ENSIGN GLOBAL COLLEGE

KPONG, EASTERN REGION-GHANA

FACULTY OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

PREVALENCE OF MUSCULOSKELETAL PAIN AMONG TEXTILE FACTORY WORKERS: A CASE STUDY IN AKOSOMBO TEXTILES LIMITED IN THE EASTERN REGION OF GHANA

BY

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A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, FACULTY OF PUBLIC HEALTH, ENSIGN COLLEGE OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF PUBLIC HEALTH DEGREE

AUGUST 2023

DECLARATION

We declare that this project is entirely the result of our hard work, research, and inquiries. We are confident that this project work was not plagiarized. All sources of information, however, have been recognized with appropriate respect.

EHOENAM A. MAWUENYEFIA, (217100183) …… ……

(Student's Name & ID) Signature Date

Certified by:

Dr Stephen Manortey …… ……..

(Supervisor's Name) Signature Date

Certified by:

Dr Stephen Manortey …… ……..

(Head of Academic Program) Signature Date

DEDICATION

I dedicate this project to God and my parents Rev. Paul Zikpi - Mawuenyefia and Mrs. Grace Mawuenyefia and my two Siblings Ama Mawusi Mawuenyefia and Nyatefe Zikpi - Mawuenyefia.

ACKNOWLEDGEMENT

My sincerest gratitude goes to the Almighty God for His immense Grace and Mercy upon my life. I am very grateful to my supervisor, Dr. Stephen Manortey, for his guidance and motivation during the compilation of this report.

A special thank you goes to the President of the College, Prof. Stephen Alder, and all other lecturers of the Department. Their academic tutoring and mentoring have shaped and increased my knowledge in my program of study.

My warmest appreciation also goes to Prosper Akorfanu Sabi for taking time off his busy schedule to offer me support when needed.

My final appreciation goes to the management of Akosombo Textiles Limited for allowing me to conduct research in their factory, Douglas Akwasi Boateng and Firmine Ami Kemavor, these two encouraged and supported me throughout my studies, and to my family for their support, I say a big thank you and God richly bless you all.

DEFINITION OF TERMS

- **Musculoskeletal Disorders (MSDs)** are conditions that can affect your muscles, bones, and joints.
- **Musculoskeletal Pain** is pain that affects: Bones. Joints. Ligaments. Muscles. Tendons. Musculoskeletal pain can be acute, meaning it is sudden and severe. Or the pain can be chronic (long-lasting).
- **Upper Limb Diseases/ Upper Limb Musculoskeletal Disorders** are aches, pains, tension, and disorders involving any part of the arm from fingers to shoulder or the neck.
- **Work-Related Musculoskeletal Disorders** are musculoskeletal disorders that result from, or is exacerbated by, conditions in the workplace environment or the performance of work tasks. Examples of workplace-related musculoskeletal disorders include carpal tunnel syndrome, osteoarthritis, sciatica, and rotator cuff syndrome

ABBREVIATION/ACRONYMS

AICL – Akosombo Industrial Company Limited

ATL – Akosombo Textiles Limited

CDC – Center for Disease Control

CI – Confidence Interval

GDP – Gross Domestic Product

ILO – International Labor Organization

MSDS - Musculoskeletal Disorders

MSK – Musculoskeletal Pain

MSQ – Musculoskeletal Questionnaire

NIOSH – National Institute for Occupational Safety and Health

OR – Odds Ratio

ULDs – Upper Limb Diseases

ULMSDs - Upper Limb Musculoskeletal Disorders

WMRDS – Work-Related Musculoskeletal Disorders

YLDs - Years of Life Lived with Disability

ABSTRACT

Background: Textile factory workers are usually at risk of work-related musculoskeletal disorders due to the nature of their work; which involves assuming of awkward postures coupled with weight lifting and other varying ways of lifting, pushing, and/or pulling trolleys, prolonged standing or sitting, and torso bending and stretching. That notwithstanding, very little attention has been paid to the musculoskeletal health effects associated with the work hazards experienced by textile factory workers in Ghana.

Objective: This study was conducted to evaluate the prevalence and risk factors of musculoskeletal pain among textile factory workers in the Eastern Region of Ghana.

Method: A cross-sectional study was conducted among textile factory workers in the Eastern Region of Ghana to collect data. A self-administered questionnaire was used to collect data on musculoskeletal pain (level of pain, site of pain), demographic features, and occupational factors (workload, job placement, and length of work). Musculoskeletal pain was assessed using adapted standardized Nordic Questionnaires. Associations between musculoskeletal pain and demographic features, and occupational factors (workload, job placement, and length of work) was examined using Pearson's Chi-square analysis and Multivariate logistic regression analysis.

Results: Among 250 respondents, the prevalence rate of pain was 58.40% among textile factory workers in Eastern Ghana with the lower back being the most prevalent body region affected with a percentage of 30.40% and a heightened pain vulnerability observed among individuals with job durations of ≤10 years and 11-20 years and had an odds ratio of 2.13 (95% CI: 0.83–5.44, p = 0.114).

Conclusion: There is a high prevalence of work-related musculoskeletal disorders among textile factory workers in Eastern region of Ghana. The heightened pain vulnerability observed among

individuals with job durations of ≤10 years and 11-20 years flags the need for early career interventions by management.

Keywords: pain prevalence, ergonomics, work length, job duration, textile factory workers, work-related musculoskeletal disorders.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

The human body is subjected to lots of pain as we go about our day-to-day activities. The working environment can be hazardous and pose a lot of stress on the human body; In a typical textile factory setting it is no different; activities like weight lifting and other varying ways of lifting, pushing, and/or pulling trolleys, prolonged standing or sitting, and torso bending and stretching are common among factory workers, and these activities done in a wrong posture or repeatedly after some time stress the body and lead to musculoskeletal pain and/or disorders. This makes the factory workers vulnerable (Norman, Kretchy and Brandford, 2013) and less productive.

The term musculoskeletal disorders (MSDs) refer to conditions that involve the nerves, tendons, muscles and supporting structure of the human body. Work-related musculoskeletal disorders (WMSDs) describe pain, discomfort, or injury to the muscles, tendons, joint bones, peripheral nerves, and/or other supporting blood vessels that may be caused or aggravated by work. WMSDs are preventable to a very large extent and at least can be delayed as well. It is noted to be the second commonest cause of disability worldwide and also increases absenteeism and presenteeism, decreases productivity, and causes financial to the employer (Kanniappan and Palani, 2020).

According to the International Labor Organization (ILO 2016), work-related musculoskeletal disorders are one of the issues contending with occupational health and safety and have been estimated to kill about 2.2 million people every year globally. Maintaining good musculoskeletal health is crucial for achieving economic, social, and functional independence. Additionally, effective musculoskeletal health is imperative for engaging in physical activity, which is critical

for decreasing the likelihood of different non-communicable illnesses (Ogundiran, *et al.*, 2020). The cost of musculoskeletal disorders amongst other occupational injuries amounts to 4% of the world's gross domestic product(GDP) in 2016 (Gebremeskel and Yimer, 2019). Studies have reported a high prevalence of musculoskeletal pain among textile factory workers in different parts of the world, including Ethiopia (Yiha and Kumie, 2010), Bangladesh (Jahan *et al.*, 2015), Iran (Md DEROS *et al.*, 2014) and Sri Lanka (Stankevitz *et al.*, 2016). For instance, a study by (Md DEROS *et al.*, 2014) in Iran found that 64.4% of textile factory workers had musculoskeletal pain. Similarly, (Jahan *et al.*, 2015) reported a prevalence of 78.3% of musculoskeletal pain among female textile workers in Bangladesh.

While the prevalence of musculoskeletal pain among textile factory workers has been reported in various studies, there is still a need for more localized research on this topic to identify the extent of the problem, its associated risk factors, and strategies for its prevention and management. There is a paucity of studies on musculoskeletal pain among textile factory workers in Africa, especially in Ghana, and more studies are needed to fill this research gap.

1.2 Problem Statement

Work-related musculoskeletal disorders are prevalent worldwide; these disorders are a major health problem among workers in both industrialized and industrially developing countries (Meenaxi and Sudha, 2012). Globally, there were approximately 1.71 billion prevalent cases of musculoskeletal disorders in 2019, with 149 million years of life lived with disability (YLDs) (Ausloos, Brugha and Collaborators, 2018). Work-related musculoskeletal disorders (WMSDs) contribute significantly to these cases and YLDs, indicating that WMSDs cause significant physical and mental suffering for workers and place a heavy burden on healthcare services and

society as a whole (Ausloos, Brugha and Collaborators, 2018; Briggs *et al.*, 2018). It is also noted to be the largest single cause of work-related illness accounting for over 33% of the incidence of occupational injuries in the general population (Etana, *et al.*, 2021). Several workplace factors, such as repetitions, awkward and static postures, manual lifting, pushing and pulling trolleys, and prolonged sitting or standing contribute significantly to causing pain and discomfort in the upper and lower extremities of the body. Studies by Govaerts *et al.*, (2021) indicated that 50% of workers' absenteeism was a result of work-related musculoskeletal disorders, which was two times higher than the number of absenteeism caused by respiratory illnesses.

Many African countries have a prevalence rate of WSMDs ranging from 15% to 93.6% (Etana, *et al.*, 2021) and about 20% of this prevalence is contributed by the industrial sector of which the textile industry is inclusive (Okello, *et al.*, 2020). The prevalence rate of WSMDs among gold miners in South Africa and Ghana was revealed to be 65.3% and 85% respectively through studies conducted (Okello, *et al.*, 2020). Worker absenteeism and presenteeism due to WMSDs is a major concern that has caused significant health and economic challenges for the manufacturing industries, and the textile factory has no exemption from the above (Ekpenyong and Inyang, 2014).

The disparities in the prevalence rates across countries could be due to the lack of an internal standard definition of WMSDs causing under/over-reporting of cases though significant and alarming, leaving a literature gap in the scope of the prevalence of WSMDs.

1.3 Rationale of the study

Musculoskeletal pain is a prevalent occupational health problem among textile factory workers, and studying it is essential to develop strategies to prevent and manage this condition. The rationale for studying musculoskeletal pain among textile factory workers is based on the preliminary

secondary data conducted at the factory's clinic; It revealed about 75% of cases reported daily are about musculoskeletal pain, giving it a high prevalence rate. Also, studies conducted by A. (Iqbal *et al.*, 2022) found that the prevalence of musculoskeletal pain was 70.86% among Bangladesh textile factory workers. Similarly, a study by (Lim *et al.*, 2022) in Malayisa found a high prevalence of musculoskeletal pain among janitorial workers. The study found that 76.8% of the workers had musculoskeletal pain. Thus, understanding the prevalence of musculoskeletal pain among textile factory workers locally is necessary to identify the extent of the problem and draft policies and preventative measures to curb the prevalence of musculoskeletal pain amongst textile factory workers.

Musculoskeletal pain has an impact on productivity due to absenteeism and presenteeism (Tanaka *et al.*, 2022). Staff may not be able to report to work or will report but won't be able to work efficiently, this negatively impacts productivity. Pain or discomfort in an individual render him a hazard to him/herself, the institution and his coworker; it has psychological effects on the affected individual and when not attended to can lead to workplace accidents, and near misses because work may not be done well. This does not only affect productivity but financially and reputationally affects the company as well.

The treatment of musculoskeletal disorders is expensive; studies conducted by Ekpenyong and Inyang, (2014) stated the National Research Council and the Institute of Medicine's total cost associated with reported WMSDs, is about 45 – 54000 million dollars and this amount is exclusive of data from developing nation on occupational injuries and public sector injuries. With a focus on our study area, an estimated 80000 Ghana cedi was spent on procuring pain medications only for the factory's clinic in 2021/2022 exclusive of the cost of medical imaging, physiotherapy, workman compensation, and hospitalization. Therefore, understanding the prevalence and risk

factors of musculoskeletal pain among textile factory workers is necessary to identify cost-effective strategies to prevent and manage this condition. Studying the prevalence of musculoskeletal pain will help the textile factory make savings on how much they spend on workman compensation, medical bills, medical imaging, physiotherapy, and painkiller medications.

1.4 Conceptual framework

This conceptual framework sought to address the prevalence of musculoskeletal disorders and how demographic factors, work factors, and job demands, and ergonomics affected or led to musculoskeletal disorders.

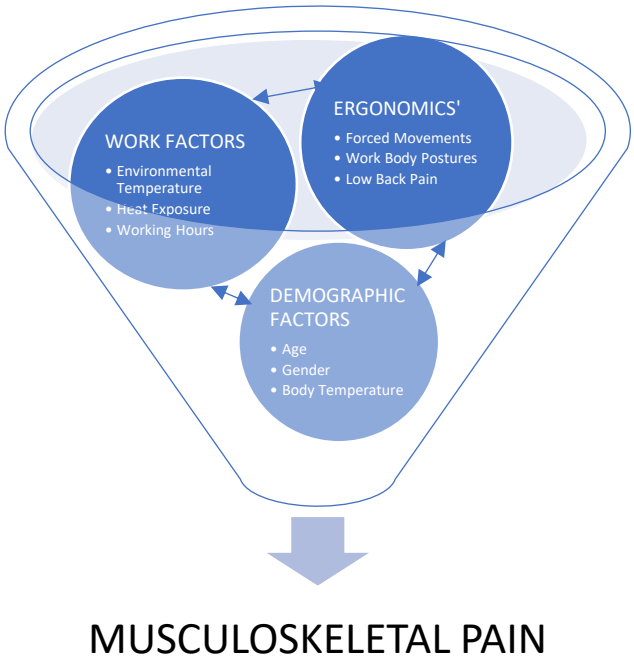

Figure 1: *Musculoskeletal Pain*

Source: Adapted from (Jalac *et al.*, 2018)

Demographic factors: This refers to the characteristics of the people in a particular setting, which indicate whether or not they are suitable to work based on their personal information that is already known, and can be either within or outside of their control.

Work factors and job demands: These are factors that exist within the work setting and can impact the physical and functional abilities, mobility, and overall health and welfare of both the workers and the machinery and equipment utilized during the entire work period.

Ergonomics: According to the International Ergonomics Association, ergonomics "is concerned with the understanding of interactions among humans and other elements of a system and the profession that applies theory, principles, data, and methods to design to optimize human well-being and overall system performance" (Agency, 2021). Implementing ergonomics reduces the risk of WMSDs and increases productivity.

1.5 Research questions

1. What is the prevalence rate of musculoskeletal pain amongst the study participants?
2. What are the risk factors of musculoskeletal pain among the study participants?
3. What is the association between the demographic characteristics of the workers and the level of musculoskeletal pain reported?

1.6 General objective

To evaluate the prevalence and risk factors of musculoskeletal pain among textile factory workers in the Eastern Region of Ghana.

1.7 Specific objectives

1. To assess the prevalence rate of musculoskeletal pain amongst the study participants.
2. To examine risk factors for musculoskeletal pain.
3. To investigate the association between the socio-demographic characteristics of the workers and the level of musculoskeletal pain.

1.8 Profile of the Study Area

The Eastern Region lies between latitudes 6º and 7º north and longitude 1.30 degrees west and 0.30 degrees east. It is the third largest region with a land area of 19,323 square kilometers, which is 8.1% of Ghana's land area (Ghana Statistical Survey, 2005). The physical characteristics of the region favor inland fisheries, inland waterway transport, and a thriving tourism industry with ecotourism and holiday tourism products. The trade and service sector has also developed dynamically in the region. The region ranks third after Greater Accra and Ashanti Regions in terms of infrastructure development.

Asuogyaman District is one of the thirty-three districts in the Eastern Region of Ghana. Established in 1988, the area was part of the former Kaoga District Council, which was the capital of Somanya. It has an estimated total area of 1,507 square kilometers and accounts for 5.7% of the total area of the eastern region with the capital Atimpoku. The district currently has a total population of 103,382. The district borders to the north with Afram Plains District to the south with North Tongu District, to the west with the Lower Manya Krobo Municipality, and to the east with South Dai District. The district is known for its hydroelectric dam (Akosombo Dam), Tourist sites, and manufacturing companies like toilet roll factory, and Akosombo Textiles Limited among others "Eastern Region" (Ghana Statistical Service) (GhanaWeb, March 28, 2019).

Akosombo Industrial Company Limited (AICL), established as Akosombo Textiles Limited began the modern textile industry in Ghana in 1967 until the name change in 2018. The textiles factory is situated on a 47-acre site along the river banks of the Volta Lake in the Eastern Region with its head office in Accra (Akosombo Textile Limited. (2023, February 1). The company's mission is to establish itself clearly and firmly as the leading textile company in Ghana, to serve as the main channel for textile production in a friendly environment, and to distribute excellent quality textile fabrics that are fashionable yet affordable in Ghana, West Africa, and beyond Africa. The factory has various sections; Administration, Printing and Dyeing, and Engineering, all of which have sub-sections, and also a registered health center that functions as a primary care facility (Akosombo Textile Limited. (2023, February 1).

1.9 Scope of Study

The goal of the study was to determine the prevalence of musculoskeletal pain amongst textile factory workers and to quantify the frequency and intensity of musculoskeletal pain, identify the risk factors for developing it at work, and investigate the association between the socio-demographic characteristics of the workers and the level of musculoskeletal pain. Employees from both genders, diverse job categories, and varied ages and levels of experience were included in the study. It took a quantitative approach through gathering data using questionnaires. The investigation was carried out within a space of three (3) months. Even though the results might not be entirely generalizable, they nonetheless offer useful information for the creation of interventions and policies to enhance worker's health in similar industrial settings.

1.10 Organization of the Study

In order to examine the prevalence of musculoskeletal pain amongst textile factory workers, a case study in Akosombo Textiles Limited in the Asuogyaman District in the Eastern Region of Ghana, the current study was divided into six separate chapters. The organization of the chapter was described below.

The general introduction which included background to the study, statement of the problem, rationale for the study, the research questions and objectives, and the significance of the study were all introduced in Chapter One. Additionally, it outlined the conceptual framework, the research technique used, and the study's scope and limitations, and organization of the study.

A comprehensive overview of the literature relevant to the topic was presented in Chapter Two. This chapter drew on ongoing research projects, recently published articles, and important reports to identify knowledge and understanding gaps and build the theoretical foundation for the research.

Chapter three was on methodology components which were research methods and design, data collection techniques and tools, study population, study variables, sampling, pre-testing, data handling, data analysis, ethical consideration, limitation of study and assumptions.

Chapter Four focused on the data, with the use of the required visual aids, such as graphs, charts, and tables, the chapter provided a complete analysis of the data acquired and explain the findings.

Chapter Five focused on the discussions of results, how the research questions, objectives, key variables, literature review linked or had a correlation to the results of the research.

Chapter Six elaborated on the conclusions and recommendations. The chapter ended with summaries of key findings with figures and recommendations to stakeholders and interested parties, and its contributions to the body of knowledge in the area.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.0 Introduction

The chapter examined the literature on the subject under investigation as it had been compiled by experts, academicians, and researchers; What musculoskeletal pain in the workspace is, it focused on its prevalence, risk factors for musculoskeletal pain, and investigated the association between socio-demographic characteristics and the level of musculoskeletal pain which formed the main focus of the review.

The discomfort or pain that may be felt in the muscles, tendons, ligaments, and other components that are responsible for maintaining the framework of the body is referred to as "musculoskeletal pain," and it is denoted by the term "musculoskeletal pain" (MSK pain) (Liew, Vecchio and Falla, 2018). It is feasible that its severity may vary from moderate to severe, and its duration could either be acute or chronic, depending on the conditions. It is also possible that its length could range from light to severe (Park *et al.*, 2023).

The etiology of musculoskeletal disorders (MSDs) is multifactorial, involving a diverse range of contributing factors (Kim *et al.*, 2012). These encompass not only physical elements, whereby mechanical load on musculoskeletal tissues leads to MSDs, but also organizational and psychosocial aspects. A thorough investigation of these intricate relationships is imperative for advancing our knowledge of MSD development and formulating effective strategies for prevention and intervention in the realm of occupational health.

2.1 Definition of Musculoskeletal Pain

Musculoskeletal disorders (MSDs) are impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, cartilage, bones and the localized blood circulation system. According to the National Institute for Occupational Safety and Health (NIOSH), which is a part of the Center for Disease Control and Prevention (CDC), If MSDs are caused or aggravated largely by work and by the effects of the immediate environment in which work is carried out, they are known as work-related MSDs (Observatory, 2019). Work-related musculoskeletal disorders (WSMDs) are therefore, defined as conditions in which the workplace environment and work conditions play a significant role in the ailment and/or make it worse or prolong its duration (Observatory, 2019). It is common practice to refer to WSMDs by their abbreviation, which is "WSMDs."

2.2 The Overview of Musculoskeletal Disorders and Risk Factors for Musculoskeletal Pain

Bernardo Ramazzini was the first to describe the musculoskeletal conditions he saw in workers who had "insistent and irregular movements in unnatural postures." Ramazzini was the first to discover that work was to blame for these ailments (Franco and Franco, 2001). Due to the significant temporary or permanent disability they cause for workers, as well as symptoms like pain, numbness, and tingling, time away from work, decreased productivity, increased worker's compensable costs, and the rising number of cases related to them that are being heard in court, these work-related disorders of the neck, shoulder, lower back, upper limbs, and locomotors organs, continue to be of interest to workers, researchers, and businesses (Meenaxi and Sudha, 2012; Comper and Padula, 2014; Islam, 2022). In the course of the previous several decades, musculoskeletal problems have evolved into a substantial cause for worry in a number of the industrialized nations (Briggs *et al.,* 2018). These disorders are common in a great number of

nations; they cause large monetary losses and have a negative effect on the general quality of life of the work force (Russo *et al.*, 2020). They also account for a considerable fraction of the overall number of work-related ailments that have been recorded and/or are eligible for financial compensation in a lot of nations (Anton and Weeks, 2016; Jebaraj *et al.*, 2022). This is the case in both of those categories. Musculoskeletal disorders of the upper extremities are especially common in occupations that demand a significant deal of manual labor (Mahto and Bhupal Gautam, 2018; Barnard *et al.*, 2021), such as working as a secretary or in the postal service, cleaning, conducting industrial inspections, and packing. These jobs put a lot of strain on the shoulders, elbows, and hands. People whose jobs involve activities such as heavy lifting, repetitive hand motions, static work in which the body is kept in a fixed posture, vibrations, or any of these factors in combination with an unfavorable psychosocial work environment are more likely to experience work-related musculoskeletal disorders (WMSDs) (Joseph *et al.*, 2020; Ogundiran *et al.*, 2020). Experimental research and epidemiology have come to the same conclusion about this matter.

It is necessary to find a solution to the worldwide problem posed by the prevalence of musculoskeletal illnesses among the working population (Barnard *et al.*, 2021). Work-related musculoskeletal disorders, commonly known as WMSDs, are the most widespread occupational health concern in Europe since they impact millions of workers (Govaerts *et al.*, 2021). WMSDs are also the most common occupational health issue in the United States (Yang *et al.*, 2022). Some of the most notable factors that lead to work-related musculoskeletal ailments include frequent bending and twisting, severe physical labor, transporting big products by hand, and whole-body vibration (Das, Ghosh and Gangopadhyay, 2013). An increased risk of working-related musculoskeletal disorders (WMSDs) is caused by a number of factors, including increasing workloads, low job satisfaction, high work expectations, and stress at work (Acaröz Candan, Sahin

and Akoğlu, 2019; Mustapha, Akomah and Baiden, 2022). These factors all lead to an increased risk of developing WMSDs (Paudyal *et al.*, 2013). In the face of this, the construction and agricultural industries have the largest incidence of illnesses and injuries connected to WMSDs (Alghadir and Anwer, 2015; Jain *et al.*, 2018). Back discomfort, work-related neck and upper limb diseases (ULDs), repetitive strain injuries, and lower limb disorders are the most common types of work-related musculoskeletal disorders (WMSDs) that people experience (Observatory, 2019). Lower limb disorders are the most common kind of work-related musculoskeletal disorder (Van *et al.*, 2016). In addition to being one of the most prevalent sorts of work-related disorders, back pain is also one of the most common types of discomfort and contributes to absenteeism than other health illnesses (Govaerts *et al.*, 2021).

There is a correlation between a number of unique risk factors, each of which has been recognized as a possible cause, and the onset of musculoskeletal discomfort in the workplace, as well as the exacerbation of symptoms that were already present. According to the findings of a study by (Mbada *et al.*, 2022), job type and job length significantly influenced one's risk of WRMSDs.

Workplace factors that increase the risk of developing WMSDs include routinely lifting heavy things, everyday exposure to vibration that affects the whole body, regular work performed at heights, working with the knees or back in a wrong posture, and doing jobs that require repeated, forceful motions (Hiremath *et al.*, 2014). Other factors that increase the risk of developing WMSDs include working at heights, working with the neck in a chronically flexed posture, and working with the hands (Moom, Sing and Moom, 2015). Another factor that raises a person's likelihood of acquiring WMSDs is engaging in frequent heavy lifting (Okello *et al.*, 2020). Working regularly in positions that put you at risk of getting WMSDs is another factor that raises the likelihood of having these disorders (Mustapha, Akomah and Baiden, 2022).

As stated by (Smith *et al.*, 2019), issues related to ergonomics, such as an improperly set up workplace or sitting for an extended period of time, have repeatedly been associated to an elevated risk. Also, empirical research has brought to light a multitude of factors that play pivotal roles in increasing one's risk of experiencing musculoskeletal pain or discomfort; Among these variables are repeated motions, excessive physical workload, and psychosocial factors, including work-related stress and insufficient social support and it is evident from these investigations that the interplay of these elements can significantly contribute to an increased risk of developing musculoskeletal pain (Quansah, 2005; Moom, Sing and Moom, 2015; Maimaiti *et al.*, 2019). As such, a comprehensive understanding of these determinants is essential for formulating effective interventions aimed at addressing and mitigating the impact of musculoskeletal issues in the context of occupational health.

Also, (Alghadir and Anwer, 2015; Amissah *et al.*, 2019)) yields compelling evidence that individuals involved in construction work exhibit a significantly augmented susceptibility to musculoskeletal pain. This heightened vulnerability can be attributed to the repetitive nature of their movements and the considerable physical exertion inherent in their occupational tasks. These findings substantiate the need for a comprehensive understanding and effective management of musculoskeletal pain within the construction industry. By recognizing the specific risk factors associated with this occupation, interventions can be developed to mitigate the prevalence and impact of musculoskeletal pain, thus fostering improved occupational health and well-being among construction workers.

2.3 Prevalence of Musculoskeletal Pain

Majority of employees in the textile industry are responsible for duties that are not only strenuous on their bodies but also need them to stay active throughout the course of the workday (NM *et al.*, 2022). These workers are often asked to move heavy objects, lift, bend and spin their bodies, reach, and do a wide range of other tasks repeatedly (Siddiqui *et al.*, 2021). When doing manual labor, it is a common practice to assume aberrant postures such forward flexion, lateral flexion, and rotation and other abnormal postures include twisting (Bulduk, Bulduk and Süren, 2017). As a direct result of this, the lumbar spine and several other parts of the body are subjected to loads that are increasingly more severe over the course of time (Bulduk, Bulduk and Süren, 2017)(Acaröz Candan, Sahin and Akoğlu, 2019). It is probable that a sizeable number of employees in diverse professions suffer from musculoskeletal issues that are brought on by their jobs because of the features of the jobs themselves. Occupational factors such as highly repetitive activities, confined and chronic work postures, and high visual demands have been linked to the development of these disorders in their various forms and degrees of severity (Mukrimaa *et al.*, 2016).

Numerous investigations of the prevalence rates of musculoskeletal pain among workers in a wide range of professions and industries have been carried out as part of a number of different research projects. For instance, a study carried out by (Smith, Balogun and Dillman, 2022) found that forty percent of office workers reported having had musculoskeletal pain at some point in their careers. The study also found that individuals who worked long hours or had poor ergonomic setups at their workplaces reported experiencing higher rates of musculoskeletal discomfort. Another study conducted by (Valipour Noroozi *et al.*, 2015) revealed a prevalence of 51% and 36.5% of back-ache and neck ache among office workers of Ahvaz Jundishapur University of Medical Sciences, these results uncovered that working in office settings carries a significant likelihood of

experiencing musculoskeletal disorders, which can potentially lead to obstacles in employment and give rise to various severe issues over time.

In a study conducted by Al-Otaibi et al. (2019) within a paint factory setting, noteworthy findings were reported regarding the prevalence and characteristics of low back pain among workers (Al-Salameen, Abugad and Al-Otaibi, 2019). The study revealed that approximately 49% of workers experiencing low back pain reported experiencing moderate pain intensity. Moreover, a significant proportion of these workers (62.2%) had encountered more than three pain episodes in the past 12 months. Among individuals with low back pain, 46.7% reported stable pain intensity during work hours, while 60% experienced a decrease in pain intensity a few hours after work. Remarkably, an even more substantial reduction in pain intensity (77.8%) was observed after a week away from work. These findings provide valuable insights into the dynamics of low back pain among workers in the paint factory context (Al-Salameen, Abugad and Al-Otaibi, 2019).

Boschman et al. conducted a study that yielded noteworthy findings regarding the prevalence of musculoskeletal pain among bricklayers and their supervisors (Boschman *et al.*, 2012). According to the findings of the research, both groups of employees were proven to have a reasonably high prevalence of aches and pains in their backs, knees, shoulders, and upper arms thus the prevalence of MSDs among 267 bricklayers and 232 supervisors was 67% and 57%, correspondingly. Unpredictably, a significant majority of bricklayers and supervisors affirmed that their job was directly responsible for the musculoskeletal problems they had in their bodies.

We realize that, not only do these results add to the continuing academic debate on the subject at hand, but they also give substantial new information concerning the occupational consequences of musculoskeletal pain in each of the several professions that were looked at in this research.

Musculoskeletal morbidity was also found to be the most common health condition in a study of female textile industry workers in Pondicherry (Kumary P, L and Roy, 2016).

Also, Stankevitz et al. (2016) conducted an empirical investigation to explore the prevalence of musculoskeletal disorders (MSDs) among Sri Lankan rubber tappers (Stankevitz *et al.*, 2016). Their findings revealed a strikingly high prevalence rate, with a staggering 66% of the surveyed tappers reporting the occurrence of at least one MSD within the previous twelve months. Specifically, the most commonly affected body regions were identified as the back (43%), shoulders (28.3%), and neck (19.3%). These compelling results underscore the significant burden of MSDs within the Sri Lankan rubber-tapping profession, shedding light on the pressing need for further research and interventions to address the occupational health challenges faced by this population (Stankevitz *et al.*, 2016).

Across various African countries, the prevalence of any musculoskeletal disorder exhibits considerable variation, ranging from 15% to 93.6%. Notably, the industrial sector, including mining, contributes to approximately 20% of the overall prevalence (Ausloos, Brugha and Collaborators, 2018). In-depth studies conducted among workers in gold mines in South Africa and Ghana unveiled striking prevalence rates of MSDs at 65.3% and 85%, respectively (Tawiah, Oppong-Yeboah and Bello, 2015; Okello *et al.*, 2020). Another prominent prevalence of musculoskeletal pain is seen in a study steered among e-waste workers at Agbogbloshie in Ghana; the largest informal e-waste dumpsite in West Africa. The prevalence of pain was high in the lower back (65.9%), shoulders (37.5%), and knees (37.5%) (Acquah *et al.*, 2021). A higher prevalence of about 94% was also noted among some nurses in Ghana due to frequent torso twisting and bending and prolonged standing and lifting of patients (Abla Kofi- Bediako *et al.*, 2021). Another

Ghanaian study on prevalence of MSDs among physiotherapists revealed a high career prevalence of work-related musculoskeletal disorders among Ghanaian physiotherapists (Yarfi *et al.*, no date). A meticulous analysis of data from diverse sources in Africa revealed a pooled prevalence of WMSD at 57% (95% confidence interval [CI]: 48, 67). Further subgroup investigation delineated the distribution of WMSDs, with manufacturing sites constituting the highest proportion of reported cases at 62% (95% CI: 44, 77), closely followed by construction sites at 57% (95% CI: 38, 76), and mining sites at 51% (95% CI: 32, 69). These fascinating findings underscore the substantial burden of occupational injuries across different sectors in Africa and emphasize the pressing need for targeted interventions and robust safety measures (Debela, Azage and Begosaw, 2021).

In comparison to their non-domestic counterparts, domestic workers exhibited a notably higher prevalence of work-related musculoskeletal disorders (WMSDs) in various anatomical regions. Specifically, the neck (19.6%), shoulder (23.8%), elbow (12%), upper back (31.9%), and ankle (26%) were identified as the areas most affected by WMSDs in this occupational group according to (Jebaraj *et al.*, 2022). These findings highlight the significance of addressing occupational risk factors and implementing targeted interventions to promote the musculoskeletal health and well-being of domestic workers.

By elucidating the prevalence rates in specific industries, these studies contribute invaluable insights that can inform evidence-based policy development and advocate for enhanced workplace safety standards to safeguard the health and well-being of the African workforce. All these and more indicates that MSDs are prevalent in all occupations but there are discrepancies in reporting prevalence of MSDs due to the lack of standardized definitions, which leads to variations in case

definitions and data collection methodologies employed across different studies thus unable us appreciate the prevalence of musculoskeletal pain.

2.4 The Association between the Socio-Demographic Characteristics and the Level of Musculoskeletal Pain

Individuals in a wide range of work settings report varying degrees of musculoskeletal pain, and research that examines the socio-demographic characteristics of persons has shown linkages between these varying degrees of pain. According to the findings of (Smith, Balogun and Dillman, 2022) one of the most important factors is the employee's age. It has been shown that older workers are more prone to have higher levels of musculoskeletal pain than younger workers (Amissah *et al.*, 2019; Ogundiran *et al.*, 2020). A study by (Berberoğlu and Tokuç, 2013) also affirmed the assumption that the number of WMSD complaints increased with age; At the age of 55-64 years, the number of self-reported symptoms was 1.7 times higher than at the age of 25-34 years.

According to the study conducted by (Jain *et al.*, 2018) age emerged as a prominent factor associated with musculoskeletal disorders (MSDs) in all body regions, with the exception of the shoulder and neck. The study's outcomes emphasize the substantial impact of age on MSDs development across diverse anatomical areas, underscoring the necessity of accounting for age-related considerations in the assessment and intervention of these conditions.

Another study revealed that there were gender differences in the prevalence and severity of MSDs and perception of work as stressors (Meenaxi and Sudha, 2012). A study conducted by (Lange *et al.*, 2010) sought to explore the impact of sex differences on psychological measures and pain coping strategies in individuals diagnosed with fibromyalgia. By investigating these aspects, the research aimed to provide valuable insights into the potential influence of gender on the experience

of fibromyalgia and its associated psychological and pain-related factors but found none. There were no gender differences with pain (Lange *et al.*, 2010). However, pain amongst female textile workers was high and interventions have to be brought about in the textile industries on the ergonomic aspects to prevent MSD and not necessarily about gender in a study by (Thangaraj, Kannappan and Chacko, 2015).

In the investigation of gender differences among farmers, a significant disparity emerged, with female farmers reporting more frequent and severe pain in comparison to their male counterparts. Notably, the study sample demonstrated compelling associations between female gender and musculoskeletal (MSK) pain in various body regions, with the exception of the arm/elbow. These findings suggest a distinct likelihood of heightened physical vulnerability or increased pain sensitivity among women in the agricultural context (Min *et al.*, 2016).

Within the scholarly discourse, Kilbom and Messing explored potential factors contributing to the elevated rates of MSK morbidity among female workers. One plausible explanation posits that females may encounter heightened exposure to MSK pain risk factors during household and childcare activities outside of their formal work roles, potentially contributing to the observed gender-based disparities (Messing K, Stock SR, 2020). These findings underscore the significance of incorporating gender-specific considerations when assessing and addressing musculoskeletal pain in the agricultural sector. By recognizing the nuanced influences of gender on pain experiences, policymakers and health professionals can devise more effective and targeted interventions to enhance the well-being and occupational health of farmers, irrespective of gender identity.

Another sociodemographic characteristic that influence prevalence in MSDs is educational status, we noticed Boschman et al. conducted a study that yielded noteworthy findings regarding the

prevalence of musculoskeletal pain among bricklayers and their supervisors(Boschman *et al.*, 2012). According to the findings of the research, both groups of employees were proven to have a reasonably high prevalence of aches and pains in their backs, knees, shoulders, and upper arms thus the prevalence of MSDs among 267 bricklayers and 232 supervisors was 67% and 57%, correspondingly.

2.5 Conclusion

The comprehensive analysis of existing literature on the prevalence of musculoskeletal pain among textile factory workers explains a significant and concerning issue within this occupational setting. The synthesis of multiple studies consistently highlights the pivotal role of various occupational factors, including repetitive motions, prolonged sitting or standing, heavy lifting, awkward postures, and exposure to vibrating equipment, in contributing to the high prevalence of musculoskeletal pain.

A salient aspect of this review centers on the recognition of textile factory workers' self-awareness as a crucial element in accurately identifying and reporting musculoskeletal pain symptoms during data collection just as suggested by (Mahto and Bhupal Gautam, 2018), they stated that lack of awareness about the MSDs and improper knowledge of ergonomics is what causes the problems of MSDs. Furthermore, it underscores the importance of fostering effective communication between the research team and workers, creating an environment conducive to transparent reporting and active engagement in the study.

The body of literature collectively emphasizes the prevalence of musculoskeletal pain in specific body regions, with the neck, shoulder, and back being the most commonly affected areas among

diverse workers. Remarkably, gender differences emerge, indicating a higher frequency and severity of pain experienced by female workers compared to their male counterparts.

The implications derived from this literature review underscore the urgency of implementing targeted ergonomic interventions and preventive measures within textile factories and other occupational settings. By addressing the unique demands of the workplace and mitigating risk factors, the burden of musculoskeletal pain in occupational groups can potentially be alleviated.

While the review acknowledges the potential influence of confounding factors, such as age, gender, and non-occupational activities, it advocates for further in-depth research to discern the intricate interplay of these variables and their impact on the prevalence of musculoskeletal pain among textile factory workers.

In conclusion, this literature review serves as an indispensable scholarly resource, expounding the prevalent issue of musculoskeletal pain among occupational settings but mainly textile factory workers. The insights gleaned from this review underscore the significance of informed intervention strategies to safeguard the health and well-being of this workforce, and offers a compelling foundation for future research endeavors in this domain.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

In this chapter, using Akosombo Textiles Limited as a case study, we described the technique utilized to examine the research topic; the prevalence of musculoskeletal pain amongst textile factory workers. This chapter wasover the sample procedures, data collection instruments, data analysis strategies, and research design that were all considered. The researcher clearly explained the processes used to produce the findings and conclusions reported in the succeeding chapters by the end of this chapter.

3.2 Research Methods and Design

A cross-sectional study was utilized to identify the prevalence of musculoskeletal pain among textile factory workers since the study aimed to determine the prevalence of musculoskeletal pain among these individuals. Cross sectional data is ideal for a study like this because it gives a snapshot of the population at a certain point in time and enables researchers to look at how different variables relate to one another. However, cross-sectional studies do not establish causal relationships or provide information about the temporal sequence of events because the data is collected at a single time point. Instead, they provide a snapshot of the population's characteristics, prevalence rates, and associations between variables (Boiano *et al.*, 2009).

Cross-sectional studies are useful in investigating the distribution of diseases, conditions, or behaviors within a population. They can help identify the prevalence of a particular health condition, risk factors associated with it, or variations in the prevalence among different subgroups

(Boiano *et al.*, 2009)hence, a cross-sectional study design was conducted among textile factory workers in the Eastern Region of Ghana. A sample size of 273 was selected among the target population to get participants for the study. The factory has about 652 workers in 3 main departments who are grouped in various subsections hence the approach will involve the use of a stratified random sampling technique to give a true representation of what goes on in the factory.

3.3 Data collection methods and instruments

A self-administered questionnaire was used to collect data on musculoskeletal pain (level of pain, site of pain), demographic features, and occupational factors (workload, job placement, and length of work). Musculoskeletal pain was assessed using adapted Questionnaires from (Kuorinka *et al.*, 1987; Dunstan *et al.*, 2005)to fit the study's objectives.

3.4 Study Population

The study was conducted in a textile factory located in the Asuogyaman District of the Eastern Region, Ghana. The company was established in 1967 as a joint venture between the Ghanaian government and a Swiss firm, Sefi. Their main product is African wax print fabric, which is popularly used for clothing and home furnishings in West Africa and other parts of the world. The factory currently employs over 652 workers and is the only company producing wax for the West African sub-region. The study population for the prevalence of musculoskeletal pain among textile factory workers included individuals representing various job roles, work experience levels, ages, and genders. The selection criteria focused on workers involved in different stages of the textile production process. The study aimed to capture the diverse occupational exposures and tasks that could contribute to musculoskeletal pain. Collaboration with factories, worker unions, and

recruitment notices facilitated participant enrollment. By targeting this specific population, the study aimed to investigate and provide insights into the prevalence of musculoskeletal pain in the context of textile factory work.

3.5 Study Variables

All study participants who have been working in the textile factory for more than twelve months and are within the age group of 18 and 65 years shall randomly be selected and involved in the study.

Inclusion criteria

- All Staff of Akosombo Textiles Limited (now Akosombo Industrial Company Limited).
- Should be 18 years and not more than 65 years.
- Must have been working in the factory for over 12 months.
- Participants who are willing to join the study.

Exclusion Criteria

- Staff employed in the last twelve (12) months
- Pregnant staff
- Staff with any history of major surgery or road traffic accidents.
- Any staff younger than 18 years or students on attachment.
- Any staff who has been incapacitated and or uses a walking aid.
- Any seasonal migrant worker

3.6 Sampling

The sample of a study is a section of the population that is drawn to make inferences or projections about the general population thus a sample size needs to be calculated to infer from the population. For this sample size, it will be calculated using YAMANE's formula, 1967.

$$n = \frac{N}{1 + N(e^2)}$$

Where,

n = sample size

N = total population of the study area (652)

e = Margin of error set at 5% (0.05)

Therefore,

$$n = \frac{652}{1 + 652(0.05^2)} = 247.91 \simeq 248$$

A 10 % non-response rate (25) was added to the calculated sample size thus resulting in a minimum sample size needed for the study to be about 25 + 248= 273 respondents.

Stratified random sampling which is a type of probability sampling was used for the research; it was used due to the segregation and diversity of jobs done in the study area. This helped make the research studies become more representative by making sure each subgroup was well-represented and improved accuracy and effectiveness. The inclusion of representatives from various strata also aided in the control of confounding variables.

3.7 Pre-testing

Pretesting of the questionnaire was done on about 10 conveniently selected participants to test the validity of the questionnaire in their setting. The pilot study had to be done in the same study area

because there was no other textile factory in the Eastern Region aside from the selected study area. Geographically, the closest manufacturer to AICL is Volta Star Textiles Limited (formerly known as Juapong Textiles Limited). However, the factory operation differs from what is done in AICL and will not be useful for this research. The findings of the pretesting were not included in the study, it checked the viability, and reliability and served as a check for the objectives of the study to identify if there was a need to modify to suit or maintain what had been already done.

3.8 Data handling

Data collected with questionnaires were screened for completeness, biases, and errors. The data was then entered using Microsoft Excel. The principal researcher was responsible for data cleaning and organization and also ensured research methods and findings were accurate and trustworthy, and that they were not misrepresenting the company or its employees**.** The data was de-identified and coded before the analysis to protect the participants' privacy. To preserve the anonymity of the participants, the raw data was only accessible to the study team, and any published results were presented in aggregate form. Data (hard copies) were securely kept in a locked filing cabinet. All data were going to be kept confidential for 5 years after which, will be destroyed. The original entry on the questionnaire was used as source data and kept safely under lock and key. Soft copies of all datasets and work done were sent to the researcher by e-mail, a copy saved in Google Drive, and on an external drive.

3.9 Data Analysis

Data collected was analyzed using the STATA statistical software package. Descriptive statistical analysis was carried out to obtain summary tables and graphs containing the demographic

characteristics of the study participants. Odds ratios (ORs) reported with their 95% confidence intervals (C. Is) with the level of statistical significance were set at a p-value of 0.05 for all tests. Results were expressed as means, frequencies, and percentages in graphs. Associations between musculoskeletal pain, demographic features, and occupational factors (workload, job placement, and length of work) were examined using Pearson's Chi-square analysis and Multivariate logistic regression analysis. A thorough report was then written to summarize the study's findings, and tables and figures were used to display the outcomes of the data analysis.

3.10 Ethical Consideration

Ethical clearance was obtained from the Ethics Review Committee of Ensign Global College and administrative approval was also sought from the management at the factory. Oral informed consent was sought from participants who could not read after explaining the study to them and consenting by stamping or pending a signature before recruitment and a written consent form for those who can read and write to sign a consent form. Participants were made aware of the objectives of the research project, and they were assured of anonymity and confidentiality for all information they provided. Participants were also assured that at any point during the data collection, they had every right to withdraw from the study without any consequences to their job security, personal, image, or self-esteem.

3.11 Limitation of Study

A key limitation of the study on the prevalence of musculoskeletal pain amongst textile factory workers is the issue of generalizability and external validity. The findings and conclusions derived

from the study may have limited applicability and generalizability to a broader population of textile factory workers. Several factors contribute to this limitation:

Firstly, the study's sample size was relatively small, which compromises the representativeness of the findings. A small sample size restricts the ability to draw robust conclusions that can be generalized to the entire population of textile factory workers. The sample may be derived from a specific geographical area, a particular type of textile factory, or a particular demographic group, which further narrows the scope of generalization.

Secondly, there is a possibility of selection bias within the study. If the participants are volunteers or self-selected, they may not represent the entire population of textile factory workers accurately. Individuals who choose to participate may have different characteristics, motivations, or health statuses compared to those who opt-out. This potential bias may affect the prevalence estimates and limit the external validity of the findings.

Thirdly, the study may rely on self-reported data, which is subject to inherent limitations. Self-reporting introduces the risk of recall bias, where participants may have difficulty accurately recalling the frequency, intensity, and duration of their musculoskeletal pain. Furthermore, participants may underreport or overreport their pain symptoms due to various factors such as social desirability bias, fear of consequences, or subjective interpretation of pain. These biases compromise the accuracy and reliability of the prevalence estimates.

Another limitation was the cross-sectional design of the study. By capturing data at a single point in time, the study did not account for temporal variations in musculoskeletal pain prevalence. Musculoskeletal pain may fluctuate over time due to changes in work conditions, ergonomic interventions, or individual factors. Thus, a longitudinal study design would provide a more

comprehensive understanding of the dynamic nature of musculoskeletal pain prevalence among textile factory workers but the time frame for this study did not allow that.

Furthermore, the study did not comprehensively consider other relevant occupational factors that can impact musculoskeletal pain prevalence. The study's primary focus on ergonomic and work-related factors neglected the potential impact of psychosocial and environmental variables on pain experiences. Variables such as social support, psychological well-being, and workplace culture might interact with ergonomic factors, shaping pain dynamics. Neglecting these factors also caused a limit in the ability to account for potential confounding variables and hindered a comprehensive understanding of musculoskeletal pain in the context of textile factory work.

The skewed gender distribution, predominantly male, raised concerns regarding potential gender bias in the study's findings. This imbalance did not fully capture potential gender-specific pain experiences, which limited the comprehensive understanding of pain prevalence.

While the study employed a standardized pain scale, relying solely on this scale to capture the intricate dimensions of musculoskeletal pain possibly overlooked subtlety in pain intensity, quality, and impact. Supplementing the pain scale with additional validated measures could have provided a more comprehensive assessment.

Lastly, the study's findings may not be generalizable across different regions, types of textile factories, or cultural contexts. Textile factories vary in terms of work processes, management practices, safety regulations, and ergonomic interventions. These variations can significantly impact the prevalence of musculoskeletal pain. Therefore, caution should be exercised when extrapolating the study's findings to populations or contexts that differ from those specifically studied.

In conclusion, the study on the prevalence of musculoskeletal pain among textile factory workers faces limitations in terms of generalizability and external validity. Acknowledging these limitations not only adds rigor to the study but also guides future research endeavors in addressing these constraints to provide a more comprehensive understanding of musculoskeletal pain in diverse occupational contexts.

3.12 Assumptions

The present study operated on the assumption that occupational factors played a pivotal role in contributing to the prevalence of musculoskeletal pain among textile factory workers. Specifically, it posited that the specific demands of textile factory work, characterized by repetitive motions, prolonged periods of sitting or standing, heavy lifting, awkward postures, and exposure to vibrating equipment, were associated with an increased risk of developing musculoskeletal pain. This proposition was grounded in a robust body of existing literature and empirical evidence, which consistently highlighted a strong correlation between occupational activities and the occurrence of musculoskeletal disorders.

Furthermore, the study presumed that textile factory workers possessed a certain level of self-awareness concerning musculoskeletal pain symptoms. It postulated that workers could accurately recognize and differentiate musculoskeletal pain from other types of discomfort or health conditions they might experience during their work. By relying on workers' self-awareness, the study aimed to ensure the veracity and reliability of pain reporting during data collection.

Moreover, the study assumed transparent and unbiased reporting of musculoskeletal pain symptoms by textile factory workers. While acknowledging the potential influence of social desirability bias and fear of consequences on workers' responses, it was presumed that workers

comprehended the significance of their contribution to occupational health research and were motivated to provide accurate information.

To enhance the validity of this assumption, the study also took into consideration effective communication between the research team and the textile factory workers. This recognition of the importance of clear communication, instructions, and questionnaires that were readily comprehensible to workers accounted for potential language barriers or cultural differences. Adequate communication aimed to foster an environment where workers could fully grasp the study's objectives, actively engage in the data collection process, and provide accurate responses.

In addition, the study assumed a degree of homogeneity within the population of textile factory workers under investigation. Specifically, it was presumed that workers shared similar job tasks, working conditions, and exposures to occupational hazards, thereby allowing the prevalence of musculoskeletal pain to be generalized within this population without significant variations based on individual job roles or other factors. This assumption enabled the study to focus on the overall prevalence of musculoskeletal pain among textile factory workers, ensuring the relevance of the findings for the broader workforce.

Also, the study placed confidence in the accuracy and reliability of the diagnostic criteria employed to identify and classify musculoskeletal pain conditions. It relied on the assumption that the selected diagnostic tools or questionnaires had been appropriately validated for use among textile factory workers and accurately captured the prevalence of musculoskeletal pain. Valid and reliable diagnostic criteria were paramount to ensure the consistency and credibility of the prevalence estimates derived from the study.

Moreover, the study presumed the absence of significant confounding factors that could distort the prevalence rates. Although it acknowledged that variables such as age, gender, physical fitness,

comorbidities, or non-occupational activities might potentially impact musculoskeletal pain prevalence, it was assumed that these factors did not significantly confound the relationship between occupational factors and the prevalence of musculoskeletal pain.

At the same time, the study presumed the representativeness of the sample, considering it to be reflective of the larger population of textile factory workers. It posited that the prevalence estimates obtained from the sample could be reasonably generalized to other textile factory workers within the same region or similar settings. This assumption allowed for broader implications and inferences of the study's findings.

Lastly, the study presumed temporal stability, assuming that the prevalence of musculoskeletal pain remained relatively constant during the study period. It posited that short-term variations in pain prevalence were minimal, thereby enabling the study to cross-sectionally assess the prevalence without significant concerns about substantial changes in pain status within the study timeframe.

In conclusion, this study presumed that occupational factors significantly influenced the prevalence of musculoskeletal pain among textile factory workers. By building upon these assumptions, the study aimed to provide valuable insights into the prevalence of musculoskeletal pain among textile factory workers and make a meaningful contribution to the existing body of knowledge in occupational health research.

CHAPTER 4

4.0 RESULTS

4.1 Introduction

The key findings from the data collected have been presented in this chapter according to the objectives of the study. By meticulously applying statistical methodologies, the chapter highlighted prevalence percentages and delved into the measures of association between musculoskeletal pain and targeted occupational and lifestyle factors. The result was presented in text, tables, and graphs. Out of the 273 total questionnaires administered, 250 were retrieved as cleaned total count for further analysis thereby yielding a response rate of 92% of the sample size.

4.2 Socio-demographic characteristics of the respondents

Table 4.1 below shows that two hundred and fifty (250) respondents participated in this study with a mean average work duration of 20.24 ±9.28 years. For this variable, "Work Duration (yrs.)," was divided into four categories: "≤10," "11-20," "21-30," and "≥31" years. The distribution showed that a significant percentage of respondents have been working for 11-20 years (31.60%). Notably, the distribution was relatively balanced across the remaining categories ("≤10," "21-30," and "≥31"), each accounting for approximately a quarter of the respondents. The distribution for sex indicated that the majority of the population were male 246/250 (98.40%), while females constituted a much smaller proportion 4/250 (1.60%). Age was categorized into different age groups: "18 - 30," "31 - 45," "46 - 55," and "56 above." The table displayed the distribution of respondents within these categories, revealing that the highest percentage fell within the "46 - 55" age group 107/250 (42.80%). The "Education" variable was categorized into four levels: "No education," "Primary," "Secondary," and "Tertiary." The distribution indicated that the majority of

respondents had secondary education (51.20%) while primary education and tertiary education represented 33.60% and 10.00%, respectively. The "Religion" variable presented the distribution of respondents based on their religious affiliations. "Christianity" constituted the most prevalent religion (86.00%), followed by "Islamic" (8.40%) and "Traditional" (5.20%). The "Department" variable categorized respondents into different departments namely Administration, Engineering, and Production. The highest number of respondents belong to the production department (61.20%). Alcohol respondents were categorized as "Yes" or "No" based on alcohol consumption. The majority of respondents do not consume alcohol (66.00%). For smoking, similar to alcohol, respondents were categorized as "Yes" or "No" based on smoking habits. The data indicated that a small proportion of respondents were smokers (3.20%).

The variable for pain sites also presented the distribution of specific areas of the body where they experienced pain. Among the reported pain sites, the lower back had the highest prevalence, with 30.40% of participants experiencing pain in this area. Other prevalent pain sites included the upper back (11.60%), the knee (10.80%), and the neck (9.60%). Conversely, a lower percentage of participants reported pain in the shoulder (9.20%), arm (8.40%), leg (4.00%), and other unspecified areas (16.00%). Another table was generated as Table 4.1.1 which highlighted the variation in reported pain sites among different job categories within the study population. It revealed that the prevalence of pain is not uniform across the various roles in the textile factory. While technicians experienced higher overall pain prevalence, each job category displayed unique patterns in terms of pain distribution.

TABLE 4.1: Analysis of sociodemographic Characteristics of study participants.

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	246	98.40
	Female	4	1.60
Age	18 - 30	7	2.80
	31 - 45	67	26.80
	46 - 55	107	42.80
	56 above	69	27.60
Education	No education	13	5.20
	Primary	84	33.60
	Secondary	128	51.20
	Tertiary	25	10.00
Religion	Christianity	215	86.00
	Islamic	21	8.40
	Traditional	13	5.20
	Others	1	0.40
Department	Administration	53	21.20
	Engineering	44	17.60
	Production	153	61.20
Work Duration (yrs.)	≤ 10	55	22.00
	11-20	79	31.60
	21-30	72	28.80
	≥ 31	44	17.60
Alcohol	Yes	85	34.00
	No	165	66.00
Smoking	Yes	8	3.20
	No	242	96.80
Pain Site	Neck	24	9.60
	Shoulder	23	9.20
	Arm	21	8.40
	Upper Back	29	11.60
	Lower Back	76	30.40
	Knee	27	10.80
	Leg	10	4.00
	Others	40	16.00
Average work duration (yrs.)	$Mean \pm SD = (20.24 \pm 9.28)$		

Source: Field Data, 2023

Table 4.1.1 shows the frequency distribution of pain sites amongst the various job categories.

Pain Site	Administrative Staff	Senior Staff	Supportive Staff	Technician	Total
Neck	2 (8.33%)	4 (16.67%)	2 (8.33%)	16 (66.67%)	24
Shoulder	2 (8.7%)	2 (8.7%)	1 (4.35%)	18 (78.26%)	23
Arm	0 (0%)	0 (0%)	3 (14.29%)	18 (85.71%)	21
Upper Back	4 (13.79%)	2 (6.9%)	0 (0%)	23 (79.31%)	29
Lower Back	4 (5.26%)	8 (10.53%)	8 (10.53%)	56 (73.68%)	76
Knee	3 (11.11%)	0 (0%)	3 (11.11%)	21 (77.78%)	27
Leg	0 (0%)	1 (10%)	1 (10%)	8 (80%)	10
Others	2 (5.71%)	7 (37.14%)	9 (42.86%)	22 (114.29%)	40
Total	**17**	**24**	**27**	**182**	**250**

Source*:* *Field Data, 2023*

4.3 Assessment of Pain and Sociodemographic characteristics of the correspondents.

These results delved into the association between pain and various sociodemographic characteristics among the studied population, utilizing the data presented in Table 4.2 below. The examination of sex with pain indicated that while the percentage of females experiencing pain was marginally lower (0.68%) than males (2.91%), the difference was not statistically significant ($p = 0.309$).

There was an interesting trend in the association between age and pain. The percentage of individuals aged 18-30 years experiencing pain was notably lower (0.68%) compared to other age groups (ranging from 25.17% to 44.90%). While the p-value (0.057) suggests that the association was not statistically significant, it was worth noting that there seemed to be a trend of increased pain prevalence with advancing age. A significant association was observed between education

and pain (p = 0.001). Individuals with primary education had a substantially higher percentage of pain (38.78%) compared to those with secondary (51.02%) or tertiary education (4.08%). Those with no education also displayed higher pain prevalence (6.12%) compared to individuals with tertiary education emphasizing the complexity of this association.

The marital status did not appear to have a substantial association with pain. The percentages of pain among different marital status categories (ranging from 4.76% to 14.97%) did not exhibit significant variation, and the p-value (0.790) confirmed the lack of statistical significance. While there seemed to be some disparity in pain percentages across religious categories, the p-value (0.068) suggested that the association between religion and pain was not statistically significant. Islamic followers displayed a higher pain percentage (10.88%), while those adhering to traditional beliefs exhibited a lower pain percentage (3.40%).

Neither alcohol consumption nor smoking demonstrated a noteworthy association with pain. The percentages of pain among non-consumers and consumers of alcohol (64.63% and 35.37% respectively) did not show significant variance. Similarly, non-smokers and smokers displayed comparable pain percentages (98.64% and 1.36% respectively).

The analysis of work duration and pain yielded a significant association (p = 0.001). Individuals with 11-20 years of working experience exhibit the highest percentage (36.73%), while those with less than 10 years of working experience showed the lowest (13.61%).

TABLE 4.2: Association between Pain and sociodemographic characteristics

Variable	Categories	PAINS		p-value
		No	Yes	
		n (%)	n (%)	
SEX	Female	3(2.91)	1(0.68)	0.309
	Male	100 (97.09)	146(99.32)	
AGE	18-30	6(5.83)	1(0.68)	0.057
	31-45	24(23.30)	43(29.25)	
	46-55	41(39.81)	66(44.90)	
	56+	32(31.07)	37(25.17)	
EDUCATION	None	4(3.88)	9(6.12)	0.001
	Primary	27(26.21)	57(38.78)	
	Secondary	53(51.46)	75(51.02)	
	Tertiary	19(18.45)	6(4.08)	
MARITAL STATUS	Single	13(12.62)	22(14.97)	0.790
	Married	82(79.61)	109(74.15)	
	Divorced	5(4.85)	9(6.12)	
	Widowed	3(2.91)	7(4.76)	
RELIGION	Christian	89(86.41)	126(85.71)	0.068
	Islamic	5(4.85)	16(10.88)	
	Traditional	8(7.77)	5(3.40)	
	Others	1(0.97)	0(0)	
ALCOHOL	No	70(67.96)	95(64.63)	0.684
	Yes	33(32.04)	52(35.37)	
SMOKING	No	97(94.17)	145(98.64)	0.068
	Yes	6(5.83)	2(1.36)	
Work Duration (yrs.)	≤ 10	35(33.98)	20(13.61)	0.001
	11-20	25(24.27)	54(36.73)	
	21-30	23(22.33)	49(33.33)	
	≥ 31	20(19.42)	24(16.33)	

Source*:* *Field Data, 2023*

4.3.1 Assessment of Pain and Work-related risk factors.

These results as seen in Table 4.3 also looked at the association between pain and some occupational risk factors thus ergonomics, and work length amongst others using Pearson' Chi Square test. Regarding ergonomic practices, the analysis indicates that there exists a statistically significant association between certain ergonomic factors and pain occurrences. Participants who reported lifting heavy loads showed a considerable statistical difference in pain prevalence ($p = 0.001$). Similar trends were observed for individuals who engage in pushing or pulling heavy loads ($p = 0.001$). Though carrying loads on the head exhibited a relatively higher p-value ($p = 0.086$), it remains an area of interest warranting further investigation.

Ergonomic posture while working emerged as a crucial contributor to pain occurrences. Participants reporting a bent posture while working demonstrated a statistically significant increase in pain prevalence ($p = 0.000$). Additionally, individuals who reported working in the same posture for prolonged hours showed a noteworthy statistical difference in pain prevalence ($p = 0.003$). On the contrary, prolonged standing and sitting did not yield statistically significant differences in pain prevalence ($p = 0.171$ and $p = 0.426$, respectively).

Exploring job positions uncovers intriguing dynamics. The role of technicians stands out significantly with pain prevalence ($p = 0.005$), while administrative, senior, and supportive staff roles lack statistically robust connections. The analysis extended to work duration and practices. Participants indicating job duration exhibited varying patterns of pain prevalence. Substantial statistical differences were observed among the four groups categorized by job duration ($p = 0.001$). Specifically, the association between job duration and pain prevalence was more pronounced among those with job durations of $\leq$10 years ($p = 0.001$) and 11-20 years ($p = 0.001$).

Interestingly, job rotation, despite its potential implications for ergonomic variety, did not yield a statistically significant difference in pain prevalence (p = 1.000).

Furthermore, factors related to work length, job rotation, and job duration underwent statistical analysis. Notably, the availability of sufficient tools for work did not demonstrate a statistically significant impact on pain prevalence (p = 0.238). Similarly, carrying out the same activity consistently did not yield a statistically significant difference in pain prevalence (p = 0.419). The presence or absence of job rotation also did not show a significant association with pain occurrences (p = 1.000).

Table 4.3: Bivariate analysis between Pain and Work-Related Factors

Description	Variable/ Categories	PAINS		p-value
		No n(%)	Yes n(%)	
ERGONOMICS	Lift heavy loads	45(43.27)	95(65.07)	0.001
	Push or pull loads	49(47.12)	100(68.49)	0.001
	Carrying loads on head	6(5.77)	19 (13.01)	0.086
	Bent posture whilst working	27(25.96)	79(54.11)	<0.001
	Prolonged standing	65(62.50)	104(71.23)	0.171
	Prolonged sitting	42(40.38)	51(34.93)	0.426
	Work in the same posture for long hours	48(46.15)	96(65.75)	0.003
JOB POSITION	Administrative Staff	6(5.77)	11(7.53)	0.005
	Senior Staff	17(16.35)	7(4.79)	
	Supportive Staff	15(14.42)	12(8.22)	
	Technician	66(63.46)	116(79.45)	
WORK LENGTH	Enough tools for work	69(66.35)	86(58.90)	0.238
	Carrying the same activity always	65(62.50)	99(67.81)	0.419
	Job Rotation	75(72.12)	105(71.92)	1.000
JOB DURATION	≤ 10	35(33.98)	20(13.61)	0.001
	11-20	25(24.27)	54(36.73)	
	21-30	23(22.33)	49(33.33)	
	≥ 31	20(19.42)	24(16.33)	

Source*: Field Data, 2023*

4.4 Assessment of Pain and Risk Factors

A series of questionnaires, each comprising 8 items, was adopted from the Örebro Musculoskeletal Pain Questionnaire(MSQ)(Dunstan *et al.*, 2005) to assess participants' perceptions regarding pain-related issues and their influence on the occupational experiences of textile factory workers. On a scale ranging from 1 to 10, each item was assigned a score, with 1 representing the "lower end" of the question's spectrum and 10 denoting the "higher end."

Table 4.4 presents an overview of participants' responses to the adopted Örebro MSQ Likert Scale Questions concerning pain with a standardized Cronbach's alpha (α) analysis. A closer examination reveals that several items exhibited a median score falling below five (5), indicating a prevailing inclination of responses toward the lower end of the scale. However, Question 7 on the scale, which inquired about "***the likelihood of being able to work six months into the future",*** displayed a mean score of **7.86**, suggesting participants' perceived confidence in their future workability. Moreover, the dataset uncovered a discernible level of discontent with the prevailing work conditions, evident through a mean score of **3.64** on the scale.

Notable is also the application of standardized Cronbach's alpha (α) analysis that was executed on the adopted Örebro questionnaire. This endeavor resulted in a derived reliability coefficient of 0.772, signifying a level of reliability that meets the criteria of ***"acceptable."*** The spectrum of the MSQ total correlations extended from 0.242 to 0.825. Remarkably, within this range is Question 4, ***"How often have you experienced pain in the past three months?"*** exhibited the most substantial correlation with ($\alpha = 0.698$).

Table 4.4: Distribution of responses and Cronbach's Alpha Analysis of the adopted Örebro MSQ on a Likert Scale

Items	Mean	Median	SD	Skewness	Alpha	Label
Q1	5.80	6	2.816	-0.35	0.783	Is your work heavy or tedious?
Q2	4.77	5	2.791	-0.22	0.702	How would you rate the pain that you have had during the past week?
Q3	4.18	4	2.699	0.04	0.702	In the past three months, on average, how bad was your pain
Q4	4.08	4	2.768	0.17	**0.698**	**How often have you experienced pain in the past three months?**
Q5	5.91	6	2.709	-0.19	0.772	With all your efforts, how much are you able to decrease your pain?
Q6	4.10	4	2.845	0.11	0.719	What is the risk that your current pain may become persistent?
Q7	7.86	8	2.130	-0.96	0.754	What are the chances that you will be able to work in six months?
Q8	3.64	3	3.000	0.37	0.815	Considering your condition of work, how satisfied are you with your job?
Test scale					**0.772**	**Mean (standardized items)**

Source*:* *Field Data, 2023*

4.5 Assessment of Pain and other independent variables using logistic regression.

The multivariate logistic regression analysis as shown in Table 4.5 below delved into the intricate interplay between pain prevalence, serving as the dependent variable (PAINS), and a range of pertinent independent factors. The logistic regression analysis explored the relationship between selected variables and pain prevalence.

Participants with primary education were 1.27 times more likely to experience pain compared to their counterparts with no formal education adjusting for all other correlates in the model (95% CI: 0.31–5.12, p = 0.741.

Similarly, Participants aged 31-45 years had an odds ratio of 14.92 (95% CI: 1.29–171.97, p = 0.030) more likely to experience pain compared to those 18-30 years controlling for other covariates in the predictive model.

The examination of job duration as a predictor variable uncovered intriguing patterns. Participants with job durations of 11-20 years had an odds ratio of 2.13 (95% CI: 0.83–5.44, p = 0.114), indicating a moderately increased likelihood of pain occurrence, although this relationship is not statistically significant within the provided confidence interval. Job durations of 21-30 years exhibited an odds ratio of 2.38 (95% CI: 0.87–6.53, p = 0.091), suggesting a similar trend with a slightly higher likelihood of pain. Job durations of 31+ years displayed an odds ratio of 1.72 (95% CI: 0.55–5.38, p = 0.349), implying a moderate association with pain prevalence that did not reach statistical significance.

The analysis of work-related factors shed light on their impact on pain prevalence. Factors such as lifting heavy loads (OR = 1.28, 95% CI: 0.57–2.91, p = 0.551), pushing or pulling heavy loads (OR = 1.69, 95% CI: 0.74–3.88, p = 0.213), carrying a load on the head (OR = 1.56, 95% CI: 0.50–4.89, p = 0.443), and prolonged bent posture whilst working (OR = 2.08, 95% CI: 1.40–4.18, p = 0.039) displayed varying degrees of correlation with pain prevalence, but none of these associations reached statistical significance within their respective confidence intervals. Notably, having enough tools for work was associated with a lower likelihood of pain occurrence (OR = 0.52, 95% CI: 0.27–0.99, p = 0.047).

Table 4.5: Logistic Regression on Pain and other Salient Independent Variables to ascertain the prevalence of pain

VARIABLE	CATEGORY	UNADJUSTED			ADJUSTED		
		COR	95% CI	p-value	AOR	95% CI	p-value
EDUCATION	No Education	1	-	-	1	-	-
	Primary	0.94	0.27 – 3.32	0.921	1.27	0.31–5.12	0.741
	Secondary	0.61	0.18 – 2.08	0.429	0.76	0.20-2.93	0.687
	Tertiary	0.14	0.03 – 0.62	0.010	0.18	0.02-1.35	0.096
AGE	18-30	1	-	-	1	-	-
	31-45	10.75	1.22 – 94.63	0.03	14.92	1.29-171.97	0.030
	46-55	9.29	1.08 - 79.90	0.04	8.36	0.71-98.69	0.092
	56+	6.94	0.79 – 60.71	0.08	6.62	0.55-79.68	0.137
JOB DURATION	<10	1	-	-	1	-	-
	11-20	3.78	1.83 – 7.81	0.000	2.13	0.83-5.44	0.114
	21-30	3.5	1.68 - 7.31	0.001	2.38	0.87-6.53	0.091
	31+	2.1	0.94 – 4.71	0.072	1.72	0.55-5.38	0.349
Job Position	Administrative Staff	1	-	-	1	-	-
	Senior Staff	0.22	0.06-0.85	0.028	0.30	0.06-1.58	0.156
	Supportive Staff	0.44	0.12-1.53	0.194	0.33	0.07-1.44	0.140
	Technician	0.96	0.34-2.71	0.937	0.47	012-1.82	0.273
Carrying out the same job always	NO	1	-	-	1	-	-
	YES	1.26	0.75-2.14	0.384	0.83	0.44-1.59	0.582
Job rotation	NO	1	-	-	1	-	-
	YES	0.99	0.57-1.73	0.973	0.57	0.27-1.18	0.132
Lift heavy loads	NO	1	-	-	1	-	-
	YES	2.44	1.46-4.09	0.001	1.28	0.57-2.91	0.551
Push or pull heavy loads	NO	1	-	-	1	-	-
	YES	2.44	1.45-4.10	0.001	1.69	0.74-3.88	0.213
Carrying a load on the head	NO	1	-	-	1	-	-
	YES	2.44	0.94-6.35	0.067	1.56	0.50-4.89	0.443
	NO	1	-	-	1	-	-

VARIABLE	CATEGORY	UNADJUSTED			ADJUSTED		
		COR	95% CI	p-value	AOR	95% CI	p-value
Prolonged bent posture whilst working	YES	3.36	1.95-5.81	0.000	2.08	1.4-4.18	0.039
Prolonged standing	NO	1	-	-	1	-	-
	YES	1.49	0.87-2.54	0.147	0.74	0.34-1.59	0.440
Prolonged sitting	NO	1	-	-	1	-	-
	YES	0.79	0.47-1.33	0.380	1.07	0.55-2.09	0.845
Same posture for long hours	NO	1	-	-	1	-	-
	YES	2.24	1.34-3.75	0.002	2.03	1.9-3.80	0.026
Enough tools for work	NO	1	-	-	1	-	-
	YES	0.73	0.43-1.22	0.233	0.52	0.27-0.99	0.047

Source: *Field Data, 2023*

CHAPTER 5

5.0 DISCUSSION

5.1 Introduction

Musculoskeletal pain, a prevalent issue across diverse occupational domains, demands meticulous investigation to unravel its multifaceted nature and implications. The textile industry plays a crucial role in global manufacturing but is associated with various occupational hazards; and musculoskeletal pain. This discussion report focuses on the findings of the prevalence of musculoskeletal pain amongst textile factory workers. The objective was to evaluate the prevalence and risk factors of musculoskeletal pain and ascertain the association between the demographic characteristics and the level of musculoskeletal pain among textile factory workers in the Eastern Region of Ghana.

5.2 Key Findings

In general, a total of 250 responses were derived from the 273 questionnaires administered with an average of 20 years (mean average work duration 20.24 ±9.28 years). The results revealed a significant percentage of respondents had been working for 11-20 years (31.60%). Notably, the distribution was relatively balanced across the remaining categories ("≤10," "21-30," and "≥31"), each accounting for approximately a quarter of the respondents. The distribution for sex indicated that the majority of the population were males 246/250 and a few females 4/250 expressed in percentages as (98.40%) for males, while females constitute (1.60%). About 51.20% of the respondents had secondary education and the distribution was relatively balanced across the rest with those primary education at 33.60%, 10% of the respondents had tertiary education and 5.2% of the respondents had no formal education. Age was categorized into different age groups: "18 -

30," "31 - 45," "46 - 55," and "56 above." 42.80% of the respondents were between the ages of 46 and 55 years and the rest of the distribution was balanced across the remaining age groups. Additionally, the pain-specific areas were grouped into Neck, Shoulder, Arm, Upper Back, Lower Back, Leg, and Others. Among the reported pain sites, the lower back had the highest prevalence, with 30.40% of participants experiencing pain in this area. Other prevalent pain sites included the upper back (11.60%), the knee (10.80%), and the neck (9.60%). Conversely, a lower percentage of participants reported pain in the shoulder (9.20%), arm (8.40%), leg (4.00%), and other unspecified areas (16.00%). Other sociodemographic characteristics of the respondents thus their religious background, alcohol, and smoking status were captured in the results and also the departments in which they work.

The sociodemographic characteristics of the study participants reveal a complex background against which musculoskeletal pain develops. The noticeable difference in gender representation among the participants raises questions about how gender-specific tasks and pain experiences are interconnected. In a similar vein, the distribution of participants across different age groups provided insights into the changing vulnerabilities of various generations. Age has been noted to be one of the most important sociodemographic factors contributing to WMSDs. It is noted that the older the age group the higher the risk of developing WMSDs (Amissah *et al.*, 2019; Ogundiran *et al.*, 2020; Smith, Balogun and Dillman, 2022). A study by (Berberoğlu and Tokuç, 2013) also affirmed the assumption that the number of WMSD complaints increased with age; At the age of 55-64 years, the number of self-reported symptoms was 1.7 times higher than at the age of 25-34 years.

Although in this study, the older age group ("56 years and above") did not record a high prevalence pain rate but was rather a higher prevalence of pain was seen among individuals aged 46- 55

suggesting the cumulative impact of occupational strains over time. Juxtaposing with other existing literature, we ask why the prevalence of pain is noted more amongst the middle-aged group than the older group. Could it be coexisting morbidities of the older groups reduce or mask the pain receptors so they don't appreciate pain or their coexisting morbidities often take them out of work Hence the work length is reduced thus reducing the prevalence of pain. These nuances enrich our understanding of pain dynamics and an avenue for other researchers to look into that area.

Additionally, the participants' educational backgrounds, religious affiliations, and departmental distributions reflect the diverse nature of the study population. Comparing works of literature on educational backgrounds with our current study, a study by (Boschman *et al.*, 2012) revealed that the prevalence of MSDs among 267 bricklayers who have received little or had no formal education and 232 supervisors who have received a higher level of formal education was 67% and 57% suggesting that educational status influenced prevalence rate of pain. In this study, Individuals with primary education had a substantially higher percentage of pain (38.78%) compared to those with secondary (51.02%) or tertiary education (4.08%). Those with no education also displayed higher pain prevalence (6.12%) compared to individuals with tertiary education, Though complex it supports the argument that the higher the educational background, the lesser the chances of pain. Education empowers an individual thus it is believed that literates exercise caution or practice some basic safety skills to ensure their work does not pose harm to them, unlike the illiterates who may not know about safety practices and will unknowingly indulge in bad safety practices that pose harm to the work and themselves thus increasing prevalence of pain amongst them than the educated ones. By incorporating these sociodemographic intricacies, our understanding of pain

dynamics is enhanced, and we gain insights into how individual characteristics and pain occurrences are interconnected.

Concerning the prevalence of pain, about 58.4% of the respondents had pain in the last 3 months which is quite on the high side and may eventually affect productivity through presenteeism and absenteeism and also the quality of life for the individual. Across various African countries, the prevalence of any musculoskeletal disorder exhibits considerable variation, ranging from 15% to 93.6%. Notably, the industrial sector, including mining, contributes to approximately 20% of the overall prevalence (Ausloos, Brugha and Collaborators, 2018). Our prevalence rate of 58.4% supports the argument that musculoskeletal disorders are a major threat to not only individuals or organizations but the nation and the world at large.

There is so much literature that reveals that the prevalence of musculoskeletal pain in factory settings or office space is predominantly on the high side in specific body areas. Noteworthy findings of our results revealed that the prevalence of pain was higher in the lower back than the other pain sites indicated and the same can be said for several studies conducted on work-related musculoskeletal pain.

Comparing these results to other works of literature outside of the continent; (Smith, Balogun and Dillman, 2022) found that forty percent of office workers reported having had musculoskeletal pain at some point in their careers and these individuals worked long hours or had poor ergonomic setups at their workplaces resulting in they experiencing higher rates of musculoskeletal discomfort. Another study also conducted by (Valipour Noroozi *et al.*, 2015) revealed a prevalence of 51% and 36.5% of backache and neck aches among office workers of Ahvaz Jundishapur University of Medical Sciences. These are alarming rates which emphasizes the importance of

tailored interventions and ergonomic improvements in not only the textile industry but across all occupations.

5.3 Prevalence of pain and work-related factors

Musculoskeletal disorders represent a profound concern within the realms of informal sectors, and the textile industry stands as no exception to this prevailing issue. The protracted durations of work, coupled with the prolonged maintenance of static seated postures(ergonomics), underscore the vulnerability of workers in the textile sector to the emergence of debilitating MSDs.

Ergonomics plays a pivotal role in delineating the relationship between occupational tasks and the emergence of musculoskeletal pain. The data analysis highlighted a statistically significant association between specific ergonomic factors and the prevalence of pain. Activities involving lifting heavy loads and engaging in pushing or pulling heavy objects exhibit substantial links to heightened pain occurrences. Such findings emphasize the profound impact of physically demanding tasks on the well-being of workers. Moreover, the intriguing observation of carrying loads on the head as an area of interest with a p-value ($p = 0.086$), indicating a less robust statistical association, the noteworthy interest in this aspect suggests the need for further investigation. This indicates that while the association might not be statistically significant at this point, there could still be potential implications worth exploring regarding the effect of this practice on pain prevalence. Ergonomic practices can exert a considerable influence on pain vulnerability, necessitating tailored interventions to mitigate risks.

Ergonomic posture, a fundamental tenet of occupational health, emerges as a critical determinant in pain prevalence. The statistical significance of a bent posture while working serves as a poignant reminder of the repercussions of inadequate body mechanics. Prolonged hours spent in the same posture with a pain prevalence ($p = 0.003$) further magnify this risk, reinforcing the significance

of incorporating ergonomic breaks and promoting postural variation. Surprisingly, prolonged standing and sitting ($p = 0.171$ and $p = 0.426$, respectively) do not exhibit statistically significant correlations with pain prevalence. This suggests that while prolonged periods of sitting or standing may not be strong drivers of pain, the posture maintained during these periods might be equally or more influential.

A fascinating interplay emerges when examining job positions with pain prevalence. The role of technicians is notably linked to pain prevalence ($p = 0.005$), indicating that technicians experience pain at a different rate compared to other job categories. The data underlines a distinct connection between technicians and elevated pain prevalence, while administrative, senior, and supportive staff roles display less robust associations. This is similar to the study conducted to ascertain the prevalence of pain among bricklayers and their supervisors (Boschman *et al.*, 2012). The pronounced link to technicians underscores the unique challenges they encounter, hinting at the nature of their tasks and the physical demands they face. This observation necessitates tailored strategies to address the pain issues confronted by different job categories, recognizing that each role presents unique ergonomic challenges.

The analysis of job duration reveals varying patterns of pain prevalence. Substantial statistical differences are observed across different groups categorized by job duration ($p = 0.001$). Specifically, the association between job duration and pain prevalence is more pronounced for those with job durations of ≤10 years and 11-20 years ($p = 0.001$). Examining work duration unravels intricate dynamics in the context of pain prevalence. Noteworthy statistical differences are unveiled among different job duration categories. Significantly, the impact of job duration is more pronounced for individuals with job tenures of ≤10 years and 11-20 years as stated earlier. This suggests that the effect of job duration on pain prevalence evolves, possibly due to the

accumulation of strain or adaptation to work conditions. Contrary to expectations, job rotation did not yield a statistically significant difference in pain prevalence ($p = 1.000$). Despite its potential to introduce ergonomic variety, interestingly, job rotation, hyped for its potential to introduce ergonomic variety, surprisingly doesn't yield a statistically significant difference in pain prevalence.

Diving into factors related to work length, job rotation, and ergonomic resources, the data yields intriguing insights. Sufficient tools for work and consistent engagement in the same activity did not demonstrate statistically significant impacts on pain prevalence. The presence or absence of job rotation similarly lacked a significant association. While these results might seem counterintuitive, they emphasized that the influence of certain factors on pain development is more pronounced than initially perceived. Factors like the availability of sufficient tools for work, carrying out the same activity consistently, and the presence or absence of job rotation did not exhibit statistically significant impacts on pain prevalence ($p > 0.05$). These results suggest that these specific factors may not play a significant role in influencing pain occurrences within the studied population. On the contrary, a study by (Lim *et al.*, 2022) revealed a high prevalence of ULMSDs due to risky awkward postures, low job control, and insufficient working tools or apparatuses.

Future research endeavors could mitigate these limitations by employing larger and more diverse samples, incorporating mixed methods designs for triangulation, and implementing longitudinal studies to explore causal relationships and temporal trends. Additionally, a deeper exploration of cultural and psychosocial factors could provide a more comprehensive understanding of pain experiences in specific contexts.

5.4 Prevalence of pain and coping mechanisms of the respondents

Scrutinizing how pain experiences; the mean values, ranging from 3.64 to 7.86, highlighted the variation in responses across items, indicative of diverse perceptions of pain and workplace conditions. Median values that frequently align with the mean suggested a symmetrical distribution of responses, indicating a relatively balanced perspective on these pain-related attributes.

Standard deviations spanning from 2.130 to 3.000 revealed the dispersion of responses around the mean, showcasing the degree of variability among workers' perceptions. The skewness values, mainly ranging from -0.96 to 0.37, indicated slight deviations from a perfectly symmetrical distribution, reinforcing the diverse nature of responses and the subtlety understanding of pain experiences.

The Cronbach's alpha coefficient of 0.772 for the test scale denoted an acceptable internal consistency, suggesting that the items within the scale are correlated and converge to measure a similar construct. This finding supports the reliability of the scale in assessing the multifaceted dimensions of musculoskeletal pain in the workplace.

A comparison with existing literature provides a broader context for interpreting the findings of this study. The moderate to high internal consistency ($\alpha = 0.772$) of the questionnaire items suggests acceptable reliability and lends credibility to the reported pain perceptions. The observed skewness and means of the items suggest a tendency towards positive responses, which might indicate the resilience of participants in dealing with pain.

In line with the literature, the reported pain intensity and frequency resonate with studies that emphasize the prevalence of chronic pain among industrial workers (Van *et al.*, 2016; Laskar *et al.*, 2021; Bid *et al.*, 2022; Mbada *et al.*, 2022). The variation in pain perceptions could align with

the multifactorial nature of pain experiences, influenced by both occupational demands and personal factors (Das, Ghosh and Gangopadhyay, 2013; Tawiah, Oppong-Yeboah and Bello, 2015; Acquah *et al.*, 2021; Etana *et al.*, 2021). The reported ability to mitigate pain through efforts corresponds to studies that underscore the significance of coping strategies in pain management (Yarfi *et al.*, no date; Abla Kofi- Bediako *et al.*, 2021).

Contrastingly, the relatively lower perceived chances of continued employment in six months (Q7) might signal a less optimistic outlook compared to some other studies that emphasize worker resilience and job security. The modest job satisfaction scores align with findings that link pain experiences with job dissatisfaction (Yiha and Kumie, 2010; Abledu, Offei and Abledu, 2014; Tanaka *et al.*, 2022). However, the complex interplay between pain and job satisfaction warrants a more in-depth investigation, considering potential mediating and moderating factors.

The pain perceptions unveiled in this study have implications for workplace interventions and employee well-being. Proactive pain management programs could address pain mitigation strategies, coping mechanisms, and ergonomic interventions tailored to the specific needs of textile factory workers. Longitudinal studies could further elucidate the causal relationships between pain experiences, job satisfaction, and employment sustainability over time.

5.5 Summary

In summary, the study embarked on an explorative journey to unravel the multifaceted dynamics of musculoskeletal pain experiences among textile factory workers. Through a holistic lens, the research scrutinized sociodemographic characteristics, ergonomic practices, job positions, work duration, and their intricate interplay in shaping pain prevalence. The incorporation of empirical insights and scholarly perspectives provided a subtle understanding of this complex study.

The analysis of sociodemographic characteristics revealed diverse distributions across categories such as gender, age, education, religion, and departments. Examining the associations between ergonomic practices and pain prevalence yielded noteworthy results. Specifically, statistical significance was observed in tasks involving heavy load lifting ($p = 0.001$), pushing or pulling heavy loads ($p = 0.001$), and adopting a bent posture during work ($p = 0.000$), all of which exhibited a substantial correlation with heightened pain prevalence. While the act of carrying loads on the head did not yield statistically significant results ($p = 0.086$), this aspect warrants consideration for potential future investigation.

In terms of job positions, a diverse panorama emerged. Technicians displayed a notable correlation with elevated pain prevalence ($p = 0.005$). Contrasting this, roles encompassing administrative, senior, and supportive staff exhibited statistically non-robust correlations with pain experiences. Exploring the impact of work duration, the vulnerability of early career stages to pain became evident, particularly among individuals with job durations of ≤10 years ($p = 0.001$) and 11-20 years ($p = 0.001$).

Evaluating the influence of ergonomic factors, the statistical significance of addressing bent postures ($p = 0.000$) and work monotony ($p = 0.003$) in pain prevention was underscored. This analysis emphasizes the importance of ergonomic interventions in mitigating pain occurrences within the observed context.

CHAPTER 6

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions:

In the realm of musculoskeletal pain, where the intersections of sociodemographic attributes, ergonomic practices, job positions, and work duration yield a complex symphony, this chapter serves as the crescendo of our exploration. This chapter encapsulates the harmonious incorporation of research findings and the specifics of the situation that define musculoskeletal pain experiences.

The overall journey through this research has illuminated the intricate interplay of factors that shape musculoskeletal pain experiences. Sociodemographic characteristics, acting as a background to pain narratives, unveil a diverse tapestry of gender, age, education, religion, and departmental distributions. These aspects provide insight into the various vulnerabilities that people bring to their workplaces. Ergonomic practices have become a mainstay of discussions about pain. Combined with heavy lifting positions, ergonomics, and culturally nuanced practices such as carrying heavy objects above the head, all create a web of pain. Job positions, with their diverse demands, create a work of disparities in pain prevalence, revealing the subtlety challenges faced by different roles. Work duration weaves a temporal narrative, tracing the trajectory of pain prevalence throughout a career. The exploration of ergonomic factors further unveils the complex web that defines pain experiences.

6.2 Recommendations

A complex method of treating musculoskeletal pain is necessary given the convergence of empirical knowledge and scientific discourse. The following recommendations emerge as a clarion call for crafting holistic solutions that honor the multifaceted nature of musculoskeletal pain:

Studies with a more diverse and representative sample across multiple textile factories could enhance the external validity of findings. Employing mixed methods approaches could mitigate self-report bias. Longitudinal designs would allow for the examination of causal relationships over time. Incorporating validated measures and exploring psychosocial factors could provide a more holistic understanding of musculoskeletal pain experiences.

6.2.1 Tailored Interventions for Diverse Job Positions

Acknowledging the disparities in pain prevalence across various job positions, Management of ATL should tailor interventions to address the unique challenges that each role presents. For technicians, ergonomic enhancements and workload management can mitigate their heightened pain vulnerability. Administrative, senior, and supportive staff roles, while displaying subdued associations with pain prevalence, necessitate interventions that promote ergonomic mindfulness and proactive pain prevention.

6.2.2 Culturally Informed Ergonomic Practices

The exploration of carrying loads on the head as a potential area of interest underscores the significance of culturally informed ergonomic interventions. Collaborative efforts between the management of the factory, ergonomic experts, and cultural anthropologists could decipher the ergonomic implications of such practices, leading to interventions that respect tradition while minimizing pain risks.

6.2.3 Early Career Interventions by Management

The heightened pain vulnerability observed among individuals with job durations of ≤10 years and 11-20 years flags the need for early career interventions by the management of AICL.

Implementing ergonomic education, proper body mechanics training, and wellness programs during these pivotal stages can mitigate pain risks and foster a foundation of well-being.

6.2.4 Comprehensive Ergonomic Strategies by Management

The non-significant association between job rotation and pain prevalence underscores the need for comprehensive ergonomic strategies by the Management of the factory. While job rotation might not bear immediate statistical significance, its potential long-term benefits necessitate further investigation thus integrating job rotation within a broader ergonomic framework could yield benefits that manifest over time.

6.3 Future Directions: Navigating Complexity

This study's comprehensive exploration opens avenues for future research that navigates the nuanced landscape of musculoskeletal pain. Longitudinal studies that trace pain trajectories over extended career spans could unveil temporal patterns and cumulative impacts. Cultural ergonomic studies could delve into the ergonomic implications of traditional practices, shedding light on potential avenues for pain prevention. Additionally, the role of psychosocial factors and their interaction with sociodemographic attributes and work-related demands remain areas warranting in-depth exploration.

In conclusion, the study recommends the Ministry of Health in collaboration with the Ghana Labor Law and Management of Textile Factory to outline and develop an occupational injury prevention strategies and policies in order to reduce the rate of WRMDs among factory workers and there should also be the development of an early protocol for the treatment and prevention of WRMDs among the workers in order to reduce the career prevalence of WRMDs and to promote efficiency and productivity recognizing that a healthy work force is a happy and productive workforce.

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APPENDIX 1

CONSENT FORM
PREVALENCE OF MUSCULOSKELETAL PAIN AMONG TEXTILE FACTORY WORKERS, A CASE STUDY IN AKOSOMBO TEXTILES LIMITED

SURVEY #.....

Hello,

My name is Ehoenam A. Mawuenyefia, a student at Ensign Global College. I am researching the prevalence of musculoskeletal pain in your factory to be able to develop policies that will help curb the prevalence of musculoskeletal pain. I would appreciate it if you could spare some time to fill out this questionnaire, it will include questions about your demographic information, medical history, and any musculoskeletal pain you may have experienced in the past 3 months. The questionnaire will be anonymous and all responses will be kept confidential.

RISKS AND BENEFITS: No known risks are associated with participating in this study. However, you may experience discomfort or inconvenience when completing the questionnaire. There are no direct benefits to participating in this study, but the information gathered from this study may help develop prevention strategies for musculoskeletal pain.

CONFIDENTIALITY: All information collected in this study will be kept confidential and will only be accessible to the research team. Your responses will be anonymous. Data from this study may be used in scientific publications or presentations, but no one participant will be identified.

WITHDRAWAL: Your participation in this study is entirely voluntary. If you choose to participate, you may withdraw at any time without penalty or consequence.

If you have any questions or concerns about this study, you may contact Ehoenam Amma at 0241382733. **CONSENT:** By signing, completing, and submitting the questionnaire, you are indicating that you have read and understood the information provided in this consent form and that you agree to participate in this study.

Thank you for your participation in this study.

……... ……/……/ 2023

Signature of Participant/ Thumbprint Date

APPENDIX 2

QUESTIONNAIRE

SURVEY #..... **DATE …….**

The prevalence of musculoskeletal pain factory is a major health concern among workers in various work environments and the textile industry is no exception. The nature of the job and the repetitive ways of tasks can lead to discomfort and pain in the muscles, joints, and bones. This pain can range from mild discomfort to chronic and disabling conditions that can significantly impact your quality of life and productivity. By gathering data on the extent of the problem, this study aims to identify risk factors and inform strategies for prevention, and management of musculoskeletal pain in the factory and as well help draft occupational health policies.

Tick the correct answer and fill in the blank spaces where applicable.

Demographic Information:

1. Sex [ ] Female [ ] Male

2. What is your age? [ ] 18 – 30 [ ] 30 – 45 [ ] 45 – 55 [ ] 55+

3. Educational background: [ ] no education [ ] Primary [ ] Secondary [ ] Tertiary

4. Marital Status: [ ] Single [ ] Married [ ] Divorced [ ] Widowed

5. Religion: [ ] Christianity [ ] Islamic [ ] Traditional [ ] Others

6. Do you consume alcohol? [ ] Yes [ ] No

7. Do you smoke? [ ] Yes [ ] No

8. Position at work ……...

9. How long have you been doing your present type of work? …… years ….. months

These questions are for people experiencing aches or pains in their back, shoulder, arms, or neck, etc. It is important to read and answer the questions carefully, without spending too much time

on each one. All questions should be answered as there is a response tailored to the individual situation. Tick (√) one.

10. Have you ever had body pains lasting more than 12 weeks? [ ] Yes [ ] No

11. Where do you have pain? Place a tick (√) for all appropriate sites.

Neck [ ] Shoulder [ ] Arm [ ] Upper Back [ ] Lower Back [ ] Knee [ ] Leg [ ]

Other (state)……

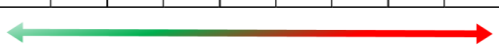
12. How many days of work have you missed because of pain during the past 3 months?

0 days [ ] 1-2 days [ ] 1 week [ ] 2 weeks [ ] 1 month [ ] 3-6 months [ ] over 1 year [ ]

13. How long have you had your current pain problem?

0-1 week [ ] 2-4 weeks [ ] 5-8 weeks [ ] 9-12 weeks [ ] More than 12 weeks [ ]

For the Questions in the Table below circle the response that applies on the scale of 0-10.

14. Is your work heavy or tedious?	0	1	2	3	4	5	6	7	8	9	10
	Not at all										**Extremely**
15. How would you rate the pain that you have had during the past week?	0	1	2	3	4	5	6	7	8	9	10
	No pain										**Unbearable pain**
16. In the past three months, on average, how bad was your pain	0	1	2	3	4	5	6	7	8	9	10
	No pain										**Unbearable pain**
17. How often would you say that you have experience pain episodes, on average, during the past three months?	0	1	2	3	4	5	6	7	8	9	10
	Never										**Always**
18. Based on all things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it?	0	1	2	3	4	5	6	7	8	9	10
	Can't decrease it at all										**Can decrease it completely**
19. In your view, how large is the risk that your current pain may become persistent?	0	1	2	3	4	5	6	7	8	9	10
	No risk										**Very large risk**
20. In your estimation, what are the chances that you will be able to work in six months?	0	1	2	3	4	5	6	7	8	9	10
	No chance										**Very large chance**
21. If you take into consideration your work routines, management, salary, promotion possibilities and work mates, how satisfied are you with your job?	0	1	2	3	4	5	6	7	8	9	10
	Not satisfied at all										**Completely satisfied**

WORK PLACEMENT AND WORKLOAD QUESTIONS

22. Do you carry out the same work almost the whole day? A) Yes B) No

*If NO, does your work vary from day to day? A) Yes B) No

23. Does the work rotate between you and your colleagues? A) Yes B) No

ERGONOMICS

24. Do you in your work often have to;

— lift heavy loads? A) Yes B) No

— push or pull heavy loads? A) Yes B) No

— carry heavy loads on your head? A) Yes B) No

25. Do you in your work often have to lift

— in an uncomfortable position? A) Yes B) No

— with the load far away from your body? A) Yes B) No

— with twisted trunk (region of chest, abdomen and back)? A) Yes B) No

— with the load above shoulder level? A) Yes B) No

— with one hand? A) Yes B) No

— with a load that is difficult to grasp or hold? A) Yes B) No

26. Do you in your work often have to:

— lift very heavy loads (more than 20 kg)? A) Yes B) No

— push or pull very heavy loads (more than 20 kg)? A) Yes B) No

— carry very heavy loads on your head (more than 20 kg)? A) Yes B) No

27. Do you in your work often have to:

— bend with your trunk (region of chest, abdomen, and back)? A) Yes B) No

— twist with your trunk (region of chest, abdomen, and back)? A) Yes B) No

— bend and twist simultaneously with your trunk (region of chest, abdomen, and back)? A) Yes B) No

28. Do you in your work often have to work

— in a bent posture for long periods? A) Yes B) No

— in a twisted posture for long periods? A) Yes B) No

— in a bent and twisted posture for long periods? A) Yes B) No

29. Do you in your work often have to

— bend your wrist or hold your wrist bent for long periods? A) Yes B) No

— twist your wrist or hold your wrist twisted for long periods? A) Yes B) No

30. Do you in your work often have to make:

— the same movements with your arms, hands of fingers many times per minute? A) Yes B) No

— the same movements (bending, twisting) with your trunk many times per minute? A) Yes B) No

— the same movements (bending, twisting) with your head many times per minute? A) Yes B) No

31. Do you in your work often have to:

— stand for long periods? A) Yes B) No

— sit for long periods? A) Yes B) No

— walk for long periods? A) Yes B) No

— work kneeled or squatted for long periods? A) Yes B) No

— work in the same posture for long periods? A) Yes B) No

32. Do you in your work often have to.

— sit on your knees or move on your knees? A) Yes B) No

— operate pedals with your feet? A) Yes B) No

— climb stairs? A) Yes B) No

— walk on irregular surfaces? A) Yes B) No

— lay on your back? A) Yes B) No

33. Do you in your work often have:

— difficulties exerting enough force because of uncomfortable postures? A) Yes B) No

— nothing to lean on? A) Yes B) No

34. Do you in your work often have to

— make sudden, unexpected movements? A) Yes B) No

— perform short, but maximal force exertions? A) Yes B) No

— exert great force with your arms or hands? A) Yes B) No

— hold things in a pinch grip with your hands? A) Yes B) No

— exert great force on tools or machinery? A) Yes B) No

35. Do you sometimes slip or fall during your work? A) Yes B) No

WORK LENGTH

36. How many minutes per day do you work

—with your hands? ……. . Hours ……... minutes per day

—above shoulder level? …….. Hours ……... minutes per day

—under knee leve1? ……Hours ……... minutes per day

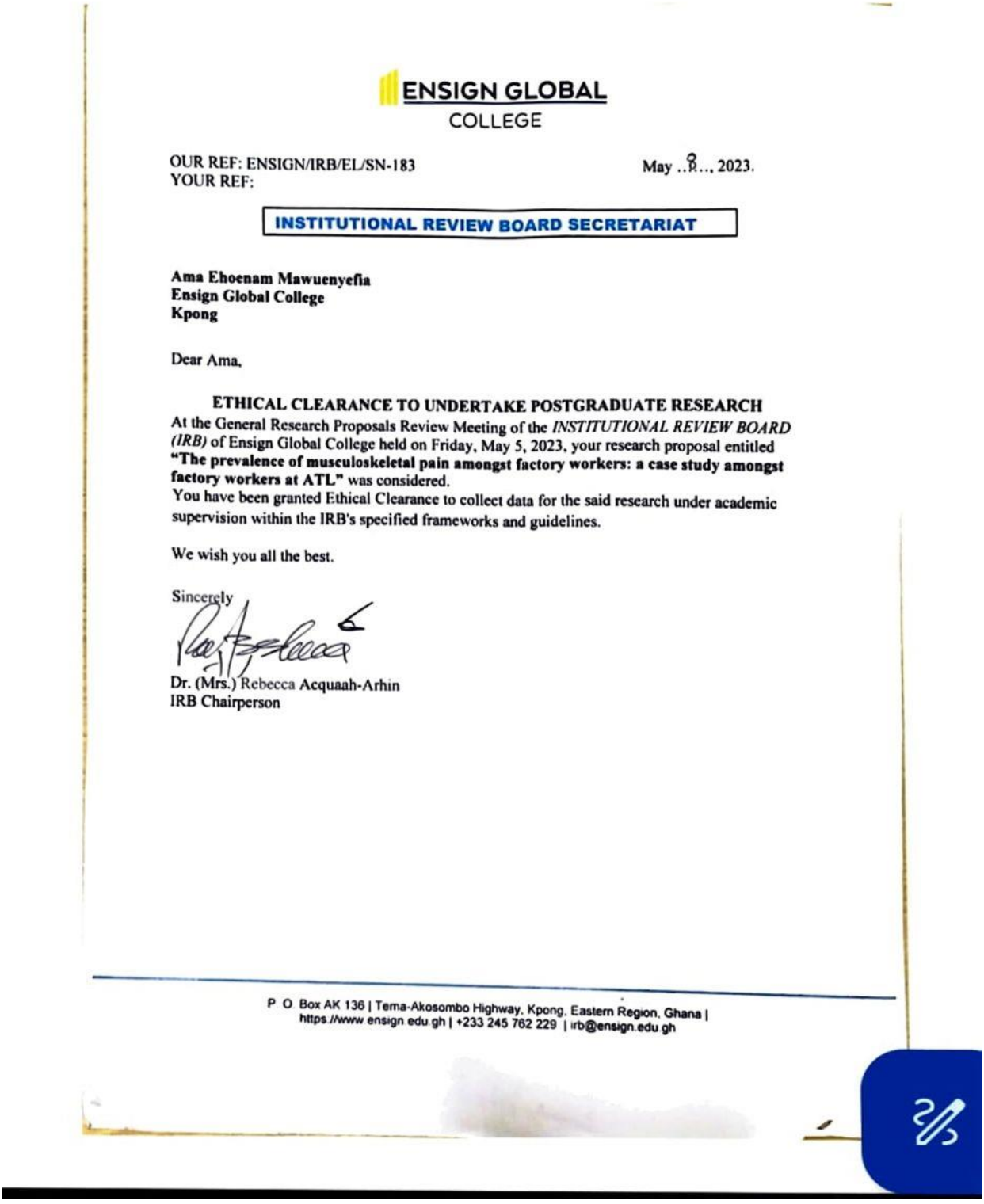
(if not applicable, insert a (0')

37. Are there in general enough tools available at your work? A) Yes B) No

Thanks for your participation on the study

APPENDIX 3

ETHICAL CLEARANCE



ENSIGN GLOBAL
COLLEGE

OUR REF: ENSIGN/IRB/EL/SN-183
YOUR REF:

May ..8.., 2023.

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Ama Ehoenam Mawuenyefia
Ensign Global College
Kpong

Dear Ama,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global College held on Friday, May 5, 2023, your research proposal entitled **"The prevalence of musculoskeletal pain amongst factory workers: a case study amongst factory workers at ATL"** was considered.
You have been granted Ethical Clearance to collect data for the said research under academic supervision within the IRB's specified frameworks and guidelines.

We wish you all the best.

Sincerely

Dr. (Mrs.) Rebecca Acquaah-Arhin
IRB Chairperson

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DATE: 27th April, 2023

TO WHOM IT MAY CONCERN

LETTER OF INTRODUCTION

MS. EHOENAM AMA MAWUENYEFIA

The bearer of this letter, Ehoenam Ama Mawuenyefia (Ms), a student of Ensign Global College seeks to embark on her thesis project in our factory. Her project topic, Prevalence of Musculoskeletal Pain Among Textile Factory Workers, A case study in ATL, in Eastern Region of Ghana, Is of interest to management.

Management has therefore given her the permission to collect data from the company to enable her achieve the set objectives with the implementation of her project.

Counting on your co-operation.

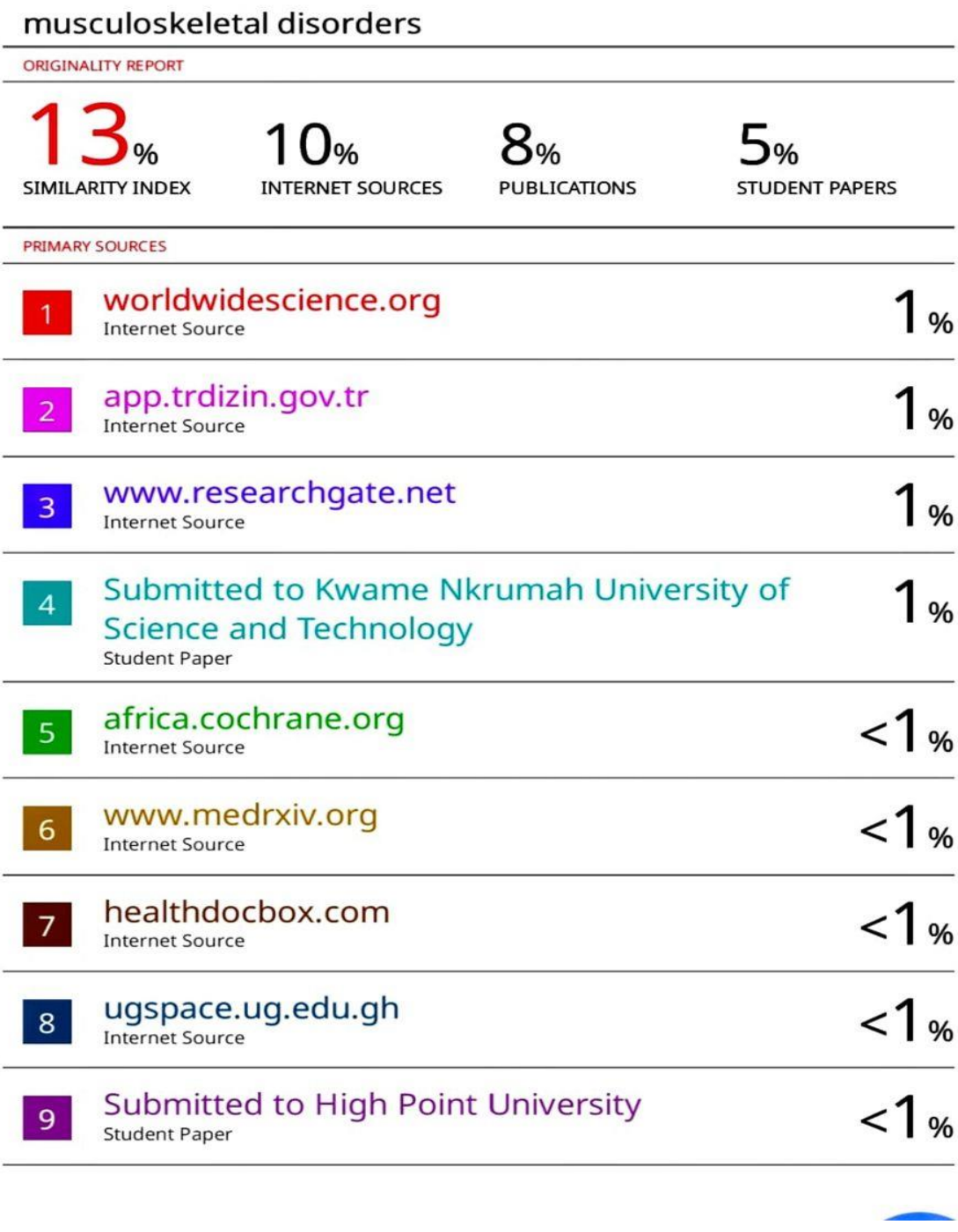
Thank you.

AKOSOMBO INDUSTRIAL CO. LTD. A.I.C.L. AKOSOMBO

NICHOLAS FERGUSON
HR MANAGER

APPENDIX 4

PLAGIARISM REPORT



musculoskeletal disorders

ORIGINALITY REPORT

13%	10%	8%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	worldwidescience.org Internet Source	1%
2	app.trdizin.gov.tr Internet Source	1%
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4	Submitted to Kwame Nkrumah University of Science and Technology Student Paper	1%
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