatory to lift weight or discharge moderate to weighty materials with the hand. It is therefore essential to know the appropriate way of handling heavy objects.

Below are some tips to help you protect your back and other joints.

When you are about lifting or carrying a heavy item, ask yourself these questions below:

1. Can I lift this weight alone in one piece, or is it a two-person job?

2. Exactly how far will I have to convey the weight?

3. Is my path clear?

4. Once the load is lifted, will it block my view?

5. Can the load be put into smaller pieces?

6. Should I wear gloves to get a better grip and protect my hands?

GOOD LIFTING TECHNIQUES:

1. Wear your gloves. Get close to the load. Centre yourself over the load and stand with your feet apart.

2. Tighten your stomach muscles. (literally "tuck in your tummy")

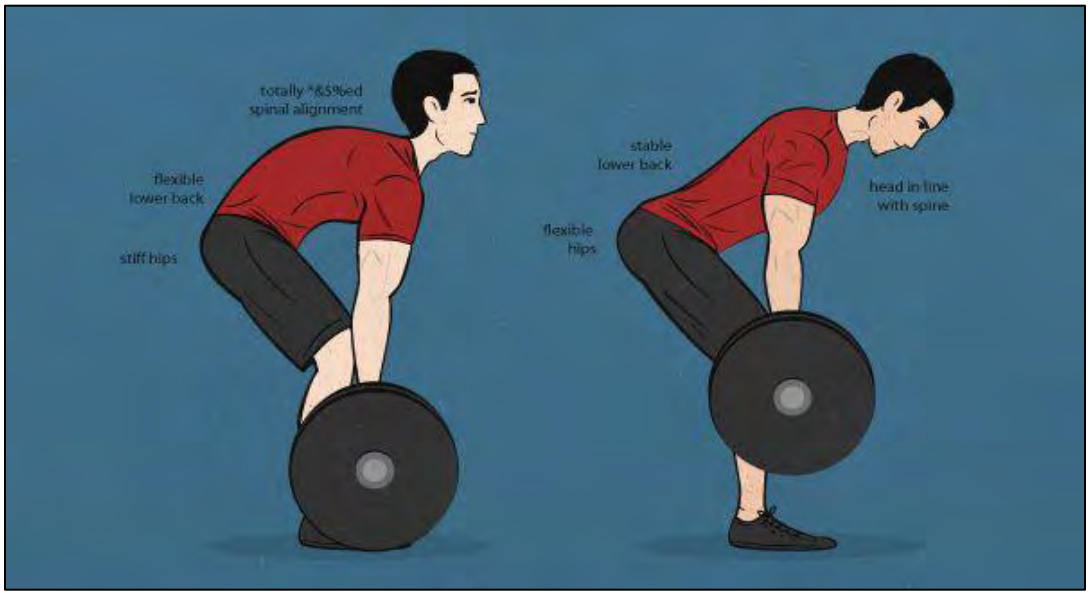
3. Get a good handhold and pull the load close to you. The farther the load is from your body, the heavier it will feel.

4. Bend your knees (Bending your knees is the single most important thing you can do when you lifting objects).

5. Do not twist or turn your body while lifting. Keep your head up, and look straight ahead. Hold the load close and keep it steady.

6. Squat down like a weightlifter, bend your knees, keep your back straight, and let your legs do the lifting. Your leg muscles are much stronger than the smaller muscles in your back.

Emia Vien (2016)



Dutta Nirmalya (2013)

The wrong way of lifting on the LEFT and the correct way is on the RIGHT

THE USE OF BACK BELTS/ SUPPORTS

Belts cause a rise in intra-abdominal pressure. This is the pressure built up while you squeeze your stomach muscles. Solid stomach and back muscles aid sustain the backbone and can decrease back pressure by up to 50% when lifting. The use of back support particularly when lifting loads greater than your body weight reduces the back stress. This support increase flexibility and can assist in keeping muscles warm. Its presence can serve as a reminder to signal you to use correct body mechanics when lifting.

You should know that this support **DO NOT** improve strength and lifting capacity, or substitutes appropriate body mechanics. However, the corset/ belts, in conjunction with proper body mechanics and lifting training, can be part of potent injury prevention strategy.

Source: (fitness body, 2012)

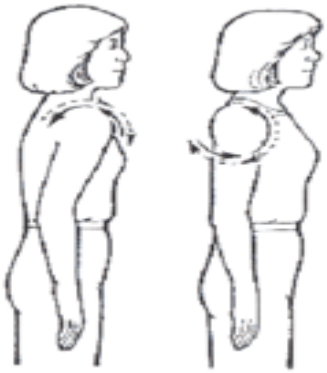
II-INJURY AND MSD PREVENTION SESSION

TASK MODIFICATION HELP IN PREVENTING OR REDUCING PAIN

How to Modify Activities

1. Change activities often throughout the day. Switch heavy and/or repetitive tasks with lighter, less repetitive ones.
2. Look for other ways of doing a specific work if it always causes discomfort or pain or injury.
3. Take enough breaks in between busy work to stretch and rest your body.
4. Use carts (common ones locally are trucks or wheelbarrows) to carry heavy loads.
5. Use two hands to lift rather than one, even with light objects and tasks.
6. Slide or push and pull objects instead of lifting.
7. Always position objects close to the body within easy reach.
8. Carry objects close to body at waist level.
9. Ask for help when lifting heavy objects.
1. Warm up and stretch before starting activities that are repetitive, static or prolonged.
2. Respect pain. Change positions or stop whenever activities cause pain.
3. Recognize early signs of the discomfort or disorder in the body and treat early.
4. Do not take medications not prescribed by your doctor when having pains
5. Be mindful of the exercises you engage in, consult a physiotherapist when you want a proper exercise program

III- EXERCISE PROGRAM TO IMPROVE FLEXIBILITY AND REDUCE PAIN

	**Shoulder Roll.** **1. Ease and dangle arms at your sides.** **2. Move shoulders up and back 5 intervals.** **3. Replicate in the reverse way.**
	**Triceps Stretch** **1. Placing arms above your head, grasp the elbow of one arm with the other hand** **2. Gradually pull the elbow behind your head to stretch it.** **3. Move smoothly.** **4. Keep it for 15-20 seconds then do same for the other arm. Repeat 5 times.**
	**Reaching Stretch.** **1. Interlock your fingers out in front of you at the shoulder level.** **2. Turn your palms externally and stretch forward.** **3. Keep it for 15-20 seconds. Repeat 5 times.**
	**Overhead Stretch.** **1. Interlock the fingers and hold overhead** **2. Turn your palms outward as you stretch.** **3. Keep it static for 15-20 seconds.** **4. Do this 5 times.**

	**Chest and Back Stretch.** **1. Interlock your hands at the back.** **2. Gently turn your elbows internal unbending the arms.** **3. Raise your arms up behind you till you feel a stretch.** 4. **Hold for 15-20 seconds. Repeat 5 times.**
	**Shoulder Stretch** **1. Place your hand at the back of your neck.** **2. Slowly pull your elbow to your chest to the opposite shoulder.** **3. Keep static stretch for 15-20 seconds.** 4. **Unwind and replicate with other arm.** 5. **Repeat 10 times for each arm.**
	**Chair Rotation Stretch.** **1. Sit on a chair.** **2. Put your feet around chair legs to make your body firm on the chair.** **3. Stretch across body and hold the back of the chair.** **4. Pull softly to increase the stretch in the mid-back.** **5. Keep stretching for 15-20 seconds, repeat stretch to the opposite side.**
	**Backward Bend** **1. Stand with hands on hips and knees a little bent.** **2. Turn and rotate your head and shoulders backwards.** **3. Come back to straight position.** 4. **Relax and repeat 15-20 stretches.**

	**Body Reach and Rotation** **1. Stand as tall as likely and reach arms up as high as possible.** **2. Rotate to the left, then to the right.** **3. Rotate slowly, repeating 15-20 times.**
	**Calf Stretch** **1. Stand a slightly away from a wall.** **2. Put one leg behind and the other forward slight bent at the knee.** **3. Push until a stretch is felt in the back of the leg below the knee.** **4. Hold 15-20 seconds.** 5. **Change legs and repeat 5 times.**
	**Hamstring Stretch** **1. Put your leg on a table or chair at a relaxed height.** **2. Faintly bend the knee of the leg on the ground.** **3. Stoop forward at your waist until you feel a stretch in the back of the raised leg.** **4. Hold for 15 seconds.** **5. Change the leg and repeat 15 times.**
	**Quadriceps Stretch** **1. Hold the top of your ankle and drag heel towards buttocks until a stretch is felt in the front part of the thigh.** **2. Avoid bending forward.** **3. Keep holding for 15 seconds.** **4. Change legs and repeat 15-20 times.**

UCLA Health and Safety, 2012

IV- REFERRAL LETTER

MEDICAL REFERRAL FORM

Date: …….

Background of Client

Name: …….....

Sex: ……Date of birth/Age: …….……

Next of kin:…….Contact Address

……....

Details of Referral

Clinic/Hospital referred to: ……...……

Referring diagnosis: ……..…….……...

Presenting complaints ……...……

……..…….

Examination Findings: ……..

……..……

Any Treatment given

……

Reasons for referral:

……

Name and Designation of referring officer: ……..

Signature of referring officer ……

OVERALL WORK PLAN- BENEFIT OF STUDY TO PARTICIPANTS

The program will be a three- time session. It will take place once every two weeks within five weeks period. This program will take place in October, 2018, after the study has been reviewed by examiners.

Session	Activity
Week one	Education on ergonomics and MSD using information leaflet I. Referrals would be given to workers with severe MSDs
Week three	Education on MSDs and injury prevention using information leaflet II. Referrals would be given to workers who may need it
Week five	The information leaflet III will be employed to teach the workers stretches to do after work. Referrals would be given if needed