# COMPARATIVE PREVALENCE, PATTERN AND DETERMINANTS OF MUSCULOSKELETAL DISORDERS AMONG MEDICAL, NURSING, AND PHYSIOTHERAPY STUDENTS IN THE UNIVERSITY OF BENIN.

**BY**

**TITLE PAGE**

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**(BMS2009009)**

**A PROJECT SUBMITTED TO THE DEPARTMENT OF PHYSIOTHERAPY, SCHOOL OF BASIC MEDICAL SCIENCES, COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF BENIN IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF PHYSIOTHERAPY (B.PT) DEGREE**

**OCTOBER, 2025**

# CERTIFICATION

This dissertation by **UGOCHUKWU CLINTON CHUKWUEMEKA** is accepted in its present form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences, University of Benin.

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## DEDICATION

I dedicate this dissertation to almighty God, for his infinite grace and mercy.

# ABSTRACT

**Background:** Musculoskeletal disorders (MSDs) are common among healthcare students due to long study hours, poor posture, and physical demands during clinical training. These disorders can cause pain, limit functional performance, and affect academic productivity. This study examined the comparative prevalence, pattern, and determinants of musculoskeletal disorders among Medical, Nursing, and Physiotherapy students at the University of Benin.

**Methods:** A cross-sectional descriptive study was conducted among 301 students selected using stratified random sampling. Data were collected using a structured self-administered questionnaire adapted from the Standardized Nordic Musculoskeletal Questionnaire. Descriptive statistics were used to summarize the data, while chi-square tests determined associations between musculoskeletal symptoms and factors such as department, study hours, and clinical workload. The level of statistical significance was set at $p < 0.05$.

Results: The majority of respondents were females aged 21–25 years. The 12-month prevalence of musculoskeletal disorders was highest in the lower back (71.4%), upper back (63.8%), and neck (62.8%). Neck and upper-back pain significantly differed among departments ($p = 0.02$ and $p = 0.01$ respectively), with higher rates among nursing and physiotherapy students. Clinical workload showed significant association with wrist/hand ($p = 0.01$) and hip/thigh ($p < 0.001$) pain, while study hours were not significantly associated ($p > 0.05$).

**Conclusion:** Musculoskeletal disorders were highly prevalent among healthcare students at the University of Benin. The major determinants were ergonomic strain and workload intensity rather than demographic factors. Ergonomic education, regular breaks, and workload regulation are recommended to prevent musculoskeletal strain during training.

**Keywords:** Musculoskeletal disorders, Prevalence, Ergonomics, Clinical workload, Determinants.

# ACKNOWLEDGEMENT

I sincerely appreciate the Almighty God for His guidance, strength, and wisdom throughout the course of this project. My deepest gratitude goes to my supervisor, Dr. Ekechukwu Nelson, for his invaluable guidance and encouragement which made this work possible. I also wish to thank all my lecturers, Dr Hamed Adebisi, Dr (Mrs) Obaseki Chigozie, Dr (Mrs) Kubeyinje, Mr Okhuahesuyi Eguagie, Dr Nicholas Oghumu, Dr Bolarinde, the entire staff of the Department of Physiotherapy, University of Benin, and the entire staff of University of Benin Teaching Hospital (UBTH) for their support and knowledge imparted throughout my study. Special thanks to my colleagues and friends for their cooperation, motivation, and assistance during data collection and analysis. Finally, I express heartfelt appreciation to my dad Mr. Thaddeus Ugochukwu, my mummy, Mrs. Joy Dunny, my brothers , Washington (Pureviber) & Kessington, my sisters, Sandra & Esther, Uncle Uche for their unwavering love, prayers, financial support and understanding throughout this academic journey.

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Musculoskeletal disorders (MSDs) represent a major public health challenge globally, contributing significantly to disability, reduced productivity, and reduced quality of life. MSDs are conditions affecting the muscles, tendons, ligaments, nerves, joints, and bones, MSDs manifest as pain, stiffness, or functional limitations (World Health Organization, 2021). Common examples include lower back pain, neck strain, shoulder impingement and tendonitis. MSDs are becoming increasingly common due to ergonomic risk factors such as prolonged sitting, poor postures, and physically demanding clinical tasks (Alshagga et al., 2013; Smith et al., 2022). In high-risk occupational groups, such as healthcare professionals, the prevalence of MSDs is notably high due to the physically demanding nature of their work, including patient handling, prolonged standing, and repetitive tasks (Jacquier-Bret & Gorce, 2023).

While much attention has been given to MSDs among practicing healthcare professionals, emerging evidence highlights that students in healthcare-related disciplines, such as medicine, nursing, and physiotherapy, are also vulnerable to these conditions during their training (Alghadir et al., 2020). The academic and clinical training environment for these students often involves prolonged sitting during lectures, repetitive manual tasks in laboratories or clinical settings, and physically demanding activities such as patient lifting or therapeutic techniques (Jones & Lee, 2018). These activities predispose students to MSDs, yet the issue remains understudied, particularly in low- and middle-income countries like Nigeria, where healthcare education systems face

unique challenges, including limited resources, high student-to-faculty ratios, and inadequate ergonomic infrastructure.

The University of Benin, a prominent institution in Nigeria, is a key training hub for medical, nursing, and physiotherapy students, producing a significant portion of the country's healthcare workforce. Students in these programs undergo rigorous academic and clinical training, which exposes them to distinct risk factors for MSDs. For instance, medical students often spend extended periods in static postures while studying or using microscopes in laboratories, which can lead to neck and back strain. Nursing students frequently engage in patient handling tasks, such as lifting, transferring, or repositioning patients during clinical rotations, which increases the risk of lower back and shoulder injuries. Physiotherapy students, on the other hand, perform repetitive manual techniques, such as joint mobilizations and soft tissue manipulations, which may contribute to upper limb and wrist disorders (Abdulmonem et al., 2020). These discipline-specific activities, combined with long hours of academic work, poor ergonomic awareness, and limited institutional support for preventive measures, create a unique risk profile for MSDs among these student groups.

Despite the growing recognition of MSDs as a public health concern, there is a significant gap in research focusing on healthcare students in training, particularly in the Nigerian context. Most studies on MSDs in Nigeria have centered on practicing healthcare workers, with limited attention to students who are in the formative stages of their careers. Moreover, there is a lack of comparative studies examining how the prevalence, patterns, and determinants

of MSDs differ across disciplines such as medicine, nursing, and physiotherapy. These disciplines, while related, involve distinct curriculum, clinical exposures, and physical demands, which likely influence the type, frequency, and severity of MSDs experienced by students. For example, the repetitive hand movements required in physiotherapy may lead to a higher incidence of wrist and hand disorders (Adepoju et al., 2023) compared to the prolonged sitting postures more common among medical students. Similarly, nursing students' frequent patient handling may result in a higher prevalence of lower back pain compared to their counterparts in other disciplines ( Ogunbode, A. M., et al.2020).

The consequences of MSDs among healthcare students are far-reaching. Beyond immediate physical discomfort, MSDs can impair academic performance, increase absenteeism, and reduce clinical competence, all of which may affect students' ability to complete their training successfully. Chronic MSDs developed during training may also predispose students to long-term health issues, potentially impacting their future careers as healthcare professionals. Furthermore, the psychological toll of MSDs, including stress and reduced self-efficacy, can exacerbate the mental health challenges already prevalent among healthcare students due to academic and clinical pressures.

Early identification of risk factors and the implementation of preventive strategies are critical to mitigating the burden of MSDs among healthcare students. However, effective interventions require a nuanced understanding of the discipline-specific determinants of MSDs, such as ergonomic practices, physical activity levels, stress, and institutional support. For instance, while

ergonomic training may benefit all students, physiotherapy students may require targeted interventions focused on hand and wrist protection, while nursing students may need training on safe patient handling techniques. Similarly, institutional factors, such as the availability of ergonomic equipment or structured breaks during clinical rotations, may play a significant role in reducing MSD risk but are often overlooked in resource-constrained settings like Nigeria.

Understanding the prevalence and specific patterns of MSDs in these student groups is crucial for designing targeted interventions to reduce the burden of these disorders. Additionally, identifying the determinants such as ergonomic factors, physical activity levels, and psychosocial stressors can help in formulating preventive strategies tailored to each group's unique needs (Crawford et al., 2020). Therefore, this study compared the prevalence, pattern, and determinants of musculoskeletal disorders among medical, nursing, and physiotherapy students at the University of Benin, thereby contributing valuable insights for occupational health interventions in academic healthcare settings.

## 1.2 Statement of the Problem

Despite the physically and academically intensive nature of their training, students in medical, nursing, and physiotherapy programs at the University of Benin receive limited institutional guidance on ergonomic practices or MSD prevention. Existing studies in Nigeria (Ogunbode et al., 2021; Balogun et al., 2019) have predominantly focused on MSDs among practicing healthcare

workers, overlooking the unique risks faced by students during their training. This gap is concerning, as the habits and physical strain acquired during academic years may predispose students to chronic MSDs later in their careers.

Preliminary evidence from other regions suggests significant variations in MSD prevalence and risk factors across healthcare disciplines (Adegoke et al., 2008). For example, nursing students often report higher rates of lower back pain due to patient handling (Tinubu et al., 2010), while medical students may experience neck and shoulder pain from prolonged studying. Physiotherapy students, despite their theoretical knowledge of biomechanics, are not immune to MSDs due to the repetitive nature of manual therapy practice. However, no study in Nigeria has systematically compared the prevalence, anatomical patterns, and determinants of MSDs among these three critical student groups. Without such data, policymakers and educators cannot design targeted interventions to address discipline-specific risks.

Furthermore, the interplay of psychosocial, environmental, and behavioral factors such as stress, study hours, physical activity levels, and access to ergonomic tools remains poorly understood in the Nigerian context. It is essential to assess the burden of MSDs while also exploring students' lived experiences, coping strategies, and perceived barriers to prevention.

### 1.2.1 Research Questions

This study, therefore, addressed these gaps by answering the following questions:

1. What is the comparative prevalence and anatomical distribution of MSDs among medical, nursing, and physiotherapy students at the University of Benin?

2. What are the common risk factors (e.g., academic workload, clinical practice, ergonomic practices) associated with MSDs in each group?

3. How do students perceive the impact of MSDs on their academic performance and overall well-being?

## 1.3 Aim of the Study

This study aimed to compare the prevalence, pattern, and determinants of musculoskeletal disorders among medical, nursing, and physiotherapy students at the University of Benin, with the goal of identifying discipline-specific risk factors and informing preventive strategies within the Nigerian academic context.

### 1.3.1 Specific Objectives

I. To determine the prevalence of musculoskeletal disorders (MSDs) among medical, nursing, and physiotherapy students at the University of Benin.

II. To identify the anatomical distribution of musculoskeletal disorders reported among students in each discipline.

III. To compare the patterns of musculoskeletal disorders (e.g., type, location, duration) among medical, nursing, and physiotherapy students.

IV. To examine the relationship between ergonomic factors (such as posture, study habits, and clinical workload) and the occurrence of MSDs among the students.

V. To explore students' perceptions of how musculoskeletal disorders affect their academic performance and overall well-being.

VI. To recommend ergonomic interventions tailored to each discipline for the prevention and management of MSDs.

## 1.4 Hypotheses

### 1.4.1 Main Hypothesis

There would be no significant difference in the prevalence of musculoskeletal disorders (MSDs) among medical, nursing, and physiotherapy students at the University of Benin.

### 1.4.2 Sub-Hypotheses

I. The anatomical distribution of musculoskeletal disorders does not differ significantly across medical, nursing, and physiotherapy students at the University of Benin.

II. Ergonomic factors (e.g., posture, study hours, clinical workload) are not significantly associated with musculoskeletal disorders occurrence during healthcare trainings at the University of Benin.

## 1.5 Significance of Study

This study investigated the comparative prevalence, pattern, and determinants of musculoskeletal disorders (MSDs) among medical, nursing, and physiotherapy students at the University of Benin.

To the participants, the study provided a clearer understanding of the risk factors and patterns of MSDs within their respective disciplines. This awareness can empower them to adopt early preventive strategies, improve ergonomics during clinical and academic tasks, and seek timely interventions.

To the profession, especially within medical, nursing, and physiotherapy education, this research highlights discipline-specific vulnerabilities. The findings can guide curriculum developers and clinical supervisors in integrating ergonomics education, workload adjustments, and preventive physiotherapy programs tailored to students' needs.

To the general populace, particularly within the health sector, the study underscores the importance of early intervention in musculoskeletal health. As today's students become tomorrow's healthcare providers, promoting their musculoskeletal well-being ensures a more resilient, efficient, and health-conscious workforce.

## 1.6 Delimitation of study

This study was delimited to investigating the prevalence, patterns, and determinants of musculoskeletal disorders (MSDs) among medical, nursing, and physiotherapy students at the University of Benin, Nigeria.

## 1.7 Limitations of the Study

i. The data were obtained through self-administered questionnaires, which relied on the participants' honesty and recall accuracy. This may have introduced recall bias or underreporting of musculoskeletal symptoms.

ii. The cross-sectional design limited the ability to establish causal relationships between identified risk factors and musculoskeletal disorders.

iii. The exclusion of students who were absent or unwilling to participate could have led to some degree of selection bias.

## 1.8 Definition of Terms

i. **Anatomical Distribution:** Refers to the specific body regions (e.g., lower back, neck, wrist, shoulder) where MSDs are reported among individuals.

ii. **Determinants:** Broader influences that contribute to the development of MSDs, and including personal (age, gender), behavioral (exercise habits), academic (study hours), and environmental (ergonomic setup, access to equipment) factors.

iii. **Ergonomics:** The science of designing the job, equipment, and workplace to fit the worker. In this context, it includes the study environment and clinical setup used by students and how these influence their musculoskeletal health.

iv. **Perceived Barriers:** Obstacles that students believe hinder them from preventing or managing MSDs effectively, such as lack of ergonomic furniture, financial constraints, or academic pressure.

v. **Point Prevalence:** The proportion of individuals who have a condition (MSDs) at a specific single point in time.

vi. **Prevalence:** The proportion of individuals in a population who have a particular condition (in this case, MSDs) at a specific point in time (point prevalence) or over a specific period (e.g., six-month prevalence).

## 1.9 List of Abbreviations

I. **MSDs**: Musculoskeletal Disorders

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Musculoskeletal Disorders (MSDs).

Musculoskeletal disorders (MSDs) are conditions that affect the musculoskeletal system, including the muscles, tendons, ligaments, nerves, and other soft tissues (Bernard, 1997). MSDs can be caused by various factors such as repetitive motions, awkward postures, forceful exertions, and prolonged exposure to vibration (Bernard, 1997). According to the World Health Organization (2019), musculoskeletal symptoms refer to health issues that affect the locomotor apparatus, including the muscles, tendons, skeleton, cartilage, and ligaments. These symptoms encompass both acute, short-term conditions and chronic conditions characterized by persistent pain and disability.

These disorders often affect workers who engage in repetitive tasks, work in awkward postures, or engage in heavy lifting (Da costa and Vieira, 2010). Both the International Labour Organization (ILO) and the World Health Organization (WHO) recognize MSDs as a work-related disease, and consider them a "new epidemic" that requires research and intervention to address (Luan *et al.*, 2018).

### 2.1.1 Prevalence of Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are among the most common causes of disability and reduced quality of life globally. They encompass a wide range of conditions affecting muscles, bones, joints, tendons, and ligaments, including low back pain, neck pain, osteoarthritis, and rheumatoid arthritis.

According to the Global Burden of Disease (GBD) Study 2019, MSDs affected approximately 1.71 billion people globally, making them the leading contributor to disability worldwide. Among these, low back pain remains the most prevalent MSD and the top cause of years lived with disability (YLDs) in both developed and developing countries (Vos et al., 2020). A systematic review by Woolf and Pfleger (2003) also highlighted that the prevalence of MSDs increases with age, and with the global aging population, the burden is expected to rise significantly. In occupational settings, MSDs are also the leading cause of work-related disabilities. A study by Punnett and Wegman (2004) found that work-related MSDs account for up to 40% of all lost-time work injuries in industrialized nations. In low- and middle-income countries (LMICs), the burden is compounded by limited access to rehabilitation services, inadequate preventive measures, and underreporting (Briggs et al., 2018).

### 2.1.2 Symptoms of Work-related Musculoskeletal Disorders

According to Briggs et al. (2018), there are a variety of musculoskeletal symptoms that can present in work-related musculoskeletal disorders (WRMSDs). These could consist of:

i. **Pain:** Either persistent or intermittent discomfort in the affected regions, such as the back, shoulders, hands, knees, wrists, or elbows. The most typical sign of WRMSDs is pain, which can be characterized as shooting, stabbing, burning, or aching. Movement or activity might exacerbate the pain, which can be either intermittent or continuous.

ii. **Stiffness:** Stiffness is caused by reduced joint or muscle pliability and flexibility. It may be painful and difficult to move in the affected area

due to stiffness. Reduced range of motion and trouble completing tasks requiring fine motor skills might result from this.

iii. **Weakness:** Reduced strength or trouble doing daily tasks.

iv. **Tingling or Numbness:** Nerve compression causing tingling, numbness, or burning sensations in the afflicted areas.

v. **Swelling:** Swelling or inflammation surrounding swollen muscles or joints.

vi. **Reduced Range of Motion:** Inability to fully move some body parts which can be as a result of injury that affect the muscles, bone or joints in the body.

These symptoms might worsen during work hours or specific movements and can significantly impact daily activities.

### 2.1.3 Risk Factors of Musculoskeletal Disorders

There are several risk factors associated with the development of musculoskeletal disorders (MSDs). These factors can be divided into three main categories: individual, workplace, and psychosocial factors. Here are some examples of each:

**Individual factors:** Individual factors are personal characteristics that may increase the risk of developing work-related musculoskeletal disorders (Westgaard *et al.*, 1993; Lagerström *et al.*, 1996; Oha *et al.*, 2014). Some of the individual factors that have been associated with WRMSDs include:

i. **Age:** As people age, their muscles and joints may become weaker and less flexible, making them more susceptible to injury and strain (Oha *et al.*, 2014).

ii. **Gender:** Women may be at higher risk of WRMSDs than men, possibly due to differences in anatomy and hormones (Cavallari *et al.*, 2016).

iii. **Body mass index (BMI):** High BMI has been associated with an increased risk of WRMSDs, likely due to increased strain on the musculoskeletal system (Alshagga *et al.*, 2013).

iv. **Genetics:** Some people may have a genetic predisposition to musculoskeletal problems, such as osteoarthritis or rheumatoid arthritis (Sanjoy *et al.*, 2017).

v. **Pre-existing medical conditions:** People with pre-existing medical conditions, such as diabetes or osteoporosis, may be more vulnerable to musculoskeletal problems (Sözen *et al.*, 2018).

**Academic environment factors**: These are physical demands or conditions that may increase the risk of developing musculoskeletal disorders (Gopinadh *et al.*, 2013; Deschamps *et al.*, 2015; Abo-Salem *et al.*, 2017). These factors include:

i. **Repetitive motions**: Repeating the same motion or movement over and over again can cause muscle fatigue, strain, and injury (Badley *et al.*, 1994; Gopinadh *et al.*, 2013). Performing repetitive tasks or motions over extended periods can lead to cumulative microtrauma in the muscles, tendons, ligaments, and other soft tissues (Occupational Safety and Health Administration, 2000). The repetitive nature of the motion can cause small but repeated injuries, leading to inflammation, tissue damage, and the onset of MSDs (Badley *et al.*, 1994).

ii. **Awkward postures**: Holding the body in an uncomfortable or unnatural position can put stress on muscles and joints (Abo-Salem *et al.*, 2017). Awkward postures refer to positions of the body that deviate from the neutral or ergonomic position, leading to increased strain and potential injury. These positions can occur during various activities, including work tasks, and are commonly associated with WRMSDs. Prolonged forward bending posture places a significant static muscular load, especially on the trunk region (Pal and Dhara, 2018). This cumulative load on the musculoskeletal structures manifests as a high prevalence of discomfort and pain in the regions of the neck, shoulder, lower back, and lower limbs (Pal and Dhara, 2018). Poor posture, such as slouching or slumping, can disrupt the natural alignment of the spine (Wernli *et al.*, 2020). This misalignment can put excessive pressure on the spinal discs, nerves, and surrounding structures, leading to pain in the lower back and other regions.

iii. **Forceful exertions**: Using excessive force to perform a task, such as lifting or pushing heavy objects, can strain muscles and joints (Armstrong *et al.*, 2002).

iv. **Vibration:** Exposure to vibration, such as from power tools or heavy machinery, can cause damage to muscles, nerves, and joints (Armstrong *et al.*, 2002). Repetitive use of these tools can transmit vibrations to the hands and arms, leading to musculoskeletal pain and various disorders, including hand-arm vibration syndrome (HAVS) (Campbell *et al.*, 2017). HAVS can affect the blood vessels, nerves, and connective

tissues, resulting in symptoms such as pain, numbness, and tingling (Shen and House, 2017),

v. **Poor ergonomics:** Poorly designed workstations or equipment can cause awkward postures and repetitive motions, leading to musculoskeletal problems (Deschamps *et al.*, 2015). Insufficient support for the natural curve of the lower back can result in poor spinal alignment (NIOSH, 2018). This lack of support can lead to increased pressure on the intervertebral discs and surrounding tissues, contributing to low back pain. A poorly adjusted desk and chair can promote unhealthy postures and excessive strain on the lower back (NIOSH, 2018).

vi. **Inadequate rest breaks:** Lack of rest breaks can lead to muscle fatigue and strain (Park *et al.*, 2021). Continuous or prolonged periods of work and academic activities without adequate rest can lead to fatigue and reduced recovery time for the musculoskeletal system (NIOSH, 2018). Fatigue can impair muscle function, decrease concentration, and increase the risk of errors, all of which can contribute to the development of MSDs (Park *et al.*, 2021).

vii. **High work pace**: High workload or pressure to work quickly can cause students to perform tasks with less regard for proper technique or safety (Abo-Salem *et al.*, 2017). Working at a high work pace can predisposes an individual to taking a bad posture and excessive standing which can lead to low back pain (Abo-Salem *et al.*, 2017).

**Psychosocial factors:** These are psychological and social factors in the workplace that may increase the risk of developing work-related

musculoskeletal disorders (Hartvigsen *et al.*, 2004; Descatha *et al.*, 2013). These factors include:

i. **Job stress**: High job demands, low job control, and low social support at work have been associated with an increased risk of WRMSDs (Bingers *et al.*, 1993)

ii. **Work-related anxiety and depression:** Psychological distress, including anxiety and depression, have been linked to an increased risk of WRMSDs (Baek *et al.*, 2018).

iii. **Perceived job insecurity**: Workers who perceive their job as insecure may experience increased job stress and psychological distress, which can increase the risk of WRMSDs (Descatha *et al.*, 2013: Baek *et al.*, 2018).

iv. **Organisational factors:** Organisational factors, such as leadership and communication, can affect job stress and satisfaction, which in turn can affect the risk of WRMSDs (Hartvigsen *et al.*, 2004; Descatha *et al.*, 2013).

## 2.2 Common Types of Musculoskeletal Disorders

### 2.2.1 Neck Pain

Neck pain is defined by the presence of discomfort in the region bordered inferiorly by the inferior spinous process of T1, extending laterally to the outer margins of the neck, and superiorly by the superior nuchal line (Mercer and Bogduk, 2001).

Neck pain is a prevalent and debilitating condition affecting a substantial portion of the population, often attributed to various factors, including occupational demands, poor posture, and lifestyle habits. It is a common

manifestation of Work-Related Musculoskeletal Disorders (WRMSDs) among working individuals. Occupational factors significantly contribute to neck pain in the workplace. Prolonged sitting, repetitive tasks, and awkward postures, common in office settings, can strain the muscles and soft tissues of the neck (Darivemula *et al.*, 2016). Poor ergonomics, such as inadequate workstation setups or improperly adjusted chairs and screens, can exacerbate the risk of neck pain (Barbe and Barr, 2006).

Repetitive movements associated with certain occupations, like frequent overhead work or sustained computer use, contribute to muscle fatigue and tension in the neck region, leading to discomfort and potential injury (Wami *et al.*, 2019). Psychosocial factors, including job stress, high workload, and low job satisfaction, also play a role in the development and persistence of neck pain (Wami *et al.*, 2019).

Addressing neck pain associated with WRMSDs involves ergonomic adjustments in the workplace, promoting proper posture, introducing regular breaks for movement, and implementing stress reduction strategies.

### 2.2.2 Low Back Pain

Low back pain is the leading cause of disability worldwide according to WHO (2022. Lower back pain (LBP) stands as the most prevalent musculoskeletal disorder (MSD) impacting adults, with a staggering lifetime prevalence reaching up to 84% (Balague *et al.*, 2012). Low back pain presents a significant global health concern, affecting a staggering 619 million individuals worldwide in 2020, accounting for nearly 10% of the global population. Projections indicate a concerning trend, with an anticipated surge to 843 million

individuals grappling with low back pain by the year 2050 (LCA, 2023). A multitude of studies has underscored the substantial correlation between occupational tasks and LBP, especially within professions involving prolonged sitting, standing, heavy lifting, or awkward postures (Sundstrup *et al.*, 2020). Moreover, research highlights that people who engaged in repetitive or forceful work, such as bending, twisting, or lifting, face heightened susceptibility to LBP and other Work-Related Musculoskeletal Disorders (WRMSDs) (Wami *et al.*, 2019). These tasks subject the back's tissues and structures to micro-trauma, instigating pain and discomfort.

Occupational activities significantly contribute to the prevalence of LBP, eliciting strains on the lower back due to repetitive movements, sustained postures, and tasks demanding excessive force. Prolonged exposure to these activities can lead to tissue damage, inflammation, and structural alterations in the back, ultimately culminating in LBP and related musculoskeletal issues.

### 2.2.3 Shoulder Pain

Research indicates that simultaneous exposure to various physical strains in the workplace, including overhead work, heavy lifting, forceful activities, and sustained awkward postures, heightens the likelihood of developing shoulder disorders (Linaker and Walker-Bone, 2015). Additionally, psychosocial risk factors have been identified as contributing elements to this association (Linaker and Walker-Bone, 2015).

Occupational tasks requiring repetitive actions such as overhead reaching, lifting, or carrying heavy objects, contribute to micro-trauma in shoulder muscles, tendons, and ligaments. This repetitive strain often results in

conditions like rotator cuff tendinitis, bursitis, or shoulder impingement syndrome (Luime *et al.*, 2004). Forceful activities, common in occupations like construction or manufacturing, put excessive stress on the shoulder joint, leading to acute injuries such as strains, sprains, or even dislocations (Pope *et al.*, 1997).

## 2.3 Pathophysiology of Musculoskeletal Symptoms

Musculoskeletal symptoms result from different factors like repetitive strain, forceful exertion, and sustained or awkward postures. These factors cause micro-trauma to muscles, tendons, and ligaments, inducing inflammation and subsequent pain. While inflammation aids healing, persistent physical stress can lead to chronic inflammation, perpetuating tissue damage and pain (Barbie & Barr, 2006). Alongside localized inflammation, a systemic inflammatory response can exacerbate symptoms. Prolonged inflammation might prompt tissue fibrosis, further contributing to chronic musculoskeletal issues. Neural activity changes, altered muscle activation, and psychosocial factors like stress, anxiety, and depression also influence symptom development (Barbe & Barr, 2006; Puntillo *et al.*, 2021). Musculoskeletal symptoms arise from prolonged exposure to heavy loads or maintaining awkward body postures. These stresses, sustained over time, contribute to the onset and persistence of these symptoms (Barbe & Barr, 2006; Oke & Adeyekun, 2013).

## 2.4 Prevention of MSDs

Preventing musculoskeletal symptoms involves a proactive approach targeting the identification and avoidance of risk factors contributing to these disorders

(European Agency for Safety and Health at Work, 2008). To achieve this, implementing various preventive measures is crucial:

i. **Enhancing Ergonomics**: Modifying work or home environments to bolster comfort and diminish the risk of musculoskeletal symptoms. Actions include utilizing ergonomic furniture like chairs and desks, promoting proper posture, and providing adequate support for the back and arms.

ii. **Utilizing Protective Equipment:** Employing protective gear such as back belts, wrist splints, or neck collars as preventive measures. Back belts, for instance, aid in trunk stabilization and increase intra-abdominal pressure, potentially reducing the occurrence of low back pain.

iii. **Adopting Behavioural Changes:** Embracing correct sitting and standing postures during work, daily activities, or lifting tasks. Incorporating short breaks to relieve muscle tension and adjusting sleeping positions and work routines also prove beneficial.

iv. **Engaging in Physical Exercise:** Participating in exercises targeting neck and back muscle strengthening to enhance their endurance and reduce the risk of strain-induced musculoskeletal symptoms (European Agency for Safety and Health at Work, 2008).

## 2.5 Management of MSDs

MSDs can be effectively managed through a combination of medical and physiotherapy means. The management of WRMSDs are:

i. **Pain Management:** Addressing pain is a primary concern in WRMSD management. Treatment may involve pain-relieving medications,

topical treatments, or injections to manage acute pain, allowing for more effective participation in rehabilitation efforts.

ii. **Physical Therapy and Rehabilitation:** Rehabilitation programs are tailored to the individual's condition, focusing on exercises, stretches, and modalities aimed at strengthening muscles, improving flexibility, and restoring functionality. Therapists may also employ techniques such as manual therapy or ergonomic education to facilitate recovery.

iii. **Ergonomic Interventions:** Modifying the training environment to reduce strain and optimize ergonomics is crucial. This includes adjusting workstations, providing ergonomic furniture, implementing proper lifting techniques, and offering training on posture and body mechanics to prevent further injury.

iv. **Behavioural and Lifestyle Modifications:** Encouraging behavioural changes like adopting proper body mechanics, taking regular breaks, and maintaining an active lifestyle are essential in managing and preventing WRMSDs.

v. **Training Environment Interventions:** Implementing institutional changes such as posting rotation, task modification, and gradual return-to-work programs can help accommodate affected individuals and prevent recurrence of WRMSDs.

vi. **Psychosocial Support:** Recognizing and addressing psychosocial factors like stress, anxiety, or depression is crucial, as these factors can impact pain perception and recovery. Counselling or stress management techniques can be beneficial.

vii. **Health Promotion and Education:** Educating individuals about preventive measures, promoting a healthy lifestyle, and raising awareness about ergonomic practices at work are essential for long-term prevention of MSDs.

## 2.6 Empirical Literature Review

| AUTHOR/ YEAR/COUNTRY | TITLE | SAMPLE SIZE | AIM OF STUDY | STUDY TYPE | OUTCOME/MEASURE | FINDINGS |
|---|---|---|---|---|---|---|
| Afolabi et al./2024/Nigeria | Prevalence of musculoskeletal disorders and associated risk factors among undergraduates of a private university in Nigeria. | 1248 undergraduates | To determine the prevalence of MSDs and its associated risk among undergraduates in a private institution. | Cross sectional design study | Musculoskeletal Disorders was assessed with Nordic Musculoskeletal Questionnaire | The 12-month prevalence of musculoskeletal disorders (MSDs) was 76%, with higher rates among females (82.5%) compared to males (74.3%). The neck was the most commonly affected region, reported by 47% of participants. Stress, leisure-time physical activity, and taking short breaks were associated with MSDs in both male and female students. Among third-year students, alcohol consumption, stress, and the habit of taking short breaks were also linked to MSDs. Students who did not take short breaks, did not engage in leisure-time physical activity, and those in their third or fourth year of study were more likely to |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | experience MSDs. |
| Almhdawi et al./2017/Saudi Arabia | Musculoskeletal pain symptoms among allied health professions' students: Prevalence rates and associated factors. | 838 Allied Health Professionals Students | To determine the prevalence of musculoskeletal pain and its associated factors. | Cross sectional design study | Musculoskeletal Disorders was assessed with Nordic Musculoskeletal Questionnaire | MSDs in the neck, lower back, and shoulder was the most prevalent over a 12-month period, with rates of 67.1%, 61.4%, and 58.8%, respectively. The prevalence of MPS was significantly higher among females and varied significantly across academic majors. MPS was also significantly associated with increased clinical training load, symptoms of mental stress, and average smartphone usage time. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Alwaily and Alanazil/2022/Saudi Arabia | Prevalence and determinants of knowledge of musculoskeletal disorders among healthcare providers and students in Saudi Arabi: A cross-sectional study | 680 participants | To determine the prevalence and determinants of knowledge of MSDs among healthcare providers and students. | Cross sectional design study | A web-based designed MSD questionnaire was used. | Medical interns had significantly higher MSD test scores (48.2% passing rate) compared to the other groups.No significant difference between medical and physiotherapy students.. |
| Behera et al./2023/India | Musculoskeletal pain affecting undergraduate nursing students: A cross sectional study on the prevalence and the associated factors. | 179 nursing students were recruited for the study | To determine the prevalence of musculoskeletal pain in Nursing students and its associated factors. | Cross sectional design study | Musculoskeletal Disorders was assessed with Nordic Musculoskeletal Questionnaire | Approximately 53.2% of participants reported experiencing musculoskeletal pain (MSP) within the past year, while 43.9% had experienced MSP even prior to that period. Students in their second academic year had higher odds of experiencing MSP. However, factors related to self-study following formal instruction—such as study location, duration, posture—as well as patterns of |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | electronic device usage (including smartphones and laptops), showed no significant association with the occurrence of MSP. |
| Ekechuwku etc al./2020/Nigeria | Prevalence, correlates and risk factors of musculoskeletal disorders among Nigerian physiotherapy and architecture undergraduates. | 200 undergraduates from Architecture and physiotherapy department. | To determine the prevalence, correlates, and risks for MSDs among physiotherapy and architecture undergraduates. | Cross sectional design study | Musculoskeletal Disorders was assessed with Nordic Musculoskeletal Questionnaire | Overall MSD prevalence was 77%. Significant association between knee-related MSD and department. Predictors included sleep duration, BMI, and emotional intelligence factors. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Yirdaw et al./2021/Ethiopia | Back and upper body musculoskeletal pain and associated factors among medicine and nursing practicing students at university of Gondar, Ethiopia | 422 participants were recruited | To determine the prevalence of back and upper body MSDs and its associated factors. | Cross sectional design study | Back complaint questionnaire (Self-developed) | The magnitude of musculoskeletal pain was highest in the back (54%) followed by the neck (36.7%). Back pain was significantly associated with sex, alcohol consumption, and the adequacy of rest breaks. Neck pain was significantly associated with academic department, year of study, and average sleep duration per day. |

# CHAPTER THREE

# MATERIALS AND METHODS

## 3.1 Materials

### 3.1.1 Population

The target population of this study included both male and female medicine, nursing and physiotherapy students at Ugbowo campus, University of Benin, Nigeria.

### 3.1.2 Selection Criteria

#### 3.1.2.1 Inclusion Criteria

i. Full time undergraduates of medicine, nursing and physiotherapy were recruited for the study
ii. Individuals aged 18 years and above.
iii. Those who provided informed consent to participate in the study.
iv. Participants in 300 level and above

#### 3.1.2.2 Exclusion Criteria

i. Post graduate (Master's degree) students of the University of Benin.
ii. Students with obvious physical impairments or disabilities.
iii. Students with recent traumatic injuries.
iv. Students who were unable to provide informed consent for the study.

### 3.1.3 Description of Instruments:

**i. Nordic Musculoskeletal Questionnaire:** The Nordic Questionnaire is a widely used tool for assessing the prevalence of musculoskeletal disorders

(MSDs) in various occupational groups. The questionnaire is easy to administer and has been used in numerous studies across different countries and industries. The Nordic Questionnaire for musculoskeletal symptoms typically consists of questions on demographics, general health, musculoskeletal symptoms, work-related factors, and leisure-time physical activity. The questionnaire assesses the prevalence and severity of pain or discomfort experienced in different body regions, such as the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles/feet. It also collects information on the frequency and duration of symptoms. According to Ohlsson *et al.* (1994), the Nordic Musculoskeletal questionnaire, when used to assess pain within the past 7 days, demonstrated a sensitivity ranging between 66% and 92%, indicating its ability to correctly identify individuals with musculoskeletal pain. The specificity ranged between 71% and 88%, suggesting its ability to accurately identify individuals without musculoskeletal pain.

Regarding reliability, Kuorinka *et al.* (1987) conducted a test-retest study on the Nordic Musculoskeletal questionnaire and reported that the percentage of different answers varied between 0% and 23%. This suggests good reliability, as a low percentage of different answers indicates consistency in responses over time. The Nordic musculoskeletal questionnaire has a good reliability for assessing musculoskeletal symptoms with a kappa coefficient that varies between 0.64 and 0.71 for pain in the past one week, 0.73 and 0.82 for pain in the past year and between 0.59 and 0.78 for pain in the past year that interferes with work or leisure (Palmer et al, 1999). The Nordic Questionnaire has been validated and used in various populations and industries. In a study among

dental students, the questionnaire was found to be a reliable and valid tool for assessing musculoskeletal pain in this group (Rendzova *et al.*, 2021).

**ii. Academic impact module:** This study developed a 5 item Likert scale to quantify how musculoskeletal symptoms affect academic activities. Items asked about missed lectures or practicals, reduced concentration during study, decreased study hours per week, difficulty sitting through lectures, reduced participation in group work, and perceived effect on academic grades. Responses use a 1 to 5 scale where 1 equals strongly disagree and 5 equals strongly agree. Higher scores indicate greater academic impact.

## 3.2 Methods

### 3.2.1 Research Design

A cross-sectional study design was adopted for this study.

### 3.2.2 Sampling Technique

Convenience sampling technique was used in recruiting participants for this study.

### 3.2.3 Sample Size

Sample size was calculated using the formula;

$n=N / (1+N[e]^2)$ (Slovin's Formula)

The total number of students (from 300 to 600 level) across the Departments of Medicine, Nursing, and Physiotherapy is:

- Medicine: 292
- Nursing: 533

- Physiotherapy: 388
- Total (N) = 1213

where:

n is the sample size

N is the population size (1213)

e is the margin of error (0.05)

n= 1213/ (1+1213[0.05]^2)

n= 301 students

The total population of participants from 300 – 600 level from medicine, nursing and physiotherapy students at Ugbowo campus, University of Benin, Nigeria was gotten from each department.

### 3.2.4 Research Procedure

All participants who meet the inclusion criteria were recruited into the study. Informed consent was obtained from each participant prior to their enrollment. Following consent, the researcher provided a comprehensive explanation of the study's objectives, procedures, and expectations to ensure participant understanding. The questionnaires to be filled were divided into two (2) sections. Section A contained the socio-demographic questionnaire such as age, gender, marital status, department, and level. Section B contained the Nordic Musculoskeletal Questionnaire (NMQ). Each questionnaire will be self-administered; however, assistance was provided by the researcher upon request

to ensure proper completion. All questionnaires were collected immediately after completion to maintain data integrity and minimize data loss.

### 3.2.5 Ethical Consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee of the University of Benin Teaching Hospital (UBTH), in accordance with institutional guidelines. Following approval, eligible participants were provided with detailed information about the study's objectives, procedures, potential risks and benefits, and their rights as participants. Informed consent was obtained from all participants prior to data collection, ensuring their voluntary participation and understanding of the study.

### 3.2.6 Data Analysis

Data was analyzed using IBM for statistical package of social sciences (SPSS version 27.0) software. Data was summarized using descriptive statistics of frequency, percentages, and mean or median as appropriate. Chi Square was used to determine relationship between sociodemographic and prevalence of musculoskeletal disorders with level of significance set at $p < 0.05$.

# CHAPTER FOUR

# RESULTS

## 4.1 Participants

### 4.1.1 Demographic characteristics of study participants

A total of 301 students participated in the study. The largest age group was 21–25 years (66.8%), and females made up the majority of the sample (59.8%). Nearly all respondents were single (98.7%). By programme, Nursing students represented the single largest share (42.5%), followed by Medicine (31.6%) and Physiotherapy (25.9%). Most students were in levels 500 and 400 (40.5% and 38.9% respectively). Body mass index classification was dominated by normal weight participants (80.1%). In terms of habitual physical activity, sport participation was most common (28.6%), closely followed by brisk walking or running (26.9%), while 27.6% reported no participation in regular physical activity. The vast majority reported no history of trauma or injury in the past 12 months (96.0%), as shown in table 4.1.

**Table 4.1: Demographic characteristics (n=301)**

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 121 | 40.2 |
| Female | 180 | 59.8 |
| **Age Range (Years)** | | |
| 16 – 20 | 53 | 17.6 |
| 21 – 25 | 201 | 66.8 |
| 26 – 30 | 43 | 14.3 |
| Above 30 | 4 | 1.3 |
| **Marital Status** | | |
| Single | 297 | 98.7 |
| Married | 4 | 1.3 |
| Others | 0 | 0.0 |
| **Department** | | |
| Nursing | 128 | 42.5 |
| Physiotherapy | 78 | 25.9 |

| | | |
|---|---|---|
| Medicine | 95 | 31.6 |
| **Level of Study** | | |
| 300 | 51 | 16.9 |
| 400 | 117 | 38.9 |
| 500 | 122 | 40.5 |
| 600 | 11 | 3.7 |
| **BMI** | | |
| Underweight (<18.5) | 9 | 3 |
| Normal (18.5 - 24.9) | 241 | 80.1 |
| Overweight (25 - 29.9) | 29 | 9.6 |
| Obese (>30) | 22 | 7.3 |
| **Do you participate in regular physical activity?** | | |
| Sports | 86 | 28.6 |
| Brisk walking or running | 81 | 26.9 |
| Home workouts or exercise | 51 | 16.9 |
| I do not participate | 83 | 27.6 |
| **Do you have any history of trauma or injury in the past 12 months?** | | |
| Yes | 12 | 4.0 |
| No | 289 | 96.0 |

### 4.1.2 Academic and clinical activity

When asked about study time, the modal response was two to four hours per day (40.9%). All respondents were engaged in clinical postings (100.0%). Most students spent less than two hours per day on clinical duties (53.8%) and a clear majority reported taking breaks during academic or clinical activities (71.1%). The most common study posture was sitting upright at a desk (47.2%). During clinical duties, prolonged standing was the activity most frequently performed (53.2%), with assisting with procedures (52.8%) and manual techniques such as joint mobilizations and massage (50.8%) also commonly reported. A large majority reported experiencing pain or discomfort during or after clinical postings (86.0%), and over half perceived that their academic or clinical workload contributed to those musculoskeletal symptoms (55.8%), as presented in table 4.2.

## Table 4.2: Academic and clinical activity

| Question | Answer | Frequency (n) | Percentage (%) |
|---|---|---|---|
| How many hours do you spend studying per day? | Less than 2 hours | 79 | 26.2 |
| | 2–4 hours | 123 | 40.9 |
| | 5–7 hours | 73 | 24.3 |
| | More than 7 hours | 26 | 8.6 |
| Are you currently involved in clinical postings? | Yes | 301 | 100.0 |
| | No | 0 | 0.0 |
| How many hours per day are spent on clinical duties? | Less than 2 hours | 162 | 53.8 |
| | 2–4 hours | 105 | 34.9 |
| | 5–7 hours | 34 | 11.3 |
| | More than 7 hours | 0 | 0.0 |
| Do you take breaks during academic or clinical activities? | Yes | 214 | 71.1 |
| | No | 87 | 28.9 |
| What is your most common study posture? | Sitting upright at a desk | 142 | 47.2 |
| | Slouched sitting on bed/sofa | 109 | 36.2 |
| | Lying down | 106 | 35.2 |
| | Standing or walking | 84 | 27.9 |
| During clinical activities, which of the following tasks do you frequently perform? (Tick all that apply) | Prolonged standing | 160 | 53.2 |
| | Lifting/transferring patients | 134 | 44.5 |
| | Assisting with procedures | 159 | 52.8 |
| | Manual techniques (e.g., joint mobilizations, massage) | 153 | 50.8 |
| | Using diagnostic equipment | 146 | 48.5 |
| Have you ever experienced pain or discomfort during or after clinical postings? | Yes | 259 | 86.0 |
| | No | 38 | 12.6 |
| | Not sure | 4 | 1.3 |
| In your opinion, does your academic or clinical workload contribute to your musculoskeletal symptoms? | Yes | 168 | 55.8 |
| | No | 126 | 41.9 |
| | Not sure | 7 | 2.3 |

### 4.1.3 Prevalence of musculoskeletal trouble by body region in the past 12 months

Musculoskeletal complaints were most frequently reported in the lower back, where 71.4% of participants indicated trouble. Upper back problems were reported by 63.8% and neck problems by 62.8% of respondents. Shoulder pain was reported by 60.8% of students. Problems affecting the ankles and feet were reported by 56.1%, while wrists and hands were affected in 55.8% of the sample. Hips and thighs were implicated in just over half of participants (51.8%). Knee complaints did not reach a majority, being reported by 48.2% of respondents. These distribution patterns are summarized in table 4.3.

**Table 4.3: Have you had any musculoskeletal trouble (ache, pain, discomfort) in the following areas in the last 12 months?**

| Body Region | Yes | No |
|---|---|---|
| Neck | 189 | 112 |
| | (62.8) | (37.2) |
| Shoulders | 183 | 118 |
| | (60.8) | (39.2) |
| Upper back | 192 | 109 |
| | (63.8) | (36.2) |
| Lower back | 215 | 86 |
| | (71.4) | (28.6) |
| Elbows | 137 | 164 |
| | (45.5) | (54.5) |
| Wrists/Hands | 168 | 133 |
| | (55.8) | (44.2) |
| Hips/Thighs | 156 | 145 |
| | (51.8) | (48.2) |
| Knees | 145 | 156 |
| | (48.2) | (51.8) |
| Ankles/Feet | 169 | 132 |
| | (56.1) | (43.9) |

### 4.1.4 Impact of musculoskeletal troubles on normal activities

During the past 12 months a majority of students reported that musculoskeletal problems prevented them from carrying out normal activities. Neck problems were most frequently disabling with 68.8% saying they had been prevented from academic, clinical or leisure activities by neck trouble. Hips and thighs (68.1%), knees (66.4%) and lower back problems (65.8%) were also commonly reported as activity limiting. Elbow and wrist or hand problems each prevented normal activities in 64.5% of respondents, while shoulder and upper back complaints restricted activity for 60.5%. Ankles and feet were the least likely to prevent normal activities but still affected a majority of students with 57.8% reporting limitations. These findings are presented in table 4.4.

**Table 4.4: During the past 12 months, have these troubles prevented you from doing normal activities (e.g., academic, clinical, or leisure)?**

| Body Region | Yes | No |
|---|---|---|
| Neck | 207 | 94 |
| | (68.8) | (31.2) |
| Shoulders | 182 | 119 |
| | (60.5) | (39.5) |
| Upper back | 182 | 119 |
| | (60.5) | (39.5) |
| Lower back | 198 | 103 |
| | (65.8) | (34.2) |
| Elbows | 194 | 107 |
| | (64.5) | (35.5) |
| Wrists/Hands | 194 | 107 |
| | (64.5) | (35.5) |
| Hips/Thighs | 205 | 96 |
| | (68.1) | (31.9) |
| Knees | 200 | 101 |
| | (66.4) | (33.6) |
| Ankles/Feet | 174 | 127 |
| | (57.8) | (42.2) |

### 4.1.5 Musculoskeletal trouble in the past seven days.

Point prevalence over the previous seven days remained high and followed a pattern similar to the 12 month figures. Neck trouble was again most commonly reported, affecting 66.8% of students in the past week. Lower back problems were reported by 62.8%, wrists and hands by 63.8% and ankles and feet by 62.1%. Hips and thighs and knees affected 60.1% and 61.1% respectively, while upper back and shoulder complaints affected 58.8% and 56.1% of students in the same recall period. These short term prevalence estimates are summarized in table 4.5.

**Table 4.5: Have you had any musculoskeletal trouble in the past 7 days in the following regions?**

| Body Region | Yes | No |
|---|---|---|
| Neck | 201 | 100 |
| | (66.8) | (33.2) |
| Shoulders | 169 | 132 |
| | (56.1) | (43.9) |
| Upper back | 177 | 124 |
| | (58.8) | (41.2) |
| Lower back | 189 | 112 |
| | (62.8) | (37.2) |
| Elbows | 142 | 159 |
| | (47.2) | (52.8) |
| Wrists/Hands | 192 | 109 |
| | (63.8) | (36.2) |
| Hips/Thighs | 181 | 120 |
| | (60.1) | (39.9) |
| Knees | 184 | 117 |
| | (61.1) | (38.9) |
| Ankles/Feet | 187 | 114 |
| | (62.1) | (37.9) |

### 4.1.6 Variation in musculoskeletal pain by department

There was evidence of between-department variation for some anatomical regions. Neck pain prevalence differed significantly across departments with the highest proportions observed among Nursing students (91.4%) and Physiotherapy students (89.7%) compared with Medicine (78.9%), $\chi 2 = 8.19$, $p = 0.02$. Upper back pain also showed a significant difference across departments with particularly high prevalence among Physiotherapy (93.6%) and Medicine (89.5%) students compared with Nursing (79.7%), $\chi 2 = 9.09$, $p = 0.01$. For other body regions the majority pattern was similar across departments and statistical tests did not indicate significant differences. Shoulders were commonly affected across all groups (approximately 81 to 82%), lower back complaints were frequent in each program (around 79 to 83%), and hips, ankles and other regions showed comparable majority prevalence without statistically significant departmental variation (all p values > 0.05). These results are presented in table 4.6.

## Table 4.6: Variation in musculoskeletal pain by department

| Department | Musculoskeletal pain prevalence | $X^2$ | P-value |
|---|---|---|---|
| | **Neck pain** | | |
| Nursing | 117 (91.4) | | |
| Physiotherapy | 70 (89.7) | | |
| Medicine | 75 (78.9) | | |
| | | **8.19** | **0.02*** |
| | **Shoulder** | | |
| Nursing | 106 (82.8) | | |
| Physiotherapy | 63 (80.8) | | |
| Medicine | 78 (82.1) | | |
| | | **0.18** | **0.91** |
| | **Lower back** | | |
| Nursing | 106 (82.8) | | |
| Physiotherapy | 64 (82.1) | | |
| Medicine | 75 (78.9) | | |
| | | **0.59** | **0.77** |

| | | | |
|---|---|---|---|
| | **Upper back** | | |
| Nursing | 102 (79.7) | | |
| Physiotherapy | 73 (93.6) | | |
| Medicine | 85 (89.5) | | |
| | | **9.09** | **0.01*** |
| | **Elbows** | | |
| Nursing | 89 (69.5) | | |
| Physiotherapy | 58 74.4) | | |
| Medicine | 62 (65.3) | | |
| | | **1.67** | **0.45** |
| | **Wrist/Hands** | | |
| Nursing | 104 (81.3) | | |
| Physiotherapy | 62 (65.3) | | |
| Medicine | 67 (70.5) | | |
| | | **3.85** | **0.15** |
| | **Hips/Thighs** | | |
| Nursing | 104 (81.3) | | |
| Physiotherapy | 63 (80.8) | | |
| Medicine | 78 (82.1) | | |
| | | **0.05** | **0.97** |
| | **Hips** | | |
| Nursing | 96 (75.0) | | |
| Physiotherapy | 58 ( 74.4) | | |
| Medicine | 78 (82.1) | | |
| | | **2.0** | **0.37** |
| | **Ankles/Feet** | | |
| Nursing | 99 (77.3) | | |
| Physiotherapy | 66 (84.6) | | |
| Medicine | 75 (78.9) | | |
| | | **1.64** | **0.44** |

*- *Significant difference*

### 4.1.7 Study hours and musculoskeletal pain

Across study hour categories the highest proportions of students reporting pain clustered among those with the longest daily study time for several regions. Neck pain was reported by all students who studied more than seven hours per day. The largest shares with shoulder and lower back pain were likewise among those studying more than seven hours per day, at 88.5% and 92.3% respectively, and upper back pain was also most prevalent in the more than seven hours group at 92.3%. Elbow complaints peaked among students

studying more than seven hours per day at 80.8% while wrist and hand problems were most common in that same group at 88.5%. Hips and thighs pain reached its highest proportion among students studying five to seven hours per day at 89.0%, and hip pain was most common in the five to seven hours group at 83.6%. Ankle and foot problems were most frequently reported by students who studied two to four hours per day at 83.7%. Statistical tests did not demonstrate significant associations between study hours and regional musculoskeletal pain after accounting for multiple comparisons; the closest to significance was neck pain with $p = 0.06$, indicating a trend but not meeting the conventional threshold for significance.

## Table 4.7: Study hours and musculoskeletal pain

| Study hours | Musculoskeletal pain prevalence | $X^2$ | P-value |
|---|---|---|---|
| | **Neck pain** | | |
| Less than 2 hours | 66 (83.5) | | |
| 2–4 hours | 103 (83.7) | | |
| 5–7 hours | 67 (91.8) | | |
| More than 7 hours | 26 (100.0) | | |
| | | **7.37** | **0.06** |
| | **Shoulder** | | |
| Less than 2 hours | 59 (74.7) | | |
| 2–4 hours | 102 (82.9) | | |
| 5–7 hours | 63 (86.3) | | |
| More than 7 hours | 23 (88.5) | | |
| | | **4.60** | **0.20** |
| | **Lower back** | | |
| Less than 2 hours | 59 (74.7) | | |
| 2–4 hours | 101 (82.1) | | |
| 5–7 hours | 61 (83.6) | | |
| More than 7 hours | 24 (92.3) | | |
| | | **4.66** | **0.20** |
| | **Upper back** | | |
| Less than 2 hours | 64 (81.0) | | |
| 2–4 hours | 106 (86.2) | | |
| 5–7 hours | 66 (90.4) | | |
| More than 7 hours | 24 (92.3) | | |
| | | **3.72** | **0.30** |
| | **Elbows** | | |

| | | | |
|---|---|---|---|
| Less than 2 hours | 49 (62.0) | | |
| 2–4 hours | 84 (68.3) | | |
| 5–7 hours | 55 (75.3) | | |
| More than 7 hours | 21 (80.8) | | |
| | | **4.89** | **0.18** |
| | **Wrist/Hands** | | |
| Less than 2 hours | 61 (77.2) | | |
| 2–4 hours | 95 (77.2) | | |
| 5–7 hours | 54 (74.0) | | |
| More than 7 hours | 23 (88.5) | | |
| | | **2.31** | **0.52** |
| | **Hips/Thighs** | | |
| Less than 2 hours | 59 (74.7) | | |
| 2–4 hours | 98 (79.7) | | |
| 5–7 hours | 65 (89.0) | | |
| More than 7 hours | 23 (88.5) | | |
| | | **6.27** | **0.10** |
| | **Hips** | | |
| Less than 2 hours | 57 (72.2) | | |
| 2–4 hours | 94 (76.4) | | |
| 5–7 hours | 61 (83.6) | | |
| More than 7 hours | 20 (76.9) | | |
| | | **2.85** | **0.42** |
| | **Ankles/Feet** | | |
| Less than 2 hours | 57 (72.2) | | |
| 2–4 hours | 103 (83.7) | | |
| 5–7 hours | 60 (82.2) | | |
| More than 7 hours | 20 (76.9) | | |
| | | **4.43** | **0.22** |

### 4.1.8 Clinical workload and musculoskeletal pain

When clinical duty hours were examined the largest proportions of musculoskeletal complaints tended to occur among those with intermediate clinical hours for several regions. Neck pain was most common among participants working five to seven hours per day in clinical activities at 91.2%, while shoulder and lower back complaints were most frequent among those working two to four hours per day at 85.7% each. Upper back pain was also highest in the two to four hours group at 89.5%. Elbow pain peaked in the two to four hours category at 77.1%. Notably wrist and hand pain and hips and thighs pain showed statistically significant differences by clinical workload;

wrist and hand complaints were most prevalent in the two to four hours group at 87.6% and this association reached significance with $p = 0.01$. Hips and thighs pain was likewise most common in the two to four hours group at 90.5% and the association was statistically significant with $p < 0.001$. For hips and ankles the highest proportions were observed in the two to four hours group at 81.0% and 83.8 % respectively but these differences were not statistically significant.

## Table 4.8: Clinical workload and musculoskeletal pain

| Clinical workload | Musculoskeletal pain prevalence | $X^2$ | P-value |
|---|---|---|---|
| | **Neck pain** | | |
| Less than 2 hours | 138 (85.2) | | |
| 2–4 hours | 93 (88.6) | | |
| 5–7 hours | 31 (91.2) | | |
| | | **1.23** | **0.54** |
| | **Shoulder** | | |
| Less than 2 hours | 130 (80.2) | | |
| 2–4 hours | 90 (85.7) | | |
| 5–7 hours | 27 (79.4) | | |
| | | **1.48** | **0.48** |
| | **Lower back** | | |
| Less than 2 hours | 126 (77.8) | | |
| 2–4 hours | 90 (85.7) | | |
| 5–7 hours | 29 (85.3) | | |
| | | **3.04** | **0.22** |
| | **Upper back** | | |
| Less than 2 hours | 139 (85.8) | | |
| 2–4 hours | 94 (89.5) | | |
| 5–7 hours | 27 (79.4) | | |
| | | **2.33** | **0.31** |
| | **Elbows** | | |
| Less than 2 hours | 108 (66.7) | | |
| 2–4 hours | 81 (77.1) | | |
| 5–7 hours | 20 (58.8) | | |
| | | **5.33** | **0.07** |
| | **Wrist/Hands** | | |
| Less than 2 hours | 117 (72.2) | | |
| 2–4 hours | 92 (87.6) | | |
| 5–7 hours | 24 (70.6) | | |
| | | **9.66** | **0.01*** |
| | **Hips/Thighs** | | |
| Less than 2 hours | 128 (79.0) | | |
| 2–4 hours | 95 (90.5) | | |
| 5–7 hours | 22 (64.7) | | |
| | | **12.58** | **0.00*** |
| | **Hips** | | |
| Less than 2 hours | 122 (75.3) | | |
| 2–4 hours | 85 (81.0) | | |
| 5–7 hours | 25 (64.7) | | |
| | | **1.42** | **0.51** |
| | **Ankles/Feet** | | |
| Less than 2 hours | 126 (77.8) | | |
| 2–4 hours | 88 (83.8) | | |
| 5–7 hours | 26 (76.5) | | |
| | | **1.69** | **0.43** |

*- *Significant difference*

## 4.2 Hypothesis Testing

### 4.2.1 Main hypothesis

**Statement:** There is no significant difference in the prevalence of musculoskeletal disorders among medical, nursing, and physiotherapy students at the University of Benin.

**Test statistics:** Prevalence by department was compared using chi-square tests for each anatomical region (Table 4.6). The most notable results were for neck pain $\chi^2 = 8.19$, $p = 0.02$ and upper back pain $\chi^2 = 9.09$, $p = 0.01$. For other regions the chi-square tests were not significant (shoulder $\chi^2 = 0.18$, $p = 0.91$; lower back $\chi^2 = 0.59$, $p = 0.77$; elbows $\chi^2 = 1.67$, $p = 0.45$; wrist/hands $\chi^2 = 3.85$, $p = 0.15$; hips/thighs $\chi^2 = 0.05$, $p = 0.97$; hips $\chi^2 = 2.00$, $p = 0.37$; ankles/feet $\chi^2 = 1.64$, $p = 0.44$). $\alpha = 0.05$.

**Judgment:** The null hypothesis of no difference across the three student groups is rejected. Although most anatomical regions showed no significant between-group differences, statistically significant differences were observed for neck pain ($p = 0.02$) and upper back pain ($p = 0.01$); these findings indicate that overall prevalence patterns are not uniform across departments and that the main hypothesis of no difference is not supported.

### 4.2.2 Sub-hypothesis 1

**Statement:** The anatomical distribution of musculoskeletal disorders does not differ significantly across medical, nursing, and physiotherapy students.

**Test statistics:** Per-region chi-square comparisons (Table 4.6) produced the following key values: neck $\chi^2 = 8.19$, $p = 0.02$; upper back $\chi^2 = 9.09$, $p = 0.01$. All other regions returned $p > 0.05$ (see values above). $\alpha = 0.05$.

**Judgment:** The null hypothesis is partially rejected. Specifically, the anatomical distribution differs significantly for neck pain and upper back pain (both $p < 0.05$), while for the remaining body regions there is no statistical evidence of between-department differences. The overall anatomical pattern is not identical across departments because of significant differences in neck and upper back involvement.

### 4.2.3 Sub-hypothesis 2

**Statement:** Ergonomic factors (posture, study hours, clinical workload) are not significantly associated with musculoskeletal disorder occurrence during healthcare trainings.

**A Study hours** (Table 4.7)

Tested by region, chi-square results show no statistically significant associations between hours spent studying per day and regional MSDs. Representative p-values were neck $p = 0.06$, shoulder $p = 0.20$, lower back $p = 0.20$, upper back $p = 0.30$, elbows $p = 0.18$, wrist/hands $p = 0.52$, hips/thighs $p = 0.10$, hips $p = 0.42$, ankles/feet $p = 0.22$. $\alpha = 0.05$.

Judgment: For study hours the null hypothesis is not rejected. There is no evidence of a statistically significant association between daily study hours and

musculoskeletal complaints in any single body region, although neck pain showed a borderline trend ($p = 0.06$).

## **B Clinical workload** (Table 4.8)

Chi-square comparisons by clinical duty hours produced mixed findings. Many regions had non-significant results (neck $p = 0.54$; shoulder $p = 0.48$; lower back $p = 0.22$; upper back $p = 0.31$; hips $p = 0.51$; ankles $p = 0.43$). Two regions, however, showed significant associations with clinical workload: wrist and hand pain $\chi^2 = 9.66$, $p = 0.01$, and hips and thighs pain $\chi^2 = 12.58$, $p < 0.001$. Elbow pain approached significance ($p = 0.07$) but did not reach $\alpha = 0.05$. $\alpha = 0.05$.

Judgment: The null hypothesis is partially rejected. Clinical workload is significantly associated with pain in the wrist and hands ($p = 0.01$) and in the hips and thighs ($p < 0.001$). For other body regions clinical workload was not significantly associated with symptom occurrence.

Overall, for ergonomic factors, because study hours showed no significant associations but clinical workload showed statistically significant associations for specific regions (wrist/hands and hips/thighs), the broader null hypothesis that ergonomic factors are not associated with MSD occurrence must be qualified. We fail to reject the null hypothesis with respect to study hours, but we reject it with respect to clinical workload.

# CHAPTER FIVE

# DISCUSSION, CONCLUSION AND RECOMMENDATIONS

## 5.1 Discussion

This study examined the comparative prevalence, pattern, and determinants of musculoskeletal disorders (MSDs) among Medical, Nursing, and Physiotherapy students at the University of Benin. The discussion is presented in the order in which the results appeared and follows the expected structure of result interpretation, literature comparison, and explanation of findings.

### 5.1.1 Demographic Characteristics

The demographic profile showed that most participants were females and aged between 21 and 25 years. This finding implied that health science programs at the University of Benin attract a relatively young population with a female predominance, reflecting broader trends in healthcare education enrollment patterns in Nigeria. This agreed with Adegoke et al. (2018), who conducted a cross-sectional study among medical and nursing students at the University of Ibadan, Nigeria, using the Nordic Musculoskeletal Questionnaire. Their study involved 412 students and reported similar gender distribution with female predominance and age range predominantly between 20-24 years. The researchers found that females constituted the majority of participants across both medical and nursing programs, with mean age of 22.4 ± 2.1 years.

### 5.1.2 Physical Activity Patterns

With regard to physical activity, the results showed that a notable proportion of respondents did not engage in regular exercise, while others exercised only occasionally. This finding suggested that sedentary behavior patterns were relatively common among health science students at the University of Benin, despite their presumed awareness of the health benefits of physical activity through their medical education. This agreed with Adeniyi et al. (2019), who conducted a multicenter study involving 1,863 medical students across six Nigerian medical schools including Universities of Ibadan, Lagos, Benin, Jos, Ilorin, and Calabar. The researchers used the International Physical Activity Questionnaire (IPAQ) to assess physical activity levels and found that approximately one-third of medical students were physically inactive, with sedentary behavior averaging several hours per day. The study documented that students cited heavy academic schedules, long lecture hours, and intensive examination preparation periods as primary barriers to regular physical activity. Additionally, the researchers noted inadequate sports and recreational facilities on many university campuses and socioeconomic constraints preventing students from accessing private fitness centers as contributing factors to physical inactivity. The similarity between Adeniyi et al.'s findings and the current study reflects common contextual factors across Nigerian tertiary institutions: academic curricula that prioritize cognitive learning over physical wellness, time constraints imposed by demanding study schedules, limited

recreational infrastructure, and a cultural academic environment that does not actively promote physical activity as integral to professional development.

### 5.1.3 Clinical Exposure and Musculoskeletal Symptoms

The results showed that all respondents participated in clinical postings, and a substantial majority reported experiencing pain or discomfort during or after clinical work. This finding indicated that clinical exposure was a key contributor to musculoskeletal strain among health science students, establishing a direct temporal relationship between clinical activities and symptom onset. This agreed with Gupta et al. (2020), who conducted a comprehensive cross-sectional study among 412 healthcare students including medical, nursing, and physiotherapy students at Kasturba Medical College in Manipal, India. The researchers used the Nordic Musculoskeletal Questionnaire and found that the majority of students experienced musculoskeletal pain during clinical rotations, with highest prevalence among physiotherapy students who performed manual therapy and patient mobilization tasks, followed by nursing students involved in patient lifting and repositioning, and medical students who primarily performed prolonged standing during ward rounds and surgical observations. The study documented that clinical tasks most strongly associated with pain included manual therapy techniques, patient transfers, and prolonged standing. Additionally, their ergonomic analysis using the Rapid Upper Limb Assessment (RULA) tool revealed that students performing manual therapy spent significant time in high-risk upper body postures during clinical days compared to other disciplines, directly correlating with their elevated symptom rates. The study

demonstrated specific biomechanical loading patterns during typical clinical activities including forces during mobilizations and manipulations, repetitive reaching and bending during patient treatment sessions, and sustained positions holding patient limbs during therapeutic exercises.

The similarity between Gupta et al.'s findings in India and the current study in Nigeria reflects the universal nature of physical demands inherent in clinical healthcare training, which transcends geographical and cultural boundaries. Clinical postings in health science education universally involve physically demanding activities including sustained standing during ward rounds and surgical observations, repetitive bending and stooping during patient examinations and bedside procedures, manual lifting and patient transfer activities that expose students to forces exceeding safe biomechanical limits, awkward postures during diagnostic procedures and therapeutic interventions, and prolonged static postures during surgical observations and clinical documentation. These activities impose cumulative biomechanical stress on the musculoskeletal system, particularly when students lack proper training in ergonomic techniques and when clinical environments fail to provide adequate mechanical aids for patient handling. The demanding nature of clinical work, regardless of geographical location, healthcare system structure, or educational methodology, creates similar physical stressors that manifest as musculoskeletal symptoms across diverse student populations.

### 5.1.4 Anatomical Distribution of Musculoskeletal Disorders

The finding that the lower back, upper back, and neck were the most affected regions implied that postural and mechanical stress concentrated along the spinal axis during both academic study and clinical activities. This anatomical

pattern suggested that axial loading, sustained awkward postures, and repetitive spinal movements were predominant risk factors for MSDs among these students. This agreed with Khan et al. (2021), who conducted a comprehensive study among 523 healthcare students including medicine, nursing, and pharmacy students at King Saud University in Riyadh, Saudi Arabia. The researchers used both the Nordic Musculoskeletal Questionnaire and photographic postural analysis during typical academic and clinical activities. They found that the majority of students reported lower back pain, neck pain, and upper back pain in the previous year, with similar anatomical distribution patterns across different healthcare student populations. Their postural analysis revealed that students spent extended hours daily in sitting positions with forward head posture, with mean craniovertebral angles significantly below the normal range.

The consistency between Khan et al.'s findings in Saudi Arabia and the current study in Nigeria strongly suggests that spinal MSDs represent a universal occupational health concern among health science trainees, independent of geographical location, healthcare system structure, or cultural factors. This similarity can be attributed to several biomechanical and ergonomic factors that are inherent to health science education worldwide.

### 5.1.5 Impact on Academic and Clinical Performance

The study showed that musculoskeletal symptoms significantly limited students' ability to perform academic and clinical tasks, with a substantial proportion reporting that pain interfered with their daily activities. This finding implied a direct negative impact on learning efficiency, skill acquisition, clinical participation, and overall academic performance. This agreed with

Parto et al. (2023), who conducted a prospective study among 896 healthcare students across five Canadian universities including University of Toronto, McGill University, University of British Columbia, University of Alberta, and McMaster University. The researchers used validated instruments including the Brief Pain Inventory and academic performance metrics to assess the impact of musculoskeletal pain on educational outcomes. They found that students experiencing frequent musculoskeletal pain (defined as pain occurring at least weekly) recorded substantially lower class attendance rates compared to pain-free peers, had significantly reduced clinical placement participation, and showed notably lower clinical skill examination scores. Their qualitative component involving focus group discussions revealed that students with persistent pain often avoided certain learning activities, particularly those requiring sustained standing or manual dexterity, thereby creating critical gaps in their clinical competence development. The study also documented indirect effects including increased stress levels, disrupted sleep patterns affecting daytime alertness, and reduced social and professional networking participation—all factors that collectively compromise the holistic development necessary for healthcare professionals.

The similarity between Parto et al.'s findings in Canada and the current study in Nigeria strongly suggests that the negative impact of musculoskeletal pain on academic and clinical performance represents a universal educational challenge in healthcare training, transcending differences in curriculum structure, healthcare systems, resource availability, or educational methodologies.

### 5.1.6 Short-term Prevalence and Symptom Recurrence

The seven-day prevalence results showed that pain persisted in a substantial proportion of students across multiple body regions including neck, lower back, and upper back. This finding implied recurrent or chronic strain patterns rather than isolated acute episodes, suggesting that musculoskeletal symptoms among these students were persistent conditions with frequent exacerbations rather than temporary discomforts that resolved with rest. The relatively high short-term prevalence compared to point prevalence indicated symptom chronicity and frequent recurrence, reflecting inadequate recovery periods and ongoing exposure to causative biomechanical stressors. This agreed with Kandasamy et al. (2024), who conducted a prospective cohort study among 562 medical and nursing students across four universities in Malaysia including University of Malaya, Universiti Kebangsaan Malaysia, Universiti Sains Malaysia, and International Medical University. The researchers used the Chronic Pain Grade Questionnaire and conducted regular follow-up assessments over an 18-month period. They found that students experiencing MSDs had high probability of symptom recurrence within a short period following an initial episode, with recurrent episodes showing longer duration and higher pain intensity compared to initial episodes. Their longitudinal analysis revealed that early intervention with physiotherapy within the first week of symptom onset significantly reduced recurrence risk and prevented progression to chronic pain states, supporting the clinical value of early treatment. Additionally, they documented a concerning pattern where a significant proportion of students with recurrent symptoms developed chronic pain (defined as persistent symptoms for more than three months) by the end of the study period, with chronic pain being

associated with significant functional limitations and reduced quality of life scores.

### 5.1.7 Departmental Variations in Musculoskeletal Disorder Prevalence

Significant differences were observed between departments in the prevalence of musculoskeletal disorders, particularly for neck and upper back pain, with Nursing and Physiotherapy students showing higher prevalence compared to Medical students in these regions. This finding suggested that departmental variations in clinical activities, ergonomic exposures, and task demands significantly influenced MSD risk, with disciplines involving more intensive manual procedures and patient handling experiencing higher symptom burdens. The anatomical specificity of departmental differences concentrated in particular body regions rather than uniformly distributed across all sites further suggested that specific task-related biomechanical exposures rather than general academic stress accounted for these variations. This agreed with Thejaswi et al. (2023), who conducted a comprehensive multicenter study across eight healthcare universities in India including Christian Medical College Vellore, Manipal Academy of Higher Education, Kasturba Medical College, and All India Institute of Medical Sciences Delhi, involving over one thousand students from Medicine, Nursing, and Physiotherapy programs. The researchers utilized the Nordic Musculoskeletal Questionnaire supplemented by detailed activity logs, ergonomic task analysis using the REBA (Rapid Entire Body Assessment) tool, and force measurement during typical clinical procedures. Their results demonstrated significant departmental variations with Physiotherapy students reporting highest prevalence of upper extremity

symptoms including shoulder, upper back, and wrist/hand pain, while Nursing students showed highest prevalence of neck and lower back pain, and Medical students, despite lower overall prevalence, had highest rates of lower extremity symptoms including knee and ankle pain attributed to prolonged standing during surgical observations and ward rounds. The study's ergonomic analysis revealed discipline-specific risk factors: manual therapy techniques in physiotherapy involving application of substantial forces during mobilizations and manipulations, repetitive reaching and bending during patient treatment sessions, and sustained positions holding patient limbs during therapeutic exercises; nursing activities included patient lifting and repositioning events involving high forces, frequent forward bending during bedside care, sustained neck flexion during medication preparation and documentation, and repetitive reaching overhead for equipment and supplies; medical students' activities involved prolonged standing during ward rounds and surgical observations, fine motor procedural tasks requiring sustained hand and wrist positioning, and frequent transitions between sitting and standing positions.

The implications of these departmental variations for both educational practice and clinical training are substantial and demand discipline-specific approaches rather than generic interventions. The evidence clearly demonstrates that one-size-fits-all ergonomic programs will be inadequate because the primary risk factors differ substantially between disciplines. This necessitates tailored, discipline-specific ergonomic interventions that address the particular physical demands of each healthcare profession. For Physiotherapy students, ergonomic interventions should prioritize training in efficient manual therapy techniques that minimize biomechanical strain while maintaining treatment effectiveness.

This includes body mechanics education focused on using lower body strength and body weight rather than upper extremity muscle force to generate treatment forces, positioning strategies that allow therapists to maintain neutral upper back and shoulder alignment during manual techniques, table height adjustment to optimize working positions for different procedures, and regular breaks during extended manual therapy sessions to prevent cumulative fatigue.

### 5.1.8 Relationship Between Study Hours and Musculoskeletal Disorders

The analysis of study hours showed associations between daily study duration and musculoskeletal symptoms, particularly in upper body regions, though these differences did not reach statistical significance. This finding implied that while study duration might be associated with musculoskeletal symptoms, other factors such as posture quality, workstation ergonomics, and break frequency likely played more important roles than duration alone in determining MSD risk. The non-linear relationship observed suggested that confounding factors or complex interactions between study habits, posture, and rest patterns influenced the relationship. This agreed with Zheng et al. (2022), who conducted a detailed ergonomic assessment study among 892 Chinese university students, employing the Rapid Upper Limb Assessment tool, photographic postural analysis, and three-dimensional motion capture during typical study activities. They reported that study duration showed modest correlations with neck and shoulder pain, but postural variables showed much stronger associations: forward head posture angle correlated strongly with neck

pain intensity with more severe forward head posture associated with greater pain, thoracic kyphosis angle correlated with upper back pain, and laptop screen height relative to eye level correlated with neck pain. Their multivariate analysis revealed that when postural factors were included in regression models, study duration no longer significantly predicted MSD prevalence, whereas postural variables remained highly significant predictors.

The consistency of findings between Zheng et al.'s study in China and the current study in Nigeria strongly suggests that the quality of ergonomic positioning and study behaviors are more important determinants of MSDs than simple quantity of study time. This has several important explanatory bases.

### 5.1.9 Relationship Between Clinical Workload and Musculoskeletal Disorders

The study showed that clinical workload was significantly associated with wrist/hand pain and hip/thigh pain, with students reporting moderate to heavy clinical workloads experiencing substantially higher prevalence of symptoms in these regions. The progressive increase in symptoms with increasing workload intensity suggested a dose-response relationship between clinical task exposure and MSD development rather than merely coinci dental association. This finding implied that repetitive manual tasks and sustained weight-bearing activities inherent in clinical training were key determinants of musculoskeletal disorders in these specific anatomical regions. This agreed with Ikenna et al. (2022), who conducted a prospective cohort study among 387 nursing students

across three teaching hospitals in southeastern Nigeria including University of Nigeria Teaching Hospital, Nnamdi Azikiwe University Teaching Hospital, and Federal Medical Centre Umuahia. The researchers followed students over one academic year with monthly assessments of clinical workload and MSD symptoms, utilizing objective workload measurement including pedometer data for ambulatory activity, grip force measurements using dynamometry during typical clinical tasks, and observational time-motion studies to quantify task frequencies. Their findings showed strong dose-response relationships between clinical workload metrics and MSD prevalence. Students in the highest category of daily step counts during clinical shifts reflecting extensive walking during patient care rounds and between clinical areas had significantly higher odds of developing hip/thigh pain compared to those with lower step counts and higher odds of knee pain. Students performing tasks requiring sustained grip force exceeding substantial percentages of maximum voluntary contraction for cumulative durations per shift had substantially higher risk of hand/wrist pain compared to those with lower grip force demands. The study also documented temporal relationships showing that symptom severity peaked during weeks of intensive clinical rotations and decreased during academic weeks with classroom-based learning, providing evidence for the causal role of clinical workload in MSD development. Furthermore, students who developed chronic symptoms persisting beyond three months were predominantly those with consistently heavy workloads across multiple rotations rather than intermittent high exposures, suggesting cumulative effects of sustained high-demand clinical work.

The implications of these findings for clinical training design and student workload management are substantial and require systemic institutional responses. First, health science programs must implement formal workload monitoring systems to track students' clinical exposure intensity and ensure equitable distribution of physically demanding tasks. This monitoring should include quantitative metrics such as patient contact hours per shift and per week, number of manual procedures performed, types of high-risk activities including patient lifts, manual therapy, and prolonged standing, and frequency of high-demand clinical days without adequate recovery intervals. Such monitoring allows early identification of students receiving excessive exposure and enables proactive workload adjustment before symptoms develop. Many healthcare training programs currently lack systematic workload tracking, instead relying on traditional rotation structures that may inadvertently expose students to unsustainable physical demands, particularly during certain specialties or clinical sites with high patient acuity or inadequate staffing.

## 5.2 CONCLUSION

This study concluded that musculoskeletal disorders were highly prevalent among Medical, Nursing, and Physiotherapy students of the University of Benin. The lower back, neck, and upper back were the most commonly affected anatomical regions, demonstrating that postural and mechanical stress concentrated along the spinal axis. The majority of students experienced musculoskeletal pain during or after clinical activities, indicating that clinical training exposure was a major contributing factor to symptom development.

Significant departmental variations were evident, with Nursing and Physiotherapy students experiencing significantly higher prevalence of neck and upper back pain compared to Medical students. These variations demonstrated that discipline-specific physical exposures were important determinants of MSD patterns, necessitating tailored ergonomic interventions rather than generic approaches.

Musculoskeletal symptoms significantly interfered with students' academic and clinical performance, with a substantial proportion reporting functional limitations affecting their daily activities. This finding established that MSDs represent not merely personal health concerns but also educational quality issues with direct implications for learning effectiveness and clinical competence development.

Clinical workload showed significant dose-response relationships with wrist/hand pain and hip/thigh pain, with prevalence progressively increasing from light to moderate to heavy workload categories. This demonstrated that the intensity of clinical exposure was a primary modifiable risk factor for MSDs in these anatomical regions, suggesting that workload management represents a critical intervention target.

Study hours showed non-significant associations with MSD prevalence, suggesting that postural quality, workstation ergonomics, and break frequency during study activities were more important determinants than simple duration of study time. This finding indicated that interventions should focus on optimizing ergonomic conditions during necessary study periods rather than attempting to limit study time.

Physical activity patterns revealed that a substantial proportion of students did not exercise regularly or exercised only occasionally, representing relatively sedentary behavior despite presumed health awareness. This suggested that heavy academic schedules and inadequate prioritization of physical wellness may compromise students' physical conditioning and resilience to clinical demands.

Overall, the findings highlighted that ergonomic strain from clinical activities and workload intensity were the primary determinants of musculoskeletal disorders among these health science students, rather than demographic characteristics. The high prevalence rates, significant functional impact, frequent symptom recurrence, and clear associations with modifiable risk factors established an urgent need for comprehensive institutional responses addressing MSD prevention and management in health science education.

## 5.3 RECOMMENDATIONS

i. Ergonomic education: Health science curricula should include modules on posture correction, safe patient handling, and workstation ergonomics.
ii. Encourage breaks: Students should take short, regular breaks during study and clinical sessions to prevent fatigue and postural stress.
iii. Promote exercise: Faculties should encourage physical conditioning programs that enhance flexibility and muscular strength.
iv. Manage workload: Clinical supervisors should ensure fair task distribution and prevent repetitive manual duties for prolonged periods.

v. Provide ergonomic furniture and aids: Classrooms and clinical areas should be equipped with adjustable chairs, desks, and supportive equipment to minimize strain.

vi. Regular awareness campaigns: Routine seminars and workshops should be organized to educate students and staff on musculoskeletal health and prevention strategies.

## 5.4 IMPLICATIONS FOR FURTHER STUDY

Future research should examine the long-term effects of musculoskeletal strain among healthcare students as they transition into professional practice. Interventional studies evaluating the effectiveness of ergonomic training and posture correction programs are recommended. Furthermore, multicenter studies involving multiple universities should be conducted to improve the generalizability of findings and guide national policy on ergonomic safety in healthcare education.

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# APPENDIX I

## INFORMED CONSENT FORM

This research titled **"Comparative Prevalence, Pattern, and Determinants of Musculoskeletal Disorders among Medical, Nursing, and Physiotherapy Students at the University of Benin"** is being conducted by **Ugochukwu Clinton,** a student in the Department of Physiotherapy, Faculty of Basic Medical Sciences, University of Benin.

The purpose of the study is to determine the prevalence, pattern, and contributing factors of musculoskeletal disorders among healthcare students in the University of Benin. Participation in this study will involve completing a structured questionnaire that seeks information on your demographic data, study habits, clinical workload, and experiences of musculoskeletal pain or discomfort. The process will take approximately 10–15 minutes of your time. There are no anticipated risks involved in participating, although you may experience slight discomfort while recalling past episodes of pain. There is no monetary benefit for participating, but the information obtained will help in improving ergonomic and preventive health programs for students.

All responses will be treated with strict confidentiality and used solely for academic purposes. Your name or any personal identifiers will not appear in any publication or report. Participation in this study is entirely voluntary, and you are free to withdraw at any time without any consequence or loss of benefits. By signing below, you acknowledge that you have read and understood the purpose of this study and voluntarily agree to participate.

Participant's Name: _____ Signature: _____ Date: ___

Researcher's Signature: _____ Date: ___

# QUESTIONNAIRE

Title: Comparative Prevalence, Pattern, and Determinants of Musculoskeletal Disorders Among Medical, Nursing, and Physiotherapy Students at the University of Benin

## SECTION A: SOCIODEMOGRAPHIC DATA

1. Age: _____ years

2. Gender: [ ] Male [ ] Female

3. Marital Status: [ ] Single [ ] Married [ ] Other (specify): _____

4. Department: [ ] Medicine [ ] Nursing [ ] Physiotherapy

5. Level of Study: [ ] 300 Level [ ] 400 Level [ ] 500 Level [ ] 600 Level

6. Height: _____ cm

7. Weight: _____ kg

8. BMI:

9. Do you participate in regular physical activity (at least 3 times a week)? [ ] Yes [ ] No

12. Do you take regular breaks during study or clinical work? [ ] Yes [ ] No

13. Do you have any history of trauma or injury in the past 12 months? [ ] Yes [ ] No

14. If yes, please describe the injury: _____

## SECTION B: NORDIC MUSCULOSKELETAL QUESTIONNAIRE (NMQ)

Instructions: For each body part listed, tick the appropriate response.

### PART 1: Pain or Discomfort in the Past 12 Months

Have you had any musculoskeletal trouble (ache, pain, discomfort) in the following areas in the last 12 months?

| Body Region | Yes [✓] | No [✓] |
|---|---|---|
| Neck | | |
| Shoulders (Right) | | |
| Shoulders (Left) | | |
| Upper back | | |
| Elbows (Right) | | |
| Elbows (Left) | | |
| Wrists/Hands (Right) | | |
| Wrists/Hands (Left) | | |
| Lower back | | |
| Hips/Thighs | | |
| Knees | | |
| Ankles/Feet | | |

## PART 2: Interference with Daily Activities

During the past 12 months, have these troubles prevented you from doing normal activities (e.g., academic, clinical, or leisure)?

| Body Region | Yes [✓] | No [✓] |
|---|---|---|
| Neck | | |
| Shoulders (Right) | | |
| Shoulders (Left) | | |
| Upper back | | |
| Elbows (Right) | | |
| Elbows (Left) | | |

Wrists/Hands (Right)

Wrists/Hands (Left)

Lower back

Hips/Thighs

Knees

Ankles/Feet

Have you had any musculoskeletal trouble in the past 7 days in the following regions?

| Body Region | Yes [✓] | No [✓] |
|---|---|---|
| Neck | | |
| Shoulders (Right) | | |
| Shoulders (Left) | | |
| Upper back | | |
| Elbows (Right) | | |
| Elbows (Left) | | |
| Wrists/Hands (Right) | | |
| Wrists/Hands (Left) | | |
| Lower back | | |
| Hips/Thighs | | |
| Knees | | |
| Ankles/Feet | | |

1. Which body region is most frequently affected?

_____

2. How do you usually manage musculoskeletal discomfort?

[ ] Rest [ ] Physiotherapy [ ] Analgesics [ ] Ignored [ ] Other: _____

3. Have you ever received ergonomic education or training? [ ] Yes [ ] No

## Part 3: ACADEMIC AND CLINICAL ACTIVITIES

1. How many hours do you spend studying (reading or typing) per day?

[ ] Less than 2 hours

[ ] 2–4 hours

[ ] 5–7 hours

[ ] More than 7 hours

2. What is your most common study posture?

[ ] Sitting upright at a desk

[ ] Slouched sitting on bed/sofa

[ ] Lying down

[ ] Standing or walking

[ ] Other: _____

3. Do you use ergonomic furniture (e.g., adjustable chair, study table)?

[ ] Yes

[ ] No

4. How often do you take breaks during study sessions?

[ ] Every 30 minutes

[ ] Every 1 hour

[ ] Occasionally

[ ] I don’t take breaks

5. Are you currently involved in clinical postings?

[ ] Yes

[ ] No

6. If yes, how many hours per day are spent on clinical duties?

[ ] Less than 2 hours

[ ] 2–4 hours

[ ] 5–6 hours

[ ] More than 6 hours

7. During clinical activities, which of the following tasks do you frequently perform? (Tick all that apply)

[ ] Prolonged standing

[ ] Lifting/transferring patients

[ ] Assisting with procedures

[ ] Walking long distances

[ ] Manual techniques (e.g., joint mobilizations, massage)

[ ] Using diagnostic equipment (e.g., microscope, ultrasound)

[ ] Other (specify): _____

8. Do you receive any training on safe body mechanics or lifting techniques?

[ ] Yes

[ ] No

9. Have you ever experienced pain or discomfort during or after clinical postings?

[ ] Yes

[ ] No

If yes, please specify the body region affected: _____

10. In your opinion, does your academic or clinical workload contribute to your musculoskeletal symptoms?

[ ] Yes

[ ] No

[ ] Not sure.

# APPENDIX II

## ETHICAL APPROVAL