CORRELATION BETWEEN SLEEPING SURFACES AND MUSCULOSKELETAL PAIN IN RESIDENTS OF CAMPUS HOSTELS WITHIN THE UNIVERSITY OF BENIN

BY

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CERTIFICATION

This dissertation by Ahmed Destiny Tobechukwu is accepted in its presented form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences of the University of Benin.

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DEDICATION

This dissertation is dedicated to God almighty, for giving me the grace and strength to keep pushing, Prof. Ezeukwu (my project supervisor), my late mother Nnebuogor Odiaka, my fathers Mr. Ahmed Abdulmalik and Rev. Fr. Franklin Odiaka and my senior colleague PT. Kolawole (Klaus) who held my hand through the process.

ABSTRACT

Background: Musculoskeletal pain (MSP) is a recurrent health concern among university students and can be facilitated by ergonomic and environmental factors, including sleeping surfaces. Poor mattress quality, inappropriate firmness, or prolonged use may expose individuals to spinal discomfort and reduced sleep satisfaction. Despite the significance of this relationship, limited research has explored the role of sleeping surfaces in MSP among Nigerian university students.

Aim: This study investigated the correlation between sleeping surfaces and musculoskeletal pain among residents of campus hostels within the University of Benin.

Methods: A cross-sectional survey design was adopted involving 346 participants (60.2% females, 39.8% males) selected through stratified random sampling from five hostels. Data were collected using a structured questionnaire comprising the Nordic Musculoskeletal Questionnaire (NMQ) and the Boston Mattress Satisfaction Questionnaire (BMSQ). Descriptive and inferential statistics were performed using SPSS version 26. The level of statistical significance was set at $p < 0.05$.

Results: The most frequently reported regions of pain were the lower back (50.7%), neck (47.3%), and upper back (43.6%). Foam mattresses were predominantly used (95.7%) with a mean thickness of 7.12 ± 2.61 cm and average sleep duration of 5.76 ± 1.31 hours. Significant associations were found between mattress type and pain in the wrist/hands, upper back, and ankles, and between duration of mattress use and pain in the neck, shoulder, elbow, upper back, and hips/thighs ($p < 0.05$).

Conclusion: The study concluded that the type and duration of mattress use significantly influence musculoskeletal pain among hostel residents. Prolonged use of substandard or worn-out foam mattresses contributes to pain and reduced sleep satisfaction. It is recommended that students and hostel management prioritize ergonomic education, regular mattress replacement, and physiotherapy-led interventions to improve spinal health and sleep quality.

Keywords: Sleeping surface, Musculoskeletal pain, Hostel residents, Mattress, University of Benin.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

A vital component of overall human health is sleep. It is essential for emotional control, cognitive function, and physical recuperation. Sleep quality has an impact on university students' general health, focus, and academic achievement. Students at universities who get low quality sleep may suffer negative consequences on their cognitive and academic performance (Trockel, Barnes & Egget, 2000; Hamblin, 2007). Sleep quality encompasses several various aspects of sleep habits including sleep disturbances and sleep duration (Storie-Soth et al., 2024), these also arise from various sleep surfaces.

Mattresses and bed structures are examples of sleeping surfaces, and they have a direct impact on posture, spinal alignment, and pressure distribution while you're sleeping or resting. Inadequate body alignment caused by worn-out or poor-quality mattresses can result in musculoskeletal pain in areas that are prone to strain during less-than-ideal sleeping conditions, such as the neck, hips, and lower back. Sleep surfaces definitely significant when it comes to sleep quality and frequent health issues of musculoskeletal discomfort and day time function (Wong, et al., 2019). Although, the exact mechanism underlining the relationship between sleep and chronic pain is still not very clear (Mathias, et al., 2018; Vinstrup, et al., 2020), a number of factors have been suggested, including abnormal brain wave activity, structural alterations in the brain, and defaults in inflammatory pain markers (Mork, et al., 2014; Mathias, et al., 2018; Babiloni, et al., 2020).

At the University of Benin, students often reside in campus hostels. The quality of the bedding varies among the university's more than eighteen residential facilities. In some residence halls, the school supplies mattresses for the students, while in others, the school suggests a standard student-sized mattress. Other students choose to bring their own mattresses, as long as they fit the bunks or bed stands in each room they occupy. The potential direct or indirect relationship between sleeping surfaces and musculoskeletal discomfort among University of Benin hostel occupants is called into question by these variations in bedding types.

Despite the potential implications for student well-being and academic productivity, very few studies have explored musculoskeletal pain in light of this relationship to sleeping surfaces within the Nigerian university context. This study aims to bridge that gap by carrying out a proper investigation, thereby finding out the correlation between sleeping surfaces and musculoskeletal pain among residents of campus hostels within the University of Benin.

1.2 STATEMENT OF THE PROBLEM

Musculoskeletal pain is a growing concern among youth and adolescents (who make up the majority of the population of students). According to studies, musculoskeletal pain is common among college students, particularly in areas like the neck and low back (Okafor et al., 2019; Ayanniyi & Udofia, 2016). While there have been a number of studies on contributing factors such as posture, physical activity, and stress (Ezeukwu, Onyeso & Ezeukwu, 2022), the possible role and contribution of sleeping surfaces to such pain has received comparatively less attention.

An average adult is generally advised to get 7 - 9 hours of sleep every day. Research indicates that university students, including those in Nigeria, frequently sleep for only six hours every night as a result of lifestyle and academic demands (Nwachukwu et al., 2021). This amounts to around 25% of the day, and any problems in the sleeping surfaces during this period may have a major effect on everyday functioning and musculoskeletal health. Notwithstanding these reservations, very few studies conducted in Nigeria have thoroughly examined the state of the sleeping surfaces in campus hostels and their impact on the musculoskeletal health of students. Therefore, by addressing an overlooked aspect of student health and providing information for preventive measures, our study aims to bridge this gap.

1.3 RESEARCH QUESTIONS

1. What are the types and conditions of sleeping surfaces that are used in the University of Benin hostels?
2. What is the prevalence and pattern of this musculoskeletal pain among such students?
3. Is there a significant correlation between the nature of sleeping surfaces and musculoskeletal pain?

1.4 AIMS OF THE STUDY

To ascertain the correlation/relationship between sleeping surfaces and musculoskeletal disorders in residents of campus hostels within the University of Benin.

1.5 SPECIFIC OBJECTIVES

1. To analyze the variety and conditions of sleeping surfaces used by hostel residents.
2. To determine the prevalence and distribution of musculoskeletal pain among these residents.
3. To examine the relationship between this musculoskeletal pain and the sleeping surfaces and their characteristics.

1.6 HYPOTHESES

1.6.1 Main Hypothesis:

There is no significant correlation between sleeping surface characteristics and the prevalence of musculoskeletal pain among campus hostel residents of the University of Benin.

1.6.2 Sub-Hypotheses:

1. There is no significant correlation between the type of sleeping surface (e.g., foam, spring, orthopedic mattress) and the prevalence of musculoskeletal pain.
2. There is no significant correlation between mattress thickness and the prevalence of musculoskeletal pain.
3. There is no significant correlation between the duration of using the mattress and musculoskeletal pain among residents.
4. There is no significant relationship between type of mattress and neck pain prevalence among residents.
5. There is no significant relationship between type of mattress and shoulder pain prevalence among residents.

6. There is no significant relationship between type of mattress and elbow pain prevalence among residents.
7. There is no significant relationship between type of mattress and wrist/hand pain prevalence among residents.
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25. There is no significant relationship between mattress firmness and upper back pain prevalence among residents.
26. There is no significant relationship between mattress firmness and lower back pain prevalence among residents.
27. There is no significant relationship between mattress firmness and hips/thighs pain prevalence among residents.
28. There is no significant relationship between mattress firmness and knee pain prevalence among residents.
29. There is no significant relationship between mattress firmness and ankle pain prevalence among residents.

1.7 SIGNIFICANCE OF STUDY

This study is significant for many reasons;

It aims to raise academic consciousness about the quality of sleeping surfaces, a largely overlooked but crucial component of students' welfare. The role of bedding conditions in the Nigerian context has received relatively little empirical investigation, despite some attention being paid to other elements and factors that impact student wellbeing (such as stress, lifestyle, and posture) and their contribution to musculoskeletal pain and disorders in students. The goal of this study is to fill a significant gap in local literature by examining this relationship.

Additionally, by identifying a significant modifiable environmental factor that contributes to experiences of pain among the young population, these research findings may have practical implications for healthcare providers, especially physiotherapists and other primary healthcare professionals. In order to improve student comfort and reduce their dependency on medicine and medical services, early detection of these factors is essential for more targeted preventative measures, ergonomic education, and therapeutic interventions.

Furthermore, the results of this study may help students and university administrators make more informed choices about bedding purchases and hostel facilities. Evidence-based guidelines could help institutions like the University of Benin understand the value of good bedding and how it affects sleep quality and, in turn, academic performance, improving general health and function.

Finally, this study can be used as a benchmark for further research in the fields of ergonomics, physiotherapy, public health, and student welfare. It might also lead to more extensive research at several Nigerian universities, which would improve national standards for student living conditions and healthcare policy changes in the educational system.

1.8 SCOPE/ DELIMITATION

The study is limited to undergraduate students of University of Benin, Benin City, Edo State, who reside in campus hostels. It focuses on the nature, condition and characteristics of their sleeping surfaces, including mattress types, thickness, firmness, duration of use and bed frame type, as reported by the students. It also evaluates the prevalence of musculoskeletal pain, the pattern, the duration, and the anatomical location among this population.

To ensure adequate exposure to these surfaces, participants will be limited to only students who have consistently used their sleeping surfaces for a duration of at least two months. This criterion is crucial to give sufficient time for any effects of the sleeping surfaces on musculoskeletal pain to manifest.

The study does not extend to students living off-campus, as their sleeping arrangements may differ widely and may be unable to be standardized within this research. Additionally, it does not include or take into consideration other potential risks of musculoskeletal pain, like past trauma, sports injuries, and so on.

The study uses self-reported data and may be subject to recall or reporting bias. However, it remains a valuable contribution to research and the understanding of how environmental factors contribute to musculoskeletal pain and student comfort.

3.4 Limitations of The Study

This study was limited by its cross-sectional design, which hinders causal inference, even though the results were pertinent. The possibility of recall bias was introduced by the self-reported nature of the data. Furthermore, comparative statistical analysis was constrained by the small number of orthopedic mattress users. To improve generalizability, future research should use bigger, multi-campus samples and objective biomechanical evaluations.

3.4 OPERATIONAL DEFINITION OF TERMS

- **Correlation:**

Correlation refers to a statistical relationship between two variables. In the context of this study, it describes the extent to which sleeping surface characteristics are associated with self-reported musculoskeletal pain (Field, 2018).

- **Hostel residents:**

These are undergraduate students who reside in university-managed campus accommodation and who have used their current sleeping surfaces consistently for a minimum of two months. This criterion ensures adequate exposure for the study (University of Benin, 2025).

- **Musculoskeletal pain:**

This is discomfort or pain originating from the muscles, bones, joints, ligaments, tendons, or nerves. It may be localized or widespread and is commonly experienced in the neck, back, shoulders, or limbs (Cleveland Clinic, 2023).

- **Sleeping Surfaces:**

  This refers to the combination of bedding materials—primarily the mattress and bed frame—on which an individual sleeps. The characteristics of the mattress, such as firmness, type, thickness, and age, affect spinal alignment and pressure distribution during rest (DeVocht et al., 2006).

3.4 LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
MSK	Musculoskeletal
BMI	Body Mass Index
WHO	World Health Organization
LBP	Low Back Pain
NMQ	Nordic Musculoskeletal Questionnaire
NMQ-E	Extended Version of the Nordic Musculoskeletal Questionnaire
BMSQ	Boston Mattress Satisfaction Questionnaire
UNIBEN	University of Benin
Cm	Centimeters
Kg	Kilograms
m^2	Square meters
SPSS	Statistical Package for the Social Sciences

CHAPTER 2: LITERATURE REVIEW

2.1 Epidemiology of musculoskeletal pain

2.1.1 Introduction

Musculoskeletal pain (MSP) is a crucial public health concern globally, cutting across all age groups and occupational categories. In the university student population, the prevalence of MSP has gained quite some attention in recent years due to their unique physical, psychological, physiological, and even environmental factors and demands placed on them. These students, especially those who reside in campus hostels, are often faced with long hours of academic engagement, which is backed by prolonged sitting, poor ergonomic setups, psychological stress, and, in many cases, substandard sleeping arrangements—all of which are predisposing factors to musculoskeletal pain.

2.1.2 Global Prevalence of Musculoskeletal Pain Among University Students

MSP is one of the most reported health concerns among university populations. According to the World Health Organization (WHO), musculoskeletal conditions are the leading contributor to disability worldwide, with low back pain ranking as the single leading cause of years lived with disability in 160 countries (WHO, 2021).

Kandasamy et al. (2023) revealed in a study conducted in Canada that there is a high prevalence of MSP among university students, with 68.4% of the surveyed students reporting musculoskeletal symptoms within the past 12 months. The most significantly reported were neck and low back pain and the relevant contributing factors were stress, poor sleep quality and prolonged screen time.

Similarly, research from Malaysia done by Alshagga et al. (2013) reported that over 65% of medical students experienced MSP in at least one region of the body. Again, the neck, shoulders and lower back were the most commonly affected, with the major risk factors being long study hours and prolonged computer use.

A cross-sectional study done in the middle east among medical students at King Saud University in Saudi Arabia discovered that 33.3% experienced lower back pain, with 25.8% reporting neck pain and 21.7% shoulder pain (Haroon et al., 2018). The study highlighted poor mattress quality and lack of physical activity as contributing factors.

Several studies have demonstrated a direct link between poor sleeping surfaces and MSP, particularly in the low back. A biomechanical analysis of different mattress types by DeVocht et al. (2006) was conducted, and it revealed that inadequate spinal support during sleep significantly increased spinal loading and muscle tension, which are precursors to MSP. Similar findings were mirrored in an ergonomic review by Jacobson et al. (2010), which also reported that mattress firmness and wear level have measurable effects on sleep quality.

These global studies prove that MSP is a widespread issue in the university student community, with multiple contributing factors across the world ranging from ergonomics to poor posture, stress, and even sleeping conditions.

2.1.3 Regional and Local Prevalence in Nigeria

In Nigeria, complaints of MSP have also been widely reported, although local studies are fewer in comparison to global studies. Regardless, available research still suggests that MSP is a pressing concern among the Nigerian university student's community.

A remarkable study conducted at a Nigerian university by Ayanniyi and Udofia (2016) reported a lifetime prevalence of 54.5% with a point prevalence of 51.7%. Prolonged poor postures during classes and studying were the significant contributors, and the most affected regions of the body were the lower back (55.1%) and neck (53.8%).

Another Nigerian study by Okafor et al. (2022) at the University of Lagos reported a similarly high prevalence of MSP in students, which was most common in the lower back and neck regions. This study statistically proved a link between reduced physical activity and an increase in MSP. The students also reported prolonged use of devices and poor-quality bedding material in campus hostels as aggravating factors.

At Obafemi Awolowo University (OAU), Ile-Ife, a study among undergraduate students who are laptop users shows a prevalence of shoulder pain of 75.7% followed by neck pain and then upper back pain (Obembe et al., 2013). Female students between 24 and 26 years were found to be the most affected, and poor ergonomics and inadequate mattress support were reported to be predisposing risk factors.

Musculoskeletal pain is an inescapable global health concern. The World Health Organization (WHO) has identified low-back pain as a leading cause of disabilities across the globe. In Nigeria, MSP cuts across various population groups including university students, workers, and even adolescents, due to so many predisposing factors. A good example is a study by Igwesi-Chidobe et al. (2017), which reported a high prevalence of chronic low back pain in rural communities, attributing it to both biomechanical and psychosocial factors.

In summary, while MSP is a widespread issue both globally and nationally, university students in Nigeria, especially those residing in campus hostels, constitute a uniquely at-risk population due to environmental exposures such as poor sleep quality, stress and poor ergonomic conditions. There is, therefore, a dire need to further look into the possibility of certain modifiable factors like sleeping surfaces making specific contributions to MSP among the undergraduate population, thereby tailoring interventions for improved students' well-being and academic performance.

2.2 Aetiology

Musculoskeletal pain (MSP) is a multifactorial condition that can arise from intrinsic and extrinsic contributing and aggravating factors. Its aetiology varies widely, depending on certain characteristics like demography, psychosocial stressors, ergonomic conditions, occupational and environmental conditions. In the case of university students, especially those who reside in campus hostels, several aetiological factors are commonly indicated.

1. **Biomechanical and Postural Stress:**

Improper body positioning, particularly during extended periods of sitting or lying down, plays a crucial role in the development of musculoskeletal pain (MSP). When an individual maintains poor posture, it can place excessive strain on various structures, including muscles, tendons, and ligaments. This repetitive strain may lead to micro-trauma within these tissues, resulting in inflammation and discomfort.

Additionally, the quality of the support provided by a mattress significantly influences spinal health. The use of worn-out mattresses that are overly thin and soft can exacerbate the problem by failing to provide adequate support. Such mattresses cause uneven distribution of body weight, which in turn leads to improper spinal alignment. This misalignment places additional strain on soft tissues surrounding the spine and contributes to muscle fatigue, further compounding the potential for chronic musculoskeletal issues. Therefore, maintaining proper body positioning and utilizing supportive sleep surfaces are essential for preventing MSP development. (DeVocht et al., 2006).

2. **Sleep surface quality:**

The physical properties of mattresses and bed frames are critical factors in both preventing and exacerbating musculoskeletal pain (MSP). Research indicates that mattresses that are either excessively soft or overly firm fail to provide the necessary support for the lumbar spine, leading to improper spinal alignment and discomfort. A notable study conducted by Jacobson et al. (2010) found that individuals who transitioned from using soft or firm mattresses to medium-firm mattresses experienced significant reductions in both back pain and perceived stress levels. This suggests that suboptimal sleeping surfaces not only compromise sleep quality but can also worsen symptoms of MSP. The findings underscore the importance of choosing a mattress that strikes the right balance of firmness to promote better spinal health and overall well-being.

3. Academic and Psychosocial Stress in Undergraduate Students:

Undergraduate students frequently experience significant levels of stress stemming from both academic pressures and social expectations. The rigorous demands of coursework, coupled with the pressure to maintain a strong social network, can contribute to heightened psychological stress. Chronic stress of this nature has been associated with increased muscle tension, which can alter an individual's perception of pain, potentially exacerbating musculoskeletal pain (MSP) symptoms (Bongers et al., 2006).

Moreover, this type of stress can lead to a cycle where anxiety and depression reduce the pain threshold, making students more susceptible to developing chronic pain conditions. For instance, students facing overwhelming deadlines might engage in poor posture or insufficient physical activity, further contributing to muscle tightness and discomfort. This interplay between psychological factors and physical health highlights the need for effective stress management strategies to support student well-being and minimize the risk of chronic pain.

4. Physical Inactivity and Sedentary Lifestyle:

The absence of regular physical activity significantly undermines the integrity of the musculoskeletal system, leading to a notable decline in strength, endurance, and flexibility. This issue is particularly pronounced among students, who frequently find themselves seated for prolonged periods while studying or engaging with electronic devices, such as computers, tablets, and smartphones. Often, these sessions last for hours at a time, with minimal breaks taken for physical movement or stretching.

The impacts of a sedentary lifestyle extend far beyond mere discomfort; research indicates that it substantially increases the risk of developing musculoskeletal pain (MSP) in various regions of the body, including the neck, back, and shoulders. Furthermore, a lack of movement can exacerbate pre-existing conditions, making them more challenging to manage and recover from. It can also prolong the rehabilitation process for individuals already suffering from MSP, as a sedentary lifestyle is linked to weakened muscles and reduced joint flexibility, factors that are crucial for effective recovery (Cimmino et al., 2011). Encouraging regular physical activity and implementing structured breaks for movement can play a vital role in mitigating these risks, promoting better overall health and well-being among students.

5. **Ergonomic and Environmental Factors:**

Hostel settings frequently suffer from a lack of ergonomic furniture, which can significantly increase the risk of musculoskeletal strain among residents. For instance, many beds are not designed to meet biomechanical standards, leading to improper posture while sleeping. Students often engage in a variety of activities in these beds, such as reading, studying, and typing on laptops. This multi-use not only exacerbates physical stress on the neck and back but can also lead to chronic pain and discomfort over time.

Moreover, the overall living conditions contribute to physical well-being. Poor ventilation can result in stale air and inadequate oxygen flow, which, alongside temperature extremes—whether it's too hot or too cold—can further disrupt sleep patterns. Coupled with limited personal space, these factors can diminish sleep quality and hinder recovery, ultimately affecting students' academic performance and mental health. It's essential to consider these environmental aspects when assessing the impact of hostel living on student well-being (Hoy et al., 2012).

6. **Gender and Biological Differences:**

As seen in some studies in the epidemiological section, gender plays a vital role in the development and overall experience of MSP. Numerous studies have established that women are significantly more likely to report experiencing multisite pain (MSP) compared to men. This trend is attributed to a complex interplay of biological, hormonal, psychological, and sociocultural factors. For instance, hormonal fluctuations, particularly variations in estrogen and progesterone that occur throughout the menstrual cycle, are known to influence pain sensitivity. Research indicates that these hormonal changes can increase the susceptibility to chronic pain conditions in females, as highlighted by Bartley & Fillingim (2013), who found that women often report heightened pain during specific phases of their cycle.

Furthermore, women typically demonstrate greater health-seeking behaviors, actively seeking medical attention and being more open about their pain experiences. This tendency can lead to higher documented prevalence rates of chronic pain conditions in women compared to men. In addition to biological factors, various psychosocial elements play a critical role in this disparity. For example, women often shoulder caregiving responsibilities, which can contribute to increased stress levels and emotional strain, further exacerbating their pain experiences.

Cultural norms also significantly impact the portrayal and reporting of pain between genders. Societal expectations often discourage men from expressing vulnerability or discomfort, leading to a tendency among male students to underreport their pain experiences. Therefore, this cultural stigma may distort the perceived prevalence of pain across genders, as noted by Fillingim et al. (2009). The result is a complex landscape where biological and sociocultural influences converge, ultimately shaping the understanding of pain experiences in different genders.

7. **Pre-existing conditions and comorbidities:**

Although this study excludes participants with known chronic conditions, it is crucial to recognize that undiagnosed health issues—such as scoliosis, which affects the curvature of the spine; arthritis, a condition characterized by inflammation and pain in the joints; and vitamin D deficiency, which can lead to musculoskeletal pain—can significantly contribute to overall pain experiences. These underlying health issues not only increase individual susceptibility to pain but can also interact with various environmental stressors, such as physical activity levels, occupational demands, and lifestyle factors, to further intensify musculoskeletal pain (MSP). This interplay underscores the importance of comprehensive health assessments to identify potential hidden conditions that may exacerbate pain in affected individuals.

In summary, understanding the causes of musculoskeletal pain among students reveals a complex web of factors that can significantly impact their well-being. For those living on campus, a combination of inadequate sleep environments, academic pressures, sedentary lifestyles, and poor ergonomics creates a perfect storm that heightens the risk of chronic pain conditions. Addressing these interconnected issues is essential for fostering healthier habits and improving overall student health.

2.3 ANATOMY AND PATHOPHYSIOLOGY

Musculoskeletal pain (MSP) related to sleeping surfaces and body posture primarily affects the axial skeleton, which includes the spine, and involves the surrounding musculature and connective tissues. These structures are crucial for maintaining proper posture, balance, and efficient load transmission during periods of rest and sleep. A comprehensive understanding of this anatomy—encompassing the vertebrae, intervertebral discs, ligaments, muscles, and fascia—can offer valuable insights into the pathomechanics of MSP, particularly in specific living situations such as hostel residency, where sleeping conditions may vary widely. Factors such as mattress firmness, sleeping position, and the ergonomic design of sleeping accommodations can have significant implications for the development and exacerbation of pain. Understanding these dynamics is essential for addressing and mitigating the discomfort associated with inadequate sleeping arrangements and postural habits.

2.3.1 The Vertebral Column

The vertebral column serves as the main axis of the body and consists of 33 vertebrae organized into five sections: cervical (7), thoracic (12), lumbar (5), sacral (5, fused), and coccygeal (4, fused). Each vertebra plays a role in safeguarding the spinal cord, supporting the body's weight, and enabling movement and posture (Chaurasia, 2013).

- **Cervical spine (C1-C7):** The cervical spine is designed for mobility, especially at the Axis (C1) and axis (C2). It allows nodding and rotation of the head. Due to its high mobility and the delicate alignment required, the cervical region is especially prone to stress and strain. Inadequate pillow support or prolonged hyperflexion during sleep may result in tension and inflammation in the cervical muscles and intervertebral joints (Moore et al., 2013; Chaurasia, 2013).

- **Thoracic spine (T1 – T12):** The thoracic spine consists of twelve vertebrae (T1–T12) that connect with the ribs, offering stability and safeguarding thoracic organs. While this area is less flexible, issues such as poor posture or an uneven sleeping surface can result in muscle imbalances and joint dysfunction, especially around the shoulder blades, which may cause thoracic discomfort or intercostal strain.

- **Lumbar spine (L1 – L5):** The lumbar vertebrae (L1–L5) are the largest and strongest, tailored to support substantial weight and mechanical strain.

The lumbar region's natural lordotic curve enables efficient shock absorption and proper alignment. However, using excessively soft or uneven mattresses can either flatten or enhance this curve, leading to lumbar strain, disc compression, and mechanical back pain. Among students, lumbar pain is one of the most frequently reported problems linked to inadequate sleeping surfaces (Moore et al., 2013; Jacobson et al., 2010).

- **Sacral spine (S1 – S5):** The sacral vertebrae comprise five fused vertebrae (S1–S5) that form the sacrum, a large, triangular bone located at the base of the spine and between the two iliac bones of the pelvis. This fusion occurs during adolescence and early adulthood, resulting in a strong, immobile structure that supports the weight of the upper body when standing and sitting. Laterally, it forms the sacroiliac joints with the ilium bones, playing a critical role in load transfer between the spine and lower limbs. Abnormalities in this region can contribute to low back pain, sacroiliac joint dysfunction, or postural imbalances—all of which are relevant when evaluating the musculoskeletal effects of prolonged or poor-quality sleep surfaces (Moore, Dalley and Agur, 2018).

Figure 1: Vertebral column and its five regions.

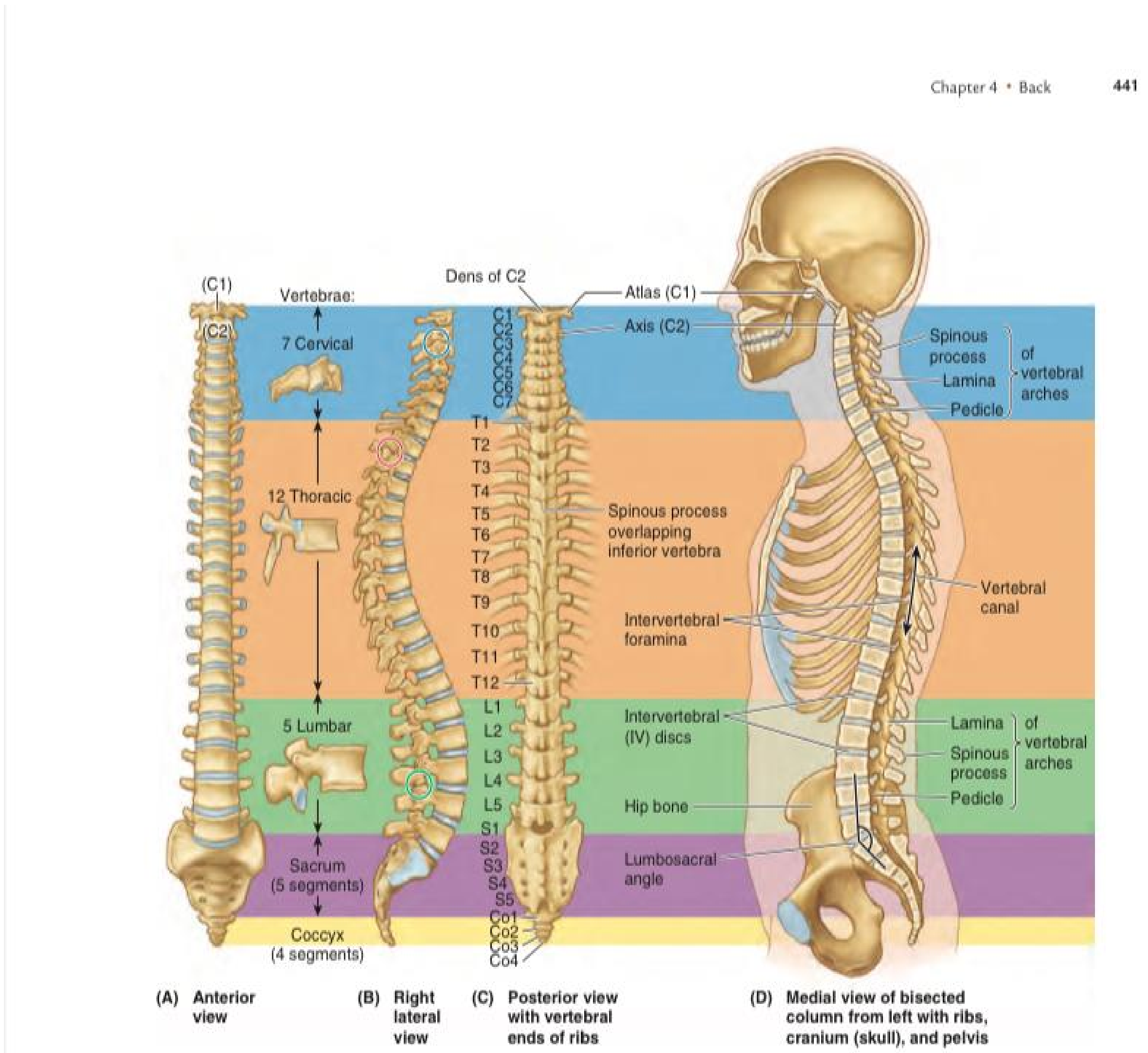

Image source: Moore Clinically Oriented Anatomy, 7th Edition (pg 441)

2.3.2 Intervertebral Disc and Ligaments:

Intervertebral discs are fibrocartilaginous structures situated between adjacent vertebral bodies, extending from the second cervical vertebra (C2) to the sacrum. Each disc consists of two primary components:

Annulus fibrosus – the tough outer ring made of concentric layers of collagen fibres that provide tensile strength.

Nucleus pulposus – a gelatinous central core that acts as a shock absorber, allowing for the transmission of forces and flexibility of the spine.

The intervertebral discs play a crucial role in our spinal health. They primarily serve to cushion axial loads, allow for some movement between the vertebrae, and help maintain the height and curvature of the spine. A key point to note is that in adults, these discs lack direct blood supply, relying instead on diffusion from nearby blood vessels located in the vertebral endplates for their nutrients. This specific anatomy makes the discs susceptible to degenerative changes, especially when exposed to prolonged poor posture or mechanical stress, like that caused by inadequate sleeping surfaces (Moore et al., 2013; Standring, 2016).

- **Spinal ligaments:** are dense bands of connective tissue that help stabilize the spine and limit excessive movement. They include;

The anterior longitudinal ligament (ALL) runs along the front surfaces of the vertebral bodies and intervertebral discs, which helps limit hyperextension of the spine.

On the other hand, **the posterior longitudinal ligament (PLL)** is positioned along the back of the vertebral bodies inside the vertebral canal and limits hyperflexion.

Additionally, other ligaments like the ligamentum flavum, interspinous ligaments, and supraspinous ligaments play a role in stabilizing the spine by restricting excessive movement. Prolonged exposure to poor sleep posture or low-quality mattresses can lead to abnormal tension and strain in ligaments, resulting in chronic low back pain or irritation of the facet joints.

2.3.3 Muscles and Tendons of The Vertebral Column

The vertebral column relies on a complex system of deep and superficial muscles that work together to maintain good posture, facilitate movement, and stabilize the spine. This support is especially important during activities like standing, walking, or even sleeping. Some of the key muscle groups involved include:

1. **Paraspinal muscles:**

The intrinsic back muscles are vital for spinal stability and fine motor control:

Multifidus: This muscle, though small, runs from the sacrum to the cervical spine and is crucial for stabilizing individual vertebrae during movement. When weakened or fatigued, it often leads to chronic low back pain.

Erector Spinae Group (iliocostalis, longissimus, spinalis): These substantial muscles extend vertically along your back and are essential for extending and bending the spine. They provide crucial support for maintaining posture, especially during sleep when proper alignment is non-negotiable.

It's important, therefore, to recognize that poor sleeping posture, particularly on mattresses that are too soft or uneven, can trigger muscle imbalances, fatigue, and spasms in these key muscles. This oversight can result in discomfort and chronic myofascial pain (Standring, 2016; Moore et al., 2013).

2. **Cervical and Lumbar Stabilizers**

Neck flexors, including the longus colli and longus capitis, are found at the front of the neck. These muscles help maintain cervical lordosis and prevent excessive extension or flexion while sleeping (Moore et al., 2013; Standring, 2016).

Lumbar extensors, which consist of the quadratus lumborum and the deep fibers of the multifidus, resist gravitational collapse of the lumbar spine. They often play a role in lumbar strain syndromes (Bogduk, 2005; Chaurasia, 2013).

When neck and lumbar support is insufficient, often due to low-quality pillows or mattresses, it can create an imbalance in muscle load. This imbalance may lead to overactivation of the stabilizer muscles, which can result in delayed onset muscle soreness (DOMS), tender trigger points, or muscle strain (Travell & Simons, 1999).

3. **Tendons and Myofascial Units**

Tendons are the connective tissues that link muscles to bones, and they are quite prone to repetitive strain injuries, particularly at the points where they attach to the bones. For example;

Thoracolumbar Fascia: This structure is crucial as it serves as a connective tissue pathway for many deep back muscles. When we maintain poor posture during sleep, it can create tension in the fascia, which may result in pain that radiates to the gluteal or lower back regions (Bogduk, 2005; Willard et al., 2012).

Tendinopathy and Enthesopathy: Misalignment of the spine during sleep can lead to repetitive microtrauma to tendons, potentially causing enthesopathies, which is pain at the sites where tendons attach to bones. This can also result in myofascial pain syndromes, which are often wrongly attributed to non-specific back pain (Travell & Simons, 1999; Fernández-de-las-Peñas et al., 2007).

2.3.4 Peripheral Structures

Peripheral joints like the sacroiliac (SI) joints, the shoulder girdle, and the temporomandibular joints (TMJ) are increasingly recognized as vulnerable to secondary musculoskeletal pain. This often results from poor sleep posture and lack of proper support from sleeping surfaces.

I. **Sacroiliac joint (SIJ):** The sacroiliac joint (SIJ) is an important load-bearing joint that helps transfer weight between the upper body and lower limbs. It is designed for stability with limited movement. However, sleeping in an improper posture, especially on your side without the right pelvic support, can increase shearing forces on the SIJ. Over time, this can result in sacroiliac joint dysfunction, which is a common source of lower back and pelvic pain (Vleeming et al., 2012).

II. **Shoulder girdle:** When side sleepers lie down, the shoulder that is in contact with the mattress experiences compressive forces, especially if the mattress doesn't evenly distribute body weight. This can result in issues such as rotator cuff impingement, subacromial bursitis, or strain in the muscles that stabilize the scapula. Using an improper mattress firmness or pillow height may exacerbate scapulothoracic dyskinesis, leading to chronic shoulder discomfort (Heneghan et al., 2009).

III. **Temporomandibular Joint:** The temporomandibular joint (TMJ) is frequently overlooked when considering sleep ergonomics, but it's important to recognize its role. Sleeping on your stomach or side can create prolonged pressure on the TMJ, especially if your head is turned and not supported. This position can lead to muscle tension in the masseter and temporalis muscles, which might cause problems like bruxism, TMJ dysfunction, or even morning headaches (Okeson, 2013).

2.3.5 Nervous Structures

The nervous system, especially the spinal cord, peripheral nerves, and nerve plexuses, is key to how our muscles and bones work and how we perceive pain. If you sleep in a bad position or use a mattress and pillow that do not provide proper support, you might end up compressing nerves or cutting off their blood supply.

This can lead to irritation, which sometimes results in pain that feels localized or radiate to other areas.

3. Spinal Cord and Spinal Nerves

The spinal cord is protected by the vertebral column and gives rise to 31 pairs of spinal nerves that exit through the intervertebral foramina. These nerves play a crucial role in innervating specific dermatomes and myotomes. If there's prolonged spinal malalignment, such as exaggerated cervical lordosis or lumbar kyphosis, it can lead to narrowing of the foramina, a condition known as foraminal stenosis. This can result in radiculopathy or neuropathic pain (Moore et al., 2013; Standring, 2016).

2. Sciatic Nerve

The sciatic nerve is the largest peripheral nerve in our body, starting from the lumbosacral plexus, specifically from the L4 to S3 segments. It runs through the gluteal area and descends along the back of the thigh. When we sleep, particularly in side-lying positions that don't adequately support the legs, this nerve can get compressed due to a tight piriformis muscle or stretched from misaligned hips and knees. This can cause symptoms like radiating pain or numbness in the legs, which is similar to those experienced in sciatica (Boyajian-O'Neill et al., 2008).

3. Brachial Plexus

The brachial plexus is formed from the anterior rami of the spinal nerves C5 to T1, and it is responsible for innervating the upper limbs. When people sleep on their sides without adequate support for the shoulder girdle, it can lead to excessive downward traction. This might result in compression neuropathy, which often impacts the axillary, radial, or ulnar nerves. Individuals experiencing this may notice symptoms like numbness, tingling, or nocturnal paresthesia in their arms and hands, as noted by Yamato et al. in 2015 and Ochoa & Fowler in 2003.

3. **Cervical and Thoracic Outlet Involvement**

Improper pillow height or lack of neck support can cause issues like cervical nerve root compression or thoracic outlet syndrome. This is particularly true if the scalene muscles or clavicle end up compressing the brachial plexus or subclavian vessels during specific sleep positions. As a result, people might experience symptoms like tingling, muscle weakness, and poor sleep quality (Moore et al., 2013; Sanders & Hammond, 2002).

2.4 Treatment

Managing musculoskeletal pain (MSP), especially for those living in hostels, needs to be a well-rounded approach that tackles both the symptoms and the root causes. Effective strategies can include non-invasive options such as physiotherapy and ergonomic adjustments, as well as medication and changes in behaviour.

2.4.1 Physiotherapy Management of Musculoskeletal Pain

Physiotherapy is essential for managing and preventing musculoskeletal pain, especially in students who may experience discomfort due to their environment, posture, or lifestyle habits. A personalized physiotherapy plan can help ease their symptoms, improve their movement, and reduce the chances of pain recurrence.

- **Assessment and Patient Education**

The first phase of managing physiotherapy starts with a comprehensive evaluation to pinpoint the source of pain, postural habits, and any functional limitations. It's essential for students to grasp the biomechanical factors leading to their pain, like improper sleeping positions, long hours of studying, or using furniture that's not ergonomic (Bishop et al., 2015). By teaching them proper posture and sleep ergonomics, students can take an active role in their own recovery.

- **Manual Therapy**

Manual therapy techniques, like soft tissue mobilization, myofascial release, and joint mobilizations, are often used to ease muscle tension and joint stiffness related to MSP. Studies show that manual therapy can effectively reduce low back and neck pain, especially when it's paired with exercise (van Middelkoop et al., 2011). Trigger point release can also help students dealing with myofascial pain syndromes.

- **Therapeutic Exercise**

Exercise therapy is essential to musculoskeletal rehabilitation. Customized programs for students that focus on building core strength, improving flexibility, and correcting posture are especially effective. According to a meta-analysis by Hayden et al. (2021), actively participating in exercise notably lowers the intensity and likelihood of experiencing musculoskeletal pain (MSP). Exercises for core stabilization, like McGill's Big Three, along with strengthening routines for the cervical region, help bring back muscular balance and prevent overloading the stabilizer muscles.

- **Electrotherapy and Modalities**

Physiotherapists can utilize techniques like Transcutaneous Electrical Nerve Stimulation (TENS), ultrasound, and hot/cold therapy to alleviate pain and reduce inflammation during the initial stages. These techniques provide short-term relief, enabling engagement in active rehabilitation (Zeng et al., 2015).

- **Postural Retraining and Ergonomic Advice**

Students really benefit from techniques that help retrain their posture. Approaches like using mirrors for feedback, giving verbal reminders, and applying biofeedback are effective for correcting those bad alignment habits. Physiotherapists can also provide helpful tips on adjusting study or sleep environments—for example, tweaking the firmness of a mattress or the height of a pillow—to support better spinal alignment (Desouzart et al., 2020).

- **Relaxation and Stress Management**

Considering the significant connection between academic stress and MSP, integrating stress management strategies like breathing exercises, progressive muscle relaxation, and guided stretching can serve as effective supplementary methods. These techniques assist in alleviating muscle tension and enhancing sleep quality (Kamper et al., 2015).

- **Home Programs and Self-Management**

Physiotherapists equip students with personalized home programs that complement therapy received in the clinic. These programs feature stretching exercises, mobility activities, and education on sleep hygiene. This method promotes sustained commitment and confidence in oneself, which is especially vital in temporary hostel settings.

2.4.2 Ergonomic and Environmental Modification:

For students, especially those living in campus hostels, ergonomic and environmental aspects are important in both causing and alleviating musculoskeletal pain (MSP). Adjusting these factors is essential for prevention and treatment.

- **Mattress and Pillow Optimization**

The quality of bedding, including mattresses and pillows, plays a crucial role in maintaining spinal alignment and promoting muscle relaxation during sleep. For students, the bedding provided in hostels is often inadequate, being either excessively firm or too soft, which can result in biomechanical strain. Research indicates that medium-firm mattresses are most effective for optimizing spinal alignment and decreasing the chances of experiencing low back pain (Jacobson et al., 2010; Kovacs et al., 2003). Similarly, ergonomic pillows designed to support the natural curvature of the cervical spine have been associated with less neck stiffness and better overall sleep quality (Gordon et al., 2021).

- **Sleep Posture Education**

Poor sleep positions—like prone sleeping or having excessive neck twisting—can worsen or initiate musculoskeletal pain (MSP). Informative initiatives designed to teach students about the best sleeping positions (such as lying on your back or side while keeping the neck and lower back supported) have proven effective in decreasing morning discomfort and rigidity (Desouzart et al., 2020). Including these guidelines in hostel orientation programs might provide lasting advantages.

- **Study Furniture and Multi-Use Bed Behavior**

In many campus living spaces, beds are being used for both rest and study, which can create ergonomic problems. Without suitable study furniture, students tend to develop poor postures over long periods. A study from Nigeria by Oyewole et al. (2019) found that students who set up their study areas on beds reported more neck and upper back pain. Using basic ergonomic tools such as portable backrests, lap desks, and adjustable lamps can help decrease musculoskeletal strain.

- **Environmental Modifications**

The hostel surroundings also affect sleep and musculoskeletal pain (MSP). Poor ventilation, loud noises, and uncomfortable temperatures can disrupt healthy sleep patterns, which are vital for musculoskeletal recovery (Grandner, 2017). Alterations in the environment—such as using blackout curtains, fans or heaters, and earplugs—can improve sleep quality and thus promote musculoskeletal health.

- **Physical Activity and Movement Breaks**

A sedentary lifestyle has become quite common among students, mainly due to their heavy academic workload. When students spend long hours in static postures, it can lead to muscular imbalances and a decrease in flexibility. Research indicates that promoting movement breaks, incorporating stretching routines, or doing brief exercises before bed can help lower the prevalence of musculoskeletal problems among students (Al-Hadidi et al., 2019).

2.4.3 Pharmacological Management

The main focus of pharmacologic treatment is to alleviate symptoms, particularly during times of acute or intensified pain episodes. This includes:

- Non-steroidal anti-inflammatory Drugs (NSAIDs)

Nonsteroidal anti-inflammatory drugs (NSAIDs) like ibuprofen and diclofenac are often recommended to alleviate inflammation and offer pain relief. They work well for temporary pain management but should be used with caution because of potential gastrointestinal irritation and renal side effects (Derry et al., 2017).

- Muscle relaxants

For muscle spasms brought on by bad posture or overuse, doctors may prescribe medications like cyclobenzaprine and tizanidine. They are particularly useful when myofascial trigger points are involved. However, their sedative effects can impair academic performance, and they should be prescribed cautiously (Chou et al., 2017).

- Analgesics

Because of its safety profile, paracetamol is still a first-line medication, particularly for students who might not be able to take NSAIDs. Although effective for mild-to-moderate pain, it lacks anti-inflammatory effects and may not address the underlying biomechanical contributors to pain (Ong et al., 2007).

- Topical Agents

Topical NSAIDs, menthol, and capsaicin-based creams provide localized relief and are preferred in younger populations to avoid systemic side effects (Derry et al., 2016).

2.4.4 Herbal and Traditional Remedies

Students may apply herbal liniments, balms, or mixtures that have been handed down via cultural traditions in Nigeria. While some formulations are anti-inflammatory, many are not clinically validated, and some may be toxicologically unsafe (Ekor, 2014).

2.4.5 Psychological and Cognitive Approaches

Cognitive-behavioral therapy (CBT) and relaxation techniques are essential adjuncts because stress and anxiety frequently occur among students and cause MSP through muscle tension and altered pain perception.

- CBT has been revealed to lower pain intensity and improve coping abilities in patients with chronic pain (Ehde et al., 2014).

- Guided relaxation, mindfulness, and breathing exercises can lower muscle tension and improve sleep, indirectly alleviating MSP (Chou et al., 2016).

2.5: TABLE 1: EMPIRICAL REVIEW

S/N	Title	Study ID	Aim of Study/ Characteristics	Type of study	Outcomes	Results and Conclusion
1	What type of matress should be chosen to avoid backpain and improve sleep quality? Review of literature	Caggiari et al. (2021)	A systematic literature review of articles published until 2019, investigating the association of different mattresses with sleep quality and low back pain.	Literature review	Mattresses analysed in the studies examined by this research group have been classified according to the European Committee for Standardization (2000) as soft, medium-firm, extra-firm or customized to avoid supine decubitus.	Results of this systematic review show that a medium-firm mattress promotes comfort, sleep quality and rachis alignment.
2	**Changes in back pain, sleep quality, and perceived stress after**	Jacobson et al. (2009)	This study compared sleep quality and stress-related symptoms between older beds	Non-randomized controlled trial (within-	Sleep quality, back pain, and perceived stress were measured before and after	Results indicated that the subjects' personal bedding systems average 9.5 years old and were moderately priced. Significant ($P < .01$) improvements were found between pre- and posttest mean

	introduction of new bedding systems		(>/=5 years) and new bedding systems.	subject, two-phase design)	the intervention using repeated-measures ANOVA. Results showed significant improvements (P < .01) in all outcomes.	values in sleep quality and efficiency. Continued improvement was noted for each of the 4-week data gathering period. Stress measures yielded similar positive changes between pre- and posttest mean values.
3	**Effect of firmness of mattress on chronic non-specific low-back pain**	Kovacs et al. (2003)	This study assessed the effect of different firmnesses of mattresses on the clinical course of patients with chronic non-specific low-back pain.	Randomized controlled trial	Mattress firmness was rated on a scale developed by the European Committee for Standardisation. The H(s) scale starts at 1.0 (firmest) and stops at 10.0 (softest). We randomly assigned participants firm mattresses (H(s)=2.3) or medium-firm mattresses	At 90 days, patients with medium-firm mattresses had better outcomes for pain in bed (odds ratio 2.36 [95% CI 1.13-4.93]), pain on rising (1.93 [0.97-3.86]), and disability (2.10 [1.24-3.56]) than did patients with firm mattresses. Throughout the study period, patients with medium-firm mattresses also had less daytime low-back pain (p=0.059), pain while lying in bed (p=0.064), and pain on rising (p=0.008) than did patients with firm mattresses.

					(H(s)=5.6).	
4	**Association of self-reported musculoskeletal pain with school furniture suitability and daily activities among primary school and university students**	Loredan et al. (2024)	To analyze the association between self-reported musculoskeletal pain (MSP), school furniture fit, and daily activities.	Cross-sectional design study	The adapted Nordic questionnaire was used to assess pain prevalence, the BackPEI questionnaire was used to assess school-related factors, and student furniture mismatch calculations were performed to determine the anthropometric suitability of school furniture	The neck, lower back, shoulders, and upper back were the most affected body parts. Our study confirmed that musculoskeletal pain occurs in primary school students and increases with age, especially lower back pain. Proper backpack wearing was found to be an important factor in alleviating neck pain. Students who sat or lifted objects properly were more likely to report upper back pain, and students whose backrest height was appropriate were more likely to report lower back pain.
5	Influence of sleep surface on musculoskeletal pain among undergraduate students in Lagos, Nigeria.	Okafor et al. (2019)	This study investigated the influence of sleep surfaces on musculoskeletal pain among undergraduate	Cross-sectional design study	Employed a 47- item modified Nordic Musculoskeletal Questionnaire along with self-	A 12-month 79.7% prevalence of musculoskeletal pain was observed with females significantly (p0.05) associated with the prevalence of musculoskeletal pain among undergraduate students. Prevalence of musculoskeletal pain among undergraduate students was high,

			students in Lagos, Nigeria		reported mattress characteristics (type, size, duration of use, perceived comfort).	more in females than males. Mattress type were not significantly associated with the prevalence of musculoskeletal pain among undergraduate students.

CHAPTER 3: MATERIALS AND METHODS

3.1 MATERIALS

3.1.1 Participants

The population of interest included undergraduate students residing in campus hostels within the University of Benin who have stayed for a minimum of three months. This duration ensured adequate exposure to the sleeping surfaces under investigation.

3.1.2 Selection criteria

3.1.2.1 Inclusion criteria

i. Undergraduate students who currently reside within campus hostels.

ii. Students who have lived at least three consecutive months in the hostels.

3.1.2.2 Exclusion criteria

i. Students with diagnosed orthopedic or neurological conditions.

ii. Students with recent musculoskeletal injuries (less than 6 months).

3.1.3 Materials

3.1.3.1 List of Instruments

i. Structured Questionnaire

ii. Height meter

iii. Weighing scale

iv. Flexible measuring tape

v. Data Collection Pro-forma (or Record Sheet)

vi. Informed Consent Forms

vii. Writing Materials

3.1.3.2 Description of instruments

i. **Structured Questionnaire:**

The structured questionnaire is divided into three main sections:

- **Section A: Sociodemographic Information**:

  This section collects data such as age, sex, faculty, level of study, name of hostel, and duration of residence. These variables are essential for subgroup analysis and determining demographic correlations with musculoskeletal symptoms.

- **Section B: Nordic Musculoskeletal Questionnaire – Extended Version (NMQ-E)**

  The NMQ-E is a validated instrument designed to assess the prevalence and impact of musculoskeletal symptoms in various body regions (neck, shoulders, upper/lower back, hips, knees, etc.).

  - **Validity**: The NMQ-E has been shown to possess high face and content validity for musculoskeletal epidemiological research.
  - **Reliability**: Test-retest reliability studies report Cohen's kappa values >0.70 for most body regions.
  - **Source**: Originally developed by Kuorinka et al. (1987); extended versions have been adapted for broader clinical and occupational settings.

- **Section C: Sleeping Surface Evaluation**
  - **Boston Mattress Satisfaction Questionnaire (BMSQ)**:

    The BMSQ is a brief instrument designed to assess individuals' subjective satisfaction with their mattress based on comfort, firmness, support, and perceived sleep quality.

    - **Validity**: Preliminary psychometric evaluations indicate acceptable construct and content validity.
    - **Reliability**: Cronbach's alpha for internal consistency has been reported between 0.70 and 0.80.
    - Items include questions on mattress comfort, back support, firmness, and sleep satisfaction.
  - **Mattress Checklist and Physical Parameters Table**

    This part records:

    - Mattress type (foam, spring, orthopaedic, etc.)
    - Thickness (measured in cm)
    - Length and width
    - Age/duration of use

ii. **Height Meter**

A height meter (also known as a portable height rod or wall-mounted height scale) was used to measure the height of participants in meters. Participants stood barefoot with their heels, buttocks, and head against a vertical surface (e.g., wall), with the head positioned in the Frankfurt plane.

- **Validity**: Height meters are widely used in field anthropometry and produce valid measurements when properly aligned and calibrated.
- **Reliability**: Height meters demonstrate high intra- and inter-rater reliability (Intraclass Correlation Coefficient, ICC > 0.90) when standard procedures are followed.

iii. **Weighing Scale**

This is used to measure body weight in kilograms. Participants were weighed wearing light clothing and no shoes.

- **Validity**: Valid when calibrated properly.
- **Reliability**: Readings typically show high test-retest reliability (ICC > 0.95). The scale will be checked for zero error before each use

iv. **Flexible Measuring Tape**

Used to measure mattress length, width, and thickness. The tape is graduated in centimeters and was used with participants' consent to obtain physical dimensions of their mattresses.

- **Validity**: High for linear measurements.
- **Reliability**: Intra-rater reliability is high (ICC > 0.90) when measurements are taken with standard procedure (flat surface, non-stretched tape).

v. **Data Collection Pro-forma**

A structured record sheet was used to quickly log numerical data and categorical responses during fieldwork. It ensures that raw data is recorded in a standardized and organized way before final transcription into digital formats.

- **Validity & Reliability**: As a researcher-designed tool, its content validity is ensured by basing it on standard questionnaires; reliability depends on the consistency of the data collection process.

vi. **Informed consent forms**

These are standard ethical documents used to confirm that participants have been properly informed about the study and voluntarily agree to participate. It contains sections on the study's purpose, procedures, confidentiality, risks, and benefits.

- **Validity**: Based on international ethical guidelines (e.g., Helsinki Declaration).
- **Reliability**: Not applicable, as it is not a measurement tool but an ethical requirement.

vii. **Writing Materials**

Includes pens, clipboards, and notepads for note-taking during data collection. They helped the researcher maintain accurate records and observations, particularly during physical measurements and informal participant interactions.

3.1.4 Methods

3.1.4.1 Research Design

The study adopted a cross-sectional survey design.

3.1.5 Sampling technique

A stratified random sampling was used. Five campus hostels, two female and three male hostels (the male hostels are less populated) within the University of Benin, were considered, where each hostel formed a stratum. Participants were selected randomly in proportion to hostel population sizes.

3.1.6 Sample size calculation

To determine an appropriate sample size for this study, Slovin's formula was used:

$$n_0 = \frac{N}{1+Ne^2}$$

Where:

- n = required sample size
- N = total population
- e = margin of error (set at 0.05 for 95% confidence level)

The total student population from the five selected hostels is:

- Hall 1 (Female) = 1200
- Hall 3 (Male) = 640
- Hall 5 (Male) = 100
- Hall 6 (Female) = 300
- NDDC Hostel (Male) = 308
- **Total (N) = 2548**

$$n = \frac{2548}{1+2548(0.05)^2} = \frac{2548}{1+2548(0.0025)} = \frac{2548}{1+6.37} = \frac{2548}{7.37} = 345.726 \approx 346$$

Thus, the required sample size is approximately **346 participants**.

To ensure representativeness, proportional allocation across the hostels (strata) was applied using the Proportional Allocation Formula:

$$n_i = \frac{N_i}{N} \times n$$

Where:

- n_i = sample size from stratum i
- N_i = population of stratum i
- N = total population across all strata
- n = total sample size

This method ensures that each subgroup (stratum) is represented in the final sample in the same proportion as they exist in the population.

Hostel	Population (N_1)	Proportion (%)	Allocated Sample (n_1)
Hall 1 (Female)	1200	47.09%	163
Hall 3 (Male)	640	25.11%	87
Hall 5 (Male)	100	3.92%	14
Hall 6 (Female)	300	11.77%	41
NDDC (Male)	308	12.09%	41
Total	**2548**	**100%**	**346**

Each hostel therefore contributed a proportionate number of participants to the study, maintaining balance and ensuring that all subgroups were fairly represented in the sample.

3.1.7 Procedure for Data Collection

Eligible participants were approached through hostel visits conducted with assistance from porters and student representatives. The study purpose and procedure were explained before obtaining informed consent.

The participants who met the inclusion criteria were given the questionnaire. During administration, the researcher was physically present to offer required clarifications and to address any queries participants could have.

Participants were assisted in completing a systematic, self-administered questionnaire designed to capture data on sleeping surfaces (including mattress type, thickness, and subjective comfort) and any history or presence of musculoskeletal discomfort. Basic demographic and biodata was also gathered, including age, sex, faculty, and length of stay in the hostel.

Along with the questionnaire, a calibrated measuring tape was used to objectively measure the accessible participant's mattress thickness, which was recorded in cm. Additionally, a height meter was used to measure each participant's height (in meters) and weight (in kilograms) using a digital weighing scale in order to calculate their Body Mass Index (BMI). These anthropometric measurements helped identify possible correlations between body composition and musculoskeletal symptoms.

All data and personal information collected was treated with strict confidentiality and was used solely for the purposes of this academic research.

3.1.8 Ethical considerations

Ethical clearance was obtained from the University of Benin Research and Ethics Committee. Written informed consent was sought and obtained from each participant. Confidentiality and anonymity of participants' information were strictly maintained. Participation was entirely voluntary, and participants were allowed to withdraw at any point without penalty.

3.1.9 Data Analysis

Data was coded and entered into the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic characteristics and responses.

Inferential statistics (Chi-square tests) were used to assess the association between categorical variables such as mattress type (foam, spring, etc.) and the presence of musculoskeletal pain.

CHAPTER FOUR: RESULTS

4.1 Sociodemographic characteristics of the participants

Table 1 shows that the majority of the participants were female 211 (60.2%), most of whom were within the 18–23 years age group 268 (76.4%). In terms of academic background, the highest representation came from the Faculty of Basic Medical Sciences 96 (27.4%), with 400 level students 94 (26.8%) forming the largest group. Regarding accommodation, most participants resided in Hall 1 170 (48.4%), and a higher proportion had stayed in hostels for more than 2 years 148 (42.2%). At home, the largest group had lived there for less than 3 months 135 (38.5%). A majority of participants reported engaging in physical activity 265 (72.9%), and the average BMI was 22.49 ± 4.01.

Table 2: Sociodemographic characteristics of the participants

Variable	Category	Frequency	Percentage
Gender	Male	140	39.9
	Female	211	60.2
Age (years)	< 18	27	7.7
	18-23	268	76.4
	23-28	56	16.0
Department	Accounting	16	4.6
	Anatomy	20	5.7
	Physiotherapy	28	7.9
	Science Lab tech	19	5.4
	Nursing	22	6.3
	Others		
Faculty	Arts	25	7.1
	Basic Medical Sciences	96	27.4
	Engineering	43	12.3
	Life Science	40	11.4
	Management science	35	10.0
	Others		
Level	100	71	20.2
	200	39	11.1
	300	85	24.2
	400	94	26.8
	500	60	17.1
	600	2	0.6
Name of hostel	Hall 1	170	48.4
	Hall 3	85	24.2
	Hall 5	15	4.3
	Hall 6	41	11.7
	NDDC	40	11.4
Duration in hostel	3-6 months	51	14.5
	6-12 months	65	18.5
	1-2 years	87	24.8
	> 2 years	148	42.2%
Duration in home	< 3 months	135	38.5
	3-6 months	99	28.2
	6-12 months	82	23.4
	1-2 years	35	10.0

Physical activtiy	Yes	265	72.9
	No	95	27.1
BMI (Mean ± S.D)	22.49 ± 4.01		

4.1.2 Prevalence of Musculoskeletal pain among respondents

The most frequently reported site of musculoskeletal pain was the lower back, with a 12-month prevalence of 178 (50.7%), and 147 (41.9%) within the last 7 days; of these, 101 (28.8%) reported interference with daily activities. The neck was the next most affected region, with 166 (47.3%) reporting pain in the past 12 months and 78 (22.2%) in the past 7 days, though only 58 (16.5%) experienced functional interference. The upper back followed closely, with a 12-month prevalence of 153 (43.6%), 131 (37.3%) in the past 7 days, and 71 (20.2%) reporting activity interference. Other commonly affected sites included the shoulder 110 (31.3%), ankles 117 (33.3%), and hips/thighs 109 (31.1%), although fewer participants reported functional limitations. In contrast, the elbow was the least affected region, with a 12-month prevalence of 42 (12.0%), a 7-day prevalence of 17 (4.9%), and interference with activity reported by just 16 (4.6%) as shown in Table 2.

Table 3: Prevalence of Musculoskeletal pain among respondents

Variable	Category	Frequency	Percentage
Neck			
12 months prevalence	Yes	166	47.3
	No	185	52.7
7-days prevalence	Yes	78	22.2
	No	273	77.8
Interfered with Activity	Yes	58	16.5
	No	293	83.5
Shoulder			
12 months prevalence	Yes	110	31.3
	No	241	68.7
7-days prevalence	Yes	101	28.8
	No	250	71.2
Interfered with Activity	Yes	69	19.7
	No	282	80.3
Elbow			
12 months prevalence	Yes	42	12.0
	No	309	88.0
7-days prevalence	Yes	17	4.9
	No	334	95.2
Interfered with Activity	Yes	16	4.6
	No	335	95.4
Wrist/Hands			
12 months prevalence	Yes	90	25.6
	No	261	74.4
7-days prevalence	Yes	59	16.8
	No	292	83.2
Interfered with Activity	Yes	54	15.4
	No	297	84.6
Upper back			

12 months prevalence	Yes	153	43.6
	No	198	56.4
7-days prevalence	Yes	131	37.3
	No	220	62.7
Interfered with Activity	Yes	71	20.2
	No	280	79.8
Lower back			
12 months prevalence	Yes	178	50.7
	No	173	49.3
7-days prevalence	Yes	147	41.9
	No	204	58.1
Interfered with Activity	Yes	101	28.8
	No	250	71.2
Hips/Thighs			
12 months prevalence	Yes	109	31.1
	No	242	68.9
7-days prevalence	Yes	82	23.4
	No	269	76.7
Interfered with Activity	Yes	70	19.9
	No	281	80.1
Knees			
12 months prevalence	Yes	97	27.6
	No	254	72.4
7-days prevalence	Yes	57	16.2
	No	294	85.8
Interfered with Activity	Yes	50	14.2
	No	301	85.8
Ankles			
12 months prevalence	Yes	117	33.3
	No	234	66.7
7-days prevalence	Yes	93	26.5
	No	258	73.5
Interfered with Activity	Yes	67	19.1
	No	284	80.9

4.1.3 Boston Sleep Satisfaction

The overall satisfaction score among participants was 5.74 ± 2.49. For specific dimensions, satisfaction with comfort (5.52 ± 2.47), support during sleep (5.57 ± 2.29), and firmness (5.48 ± 2.61) were moderate. Higher ratings were reported for temperature regulation (5.72 ± 2.28), ease of movement (6.03 ± 2.49), and satisfaction with sleep quality (6.11 ± 2.42). In contrast, lower ratings were observed for level of pain/stiffness (4.66 ± 2.73) and likelihood of recommending (4.53 ± 2.99). Morning stiffness after sleeping was moderately rated at 5.99 ± 2.34 as shown in Table 3.

Table 4: Boston Sleep Satisfaction

Variable	Min	Max	Mean ± S. D
Overall satisfaction	0.00	10.0	5.739 ± 2.49
Satisfaction with comfort	0.00	10.0	5.52 ± 2.47
Support provided during sleep	0.00	10.0	5.57 ± 2.29
Firmness level	0.00	10.0	5.48 ± 2.61
Temperature regulation	0.00	10.0	5.72 ± 2.28
Ease of movement	0.00	10.0	6.03 ± 2.49
Morning stiffness after sleeping	1.00	10.0	5.99 ± 2.34
Level of pain/stiffness	0.00	10.0	4.66 ± 2.73
Satisfaction with sleep quality	0.00	10.0	6.11 ± 2.42
Likelihood of recommending	0.00	10.0	4.53 ± 2.99

4.1.4 Sleeping surface characteristics

Most participants reported using a foam mattress 336 (95.7%), with only a few using spring 13 (3.7%) or orthopedic 2 (0.6%) mattresses. The largest group had used their mattress for more than 3 years 99 (28.2%), followed by 6–12 months 87 (24.8%) and 1–2 years 72 (20.5%), while the lowest reported duration was less than 6 months 36 (10.3%). In terms of firmness, the majority described their mattresses as medium 201 (57.3%), with smaller proportions reporting soft 74 (21.1%), firm 42 (12.0%), or unknown 34 (9.7%). Nearly all respondents used a metal bed base 351 (100%). About half reported the use of a topper 180 (51.3%), while the rest did not 171 (48.7%). The most common sleeping posture was varied positions 155 (44.2%), followed by side 121 (34.5%), stomach 45 (12.8%), and back 30 (8.6%). More than one-third reported waking at night due to discomfort 123 (35.0%), while 227 (64.7%) did not. Similarly, 137 (39.0%) reported using an extra pillow for support compared to 214 (61.0%) who did not. The mean mattress thickness was 7.12 ± 2.61 cm, and the average hours of sleep per night was 5.76 ± 1.31.

Table 5: Sleeping surface characteristics

Variable	Category	Frequency	Percentage
Sleep mattress	Foam	336	95.73
	Spring	13	3.7
	Orthopedic	2	0.57
Duration of using mattress	> 3 years	99	28.21
	6 - 12 months	87	24.79
	1 - 2 years	72	20.51
	2 - 3 years	57	16.24
	less than 6 months	36	10.26
Mattress firmness	Medium	201	57.26
	Soft	74	21.08
	Firm	42	11.97
	Unknown	34	9.69
Bed base	Metal	351	100.0
Use of topper	Yes	180	51.28
	No	171	48.72
Usual sleep posture	Varies	155	44.16
	Side	121	34.47
	Stomach	45	12.82
	Back	30	8.55
Waking up at night due to discomfort?	Yes	123	35.0
	No	227	64.7
Use of extra pillow for support	Yes	137	39.0
	No	214	61.0
Mattress thickness (Mean ± S.D) cm	7.12 ± 2.61 cm		
Average hours of sleep at night (Mean ± S.D)	5.76 ± 1.31 hrs		

4.1.5: Association between Type of Mattress and Prevalence f Musculoksletal pain

The association between type of mattress and musculoskeletal pain showed significant findings for the wrist/hands (χ^2=10.336, p=0.006), upper back (χ^2=11.992, p=0.002), and ankles (χ^2=10.621, p=0.005), where prevalence was higher among participants using foam and spring mattresses compared to orthopedic mattresses. No significant associations were observed for pain in the neck (p=0.268), shoulder (p=0.543), elbow (p=0.345), lower back (p=0.057), hips/thighs (p=0.051), or knees (p=0.069) as shown in Table 5.

Table 6: Association between Type of Mattress and Prevalence of Musculoksletal pain

Variable	Category	Type of Mattress Foam	Orthopaedic	Spring	X^2, p
Neck					
12 months prevalence	Yes	159	2	5	2.636, 0.268
	No	177	0	8	
Shoulder					
12 months prevalence	Yes	42	0	0	1.221, 0.543
	No	294	2	13	
Elbow					
12 months prevalence	Yes	42	0	0	2.130, 0.345
	No	294	2	13	
Wrist/Hands					
12 months prevalence	Yes	88	2	0	10.336, 0.006*
	No	248	0	13	
Upper back					
12 months prevalence	Yes	140	2	11	11.992, 0.002*
	No	196	0	2	
Lower back					
12 months prevalence	Yes	166	2	10	5.747, 0.057
	No	170	0	3	
Hips/Thighs					
12 months prevalence	Yes	105	2	2	5.937, 0.051
	No	231	0	11	
Knees					
12 months prevalence	Yes	90	0	7	5.351, 0.069
	No	246	2	6	
Ankles					
12 months prevalence	Yes	115	2	0	10.621, 0.005
	No	221	0	13	

4.1.6 Association between Duration of Using of Mattress and Prevalence of Musculoskeletal Pain

The duration of mattress use was significantly associated with musculoskeletal pain in several body regions. Significant associations were observed for the neck (χ^2=22.47, p<0.001), shoulder (χ^2=15.79, p=0.03), elbow (χ^2=10.93, p=0.027), upper back (χ^2=10.21, p=0.037), and hips/thighs (χ^2=11.17, p=0.025). In these regions, pain prevalence was generally higher among participants who had used their mattress for more than one year compared to shorter durations. No significant associations were found for the wrist/hands (p=0.162), lower back (p=0.988), knees (p=0.175), or ankles (p=0.795).

Table 7: Association between Duration of Using of Mattress and Prevalence of Musculoskeletal Pain

Variable	Category	Duration of Using Mattress < 6 months	6-12 months	1-2 years	2-3 years	> 3 years	X^2, p
Neck							
12 months prevalence	Yes	7	35	32	31	61	22.47, <0.001*
	No	29	52	40	26	38	
Shoulder							
12 months prevalence	Yes	14	19	14	21	42	15.792, 0.03*
	No	22	68	58	36	57	
Elbow							
12 months prevalence	Yes	8	16	7	4	7	10.925, 0.027*
	No	21	71	65	53	92	
Wrist/Hands							
12 months prevalence	Yes	11	26	13	10	30	6.539, 0.162
	No	25	61	59	47	69	
Upper back							
12 months prevalence	Yes	10	34	40	29	40	10.212, 0.037*
	No	26	53	32	28	59	
Lower back							
12 months prevalence	Yes	18	43	38	30	49	0.331, 0.988
	No	18	44	34	27	50	
Hips/Thighs							
12 months prevalence	Yes	12	35	13	14	35	11.167, 0.025*
	No	24	52	59	43	64	
Knees							
12 months prevalence	Yes	14	26	22	16	19	6.342, 0.175
	No	22	61	50	41	80	
Ankles							
12 months prevalence	Yes	9	29	18	18	36	1.676, 0.795
	No	27	58	47	47	63	

4.1.7 Association between Type of Mattress and Prevalence of Musculoskeletal Pain

The chi square result showed significant associations between mattress firmness and musculoskeletal pain in the neck (χ^2=7.913, p=0.048), shoulder (χ^2=16.109, p<0.001), wrist/hands (χ^2=9.597, p=0.022), and lower back (χ^2=8.100, p=0.044). In these regions, pain was most frequently reported among participants using medium or firm mattresses. No significant associations were observed for the elbow (p=0.308), upper back (p=0.255), hips/thighs (p=0.424), knees (p=0.060), or ankles (p=0.205).

Table 8: Association between Type of Mattress and Prevalence of Musculoskeletal Pain

Variable	Category	Type of Mattress Soft	Medium	Firm	Unknown	X^2, p
Neck						
12 months prevalence	Yes	34	99	24	9	7.913, 0.048*
	No	40	102	18	25	
Shoulder						
12 months prevalence	Yes	13	10	76	11	16.109, <0.001*
	No	21	64	125	31	
Elbow						
12 months prevalence	Yes	5	27	4	6	3.596, 0.308
	No	69	174	38	28	
Wrist/Hands						
12 months prevalence	Yes	12	54	8	6	9.597, 0.022*
	No	62	137	34	28	
Upper back						
12 months prevalence	Yes	39	81	20	13	4.058, 0.255
	No	35	120	22	21	
Lower back						
12 months prevalence	Yes	39	111	17	11	8.100, 0.044*
	No	35	90	25	23	
Hips/Thighs						
12 months prevalence	Yes	27	56	13	13	2.796, 0.424
	No	47	145	29	21	
Knees						
12 months prevalence	Yes	24	45	14	14	7.418, 0.060
	No	50	156	28	20	
Ankles						
12 months prevalence	Yes	21	76	10	10	4.581, 0.205
	No	53	125	32	24	

4.2 Hypothesis Testing

1. There would be no significant relationship between type of mattress and neck pain prevalence.

Test: Chi-square test

Observed p value: 0.268

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

2. There would be no significant relationship between type of mattress and shoulder pain prevalence.

Test: Chi-square test

Observed p value: 0.543

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

3. There would be no significant relationship between type of mattress and elbow pain prevalence.

Test: Chi-square test

Observed p value: 0.345

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

4. There would be no significant relationship between type of mattress and wrist/hand pain prevalence.

Test: Chi-square test

Observed p value: 0.006

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

5. There would be no significant relationship between type of mattress and upper back pain prevalence.

Test: Chi-square test

Observed p value: 0.002

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

6. There would be no significant relationship between type of mattress and lower back pain prevalence.

Test: Chi-square test

Observed p value: 0.057

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

7. There would be no significant relationship between type of mattress and hips/thighs pain prevalence.

Test: Chi-square test

Observed p value: 0.051

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

8. There would be no significant relationship between type of mattress and knee pain prevalence.

Test: Chi-square test

Observed p value: 0.069

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

9. There would be no significant relationship between type of mattress and ankle pain prevalence.

Test: Chi-square test

Observed p value: 0.005

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

10. There would be no significant relationship between duration of mattress use and neck pain prevalence.

Test: Chi-square test

Observed p value: <0.001

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

11. There would be no significant relationship between duration of mattress use and shoulder pain prevalence.

Test: Chi-square test

Observed p value: 0.030

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

12. There would be no significant relationship between duration of mattress use and elbow pain prevalence.

Test: Chi-square test

Observed p value: 0.027

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

13. There would be no significant relationship between duration of mattress use and wrist/hand pain prevalence.

Test: Chi-square test

Observed p value: 0.162

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

14. There would be no significant relationship between duration of mattress use and upper back pain prevalence.

Test: Chi-square test

Observed p value: 0.037

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

15. There would be no significant relationship between duration of mattress use and lower back pain prevalence.

Test: Chi-square test

Observed p value: 0.988

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

16. There would be no significant relationship between duration of mattress use and hips/thighs pain prevalence.

Test: Chi-square test

Observed p value: 0.025

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

17. There would be no significant relationship between duration of mattress use and knee pain prevalence.

Test: Chi-square test

Observed p value: 0.175

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

18. There would be no significant relationship between duration of mattress use and ankle pain prevalence.

Test: Chi-square test

Observed p value: 0.795

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

19. There would be no significant relationship between mattress firmness and neck pain prevalence.

Test: Chi-square test

Observed p value: 0.048

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

20. There would be no significant relationship between mattress firmness and shoulder pain prevalence.

Test: Chi-square test

Observed p value: <0.001

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

21. There would be no significant relationship between mattress firmness and elbow pain prevalence.

Test: Chi-square test

Observed p value: 0.308

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

22. There would be no significant relationship between mattress firmness and wrist/hand pain prevalence.

Test: Chi-square test

Observed p value: 0.022

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

23. There would be no significant relationship between mattress firmness and upper back pain prevalence.

Test: Chi-square test

Observed p value: 0.255

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

24. There would be no significant relationship between mattress firmness and lower back pain prevalence.

Test: Chi-square test

Observed p value: 0.044

JUDGEMENT: The observed p value is less than 0.05, hence the null hypothesis was REJECTED.

25. There would be no significant relationship between mattress firmness and hips/thighs pain prevalence.

Test: Chi-square test

Observed p value: 0.424

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

26. There would be no significant relationship between mattress firmness and knee pain prevalence.

Test: Chi-square test

Observed p value: 0.060

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

27. There would be no significant relationship between mattress firmness and ankle pain prevalence.

Test: Chi-square test

Observed p value: 0.205

JUDGEMENT: The observed p value is greater than 0.05, hence the null hypothesis was NOT REJECTED.

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion of Findings

This study investigated the correlation between sleeping surfaces and musculoskeletal pain among residents of campus hostels within the University of Benin. According to the results, musculoskeletal discomfort was very common among the individuals. The most affected areas were found to be the neck (47.3%), upper back (43.6%), and lower back (50.7%). These findings are consistent with those of Okafor et al. (2019) and Ayanniyi and Udofia (2016), who found that poor ergonomics, inadequate spinal support, and prolonged postures and positions during study and rest are common causes of cervical and lumbar pain in students and the sedentary population.

The impact of inadequate sleep ergonomics on spinal alignment and muscular fatigue is highlighted by the prevalence of pain in the upper and lower back regions. Postural stress is increased when students read or use devices for extended periods of time on mattresses that are only intended for sleeping. Obembe et al. (2013) found that university students' constant use of beds as workspaces contributed to their ongoing neck and upper back pain.

Pain in the ankles, upper back, and wrists/hands was significantly correlated with the type of mattress ($p < 0.05$). The prevalence of pain was higher among participants who used foam and spring beds than among those who used orthopedic mattresses. This is in line with the findings of Jacobson et al. (2010), who found that medium-firm orthopedic mattresses significantly decreased back discomfort. By guaranteeing uniform pressure distribution and enhancing spinal support, these mattresses also improved the quality of sleep. Additionally, DeVocht et al. (2006) showed that sleeping on mattresses with low density causes discomfort and muscle strain.

There was a statistically significant correlation between the duration of mattress use and hip/thigh, upper back, elbow, shoulder, and neck pain. This result confirms the findings of Kovacs et al. (2003), who found that mattresses that are worn out lose their supporting qualities and cause pain during sleep. Therefore, it is conceivable that prolonged mattress use (more than a year) may make these hostel inhabitants more susceptible to musculoskeletal pain, particularly in the axial and appendicular regions which suffer pressure during sleep.

Musculoskeletal pain persisted despite the fact that the majority of patients (95.7%) utilized foam mattresses with an average thickness of 7.12 ± 2.61 cm. This finding implies that variables including foam density, firmness, usage duration, and sleeping position can have a greater impact on discomfort than just mattress type. According to Caggiari et al. (2021), medium-firm mattresses maximize spinal curvature and minimize pain; however, these advantages diminish over time or when the foam deforms from excessive use.

Students were not totally uncomfortable, but their sleep experience was not ideal, according to the participants' mean sleep satisfaction score (5.74 ± 2.49), which showed moderate contentment. Students in this study slept for an average of 5.76 ± 1.31 hours, which was less than the 7–9 hours of sleep per day that young adults are advised to get (Nwachukwu et al., 2021). Insufficient sleep hinders muscle repair and leads to chronic pain sensitivity, according to

Mork et al. (2014). This offers a potential reason for the responders' ongoing pain.

It is interesting to note that the most commonly reported discomfort areas, the neck and lower back, did not significantly correlate with mattress type. This could suggest that musculoskeletal pain is complex, involving the interaction of sleep surface quality with factors like bad posture, academic stress, or physical inactivity (Ezeukwu et al., 2022). However, the study's noteworthy correlations confirm that sleeping surfaces and usage length are controllable risk factors for the treatment of musculoskeletal pain in students.

These results are consistent with global evidence showing that bedding quality and sleep ergonomics affect spinal health and pain outcomes (Jacobson et al., 2009; Loredan et al., 2024). Therefore, physiotherapy interventions that emphasize ergonomic education, sleep hygiene, and mattress evaluation may be extremely important in avoiding and reducing student musculoskeletal discomfort.

5.2 Conclusion

The study found that musculoskeletal discomfort was highly prevalent among University of Benin hostel occupants, with the most commonly affected areas being the neck, upper back, and lower back. This implies that MSP is a prevalent grievance among this demographic and could negatively impact students' everyday activities and comfort.

The majority of mattresses were made of foam, most of which had a medium density and an average thickness of about 7 cm. Numerous individuals reported using the same mattress for extended periods of time, frequently longer than is advised. These results suggest that most hostel occupants' sleeping surfaces do not offer enough spinal alignment or postural support.

Significant correlations between the kind, thickness, and duration of use of mattresses and pain in particular body parts were discovered by the study. Long-term use and poorly designed sleeping surfaces were associated with increased pain prevalence, suggesting that insufficient bedding may be a contributing factor in the onset or maintenance of musculoskeletal pain.

The overall findings of this study indicate that musculoskeletal discomfort is prevalent among hostel inhabitants and is impacted by the ergonomics of their sleeping surfaces. University students' musculoskeletal health and sleep pleasure can be improved by addressing this issue through better bedding, frequent mattress replacements, and ergonomic guidance provided through physiotherapists.

5.3 Recommendation

1. Physiotherapy practice: When performing a standard musculoskeletal evaluation on students and young adults, physiotherapists may incorporate an assessment of sleep ergonomics. In order to reduce repeated discomfort, preventive programs might also incorporate spinal stabilization techniques and posture correction exercises.
2. Hostel and Institution Management: To ensure that students have enough spinal support, regular mattress replacement schedules (every one to two

years) should be put in place. Additionally, students should be given medium-firm mattresses that meet ergonomic criteria, or encouraged to use them if they bring their own mattresses.

3. Health education: As part of students' health initiatives, educational campaigns should constantly include sleep position, duration, and surface choice. In order to encourage musculoskeletal wellbeing throughout the university community, physiotherapy students ought to serve as health ambassadors.

5.4 Implications for further study

Future study should concentrate on broadening parameters and accounting for additional potential factors that could influence both sleep and musculoskeletal pain, although a number of studies have examined the potential association between sleeping surfaces and musculoskeletal pain. In order to improve the causal understanding of pain mechanisms, future research should include biomechanical assessments (such as spinal curvature analysis), investigate the combined effects of physical activity, posture, and sleeping surfaces on musculoskeletal health, and perform longitudinal and interventional studies to look at how changing mattresses affects pain reduction.

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APPENDIX I: ETHICAL CLEARANCE LETTER

RESEARCH ETHICS COMMITTEE
COLLEGE OF MEDICAL SCIENCES
UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

Chairman: Prof. F. A Imarhiagbe
MBChb, FMCP
Cert Clin Res and ethics (NIH), MD.
0803449092

P.M.B 1154, BENIN CITY
Email: researchethics.cms@gmail.com

Our Ref: CMS/REC/01/VOL.2/794 **Date:** 18th September, 2025

Re: CORRELATION BETWEEN SLEEPING SURFACES AND MUSCULOSKELETAL PAIN IN RESIDENTS OF CAMPUS HOSTEL WITHIN THE UNIVERSITY OF BENIN

Name of Principal Investigator: **AHMED DESTINY TOBECHUKWU**
Department Of Physiotherapy,
School of Basic Medical Science
College of Medical Sciences,
University of Benin

REC Approval No: **CMS/REC/2025/794**

This is to inform you that the research described in the submitted proposal, the Informed Consent Forms and other participant information materials have been reviewed and approved by the College Research Ethics Committee, University of Benin.

This approval dates from **18th September, 2025 to 19th September, 2026.** In multi-year research, Endeavour to submit your annual report to the REC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the code including ensuring that all adverse events are reported promptly to the REC. No, changes are permitted in the research without prior approval by REC except in circumstances outlined in the code. REC reserves the right to conduct compliance visit to your research site without prior notice. Thank you.

PROF. F.A IMARHIAGBE
Chairman, REC

Promoting best ethical & scientific standard for research in Nigeria

APPENDIX II: INFORMED CONSENT FORM

Title of study: Correlation between sleeping surfaces and musculoskeletal pain in residents of campus hostels within the University of Benin.

Researcher: Destiny Tobechukwu Ahmed

I am a final-year student of the Department of Physiotherapy, University of Benin, conducting a research study as part of the requirements for the completion of my undergraduate project.

Purpose: This study aims to investigate the relationship between the type and characteristics of sleeping surfaces and the occurrence of musculoskeletal pain among students residing in hostels on campus.

Participation: Your participation in this study is entirely voluntary. You may choose to withdraw at any time without penalty.

Confidentiality: All information provided will be kept strictly confidential and used solely for research purposes.

Risks/Benefits: There are no known risks associated with participation. The findings may help in recommending better sleeping surfaces to reduce pain and improve comfort.

Consent: By signing below, you agree to participate in the study and affirm that you have understood the purpose and nature of the study.

Signature: ________________________ Date: ________________

APPENDIX III: QUESTIONNAIRE

Title of study: Correlation between sleeping surfaces and musculoskeletal pain in residents of campus hostels within the University of Benin.

SECTION A: BIODATA

1. Age (in years): ☐ Below 18 ☐ 18 – 23 ☐ 23 – 28 ☐ Above 28
2. Sex: ☐ Male ☐ Female
3. Department: ____
4. Faculty: ____
5. Level: __________
6. Name of Hostel: ____________________________________
7. **Approximately how long have you lived in a campus hostel (not including time at home)?** ☐ Less than 3 months ☐ 3–6 months ☐ 6–12 months ☐ 1–2 years ☐ More than 2 years
8. **Within the period you've been enrolled as a student, approximately how long have you spent sleeping at home (not in hostel)?** ☐ Less than 3 months ☐ 3–6 months ☐ 6–12 months ☐ 1–2 years ☐ More than 2 years
9. Do you engage in physical activity at least 3 times a week? ☐ Yes ☐ No
10. **Height (in meters):** ____________
11. **Weight (in kg):** _______________
12. BMI: ___________ *(to be calculated by researcher using weight (kg) / height² (m²))*

SECTION B: NORDIC MUSCULOSKELETAL QUESTIONNAIRE – EXTENDED (NMQ – E)

Please answer the following questions about any ache, pain, or discomfort you may have experienced in the past 12 months or the past 7 days in the areas shown below. Tick as appropriate.

Instructions: For each body part, answer the following:

1. Have you had trouble (such as ache, pain, discomfort) in the last **12 months**?
2. Have you had trouble in the last **7 days**?
3. Has it prevented you from carrying out normal activities (e.g., work, school)?

Body Region	12-Months	Last 7 Days	Interfered with Activity
Neck	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Shoulders	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Elbows	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Wrist/Hands	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Upper Back	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Lower Back	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Hips/Thighs	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Knees	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ankles/Feet	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

SECTION C: BOSTON MATTRESS SATISFACTION QUESTIONNAIRE (BMSQ)

(Adapted from Jacobson et al., 2009)

Instructions: Please rate your satisfaction with the mattress you currently use in your hostel. Use a scale of 1–10 where 1 = very dissatisfied and 10 = very satisfied.

1. Overall satisfaction with your mattress: _______/10
2. Satisfaction with comfort: _______/10
3. Support provided during sleep: _______/10
4. Firmness level: _______/10
5. Temperature regulation (does it stay too hot/cold?): _______/10
6. Ease of movement on the mattress: _______/10
7. Morning alertness after sleeping on the mattress: _______/10
8. Level of pain/stiffness after waking up: _______/10
9. Satisfaction with sleep quality: _______/10
10. Likelihood of recommending this mattress type to others: _______/10

SECTION D: SLEEPING SURFACE DETAILS

1. What type of mattress do you currently sleep on?

☐ Foam ☐ Spring ☐ Orthopedic ☐ Air ☐ Other: _____________

2. Please fill in the dimensions of your mattress (in cm):

Use a measuring tape or ruler. Measure your mattress in ***centimeters (cm)*** *as follows:*

- Length (head to foot): _________ cm

- Width (side to side): __________ cm
- Height (height from bottom to top): _______ cm

3. Please indicate **how long you have been using the mattress**: ☐ Less than 6 months ☐ 6–12 months ☐ 1–2 years ☐ 2–3 years ☐ More than 3 years
4. **Mattress Firmness (subjective rating):** ☐ Soft ☐ Medium ☐ Firm ☐ Unknown
5. Bed base type: ☐ Wood frame ☐ Metal ☐ Floor only ☐ Other: ____________
6. Is a mattress topper used? ☐ Yes ☐ No
7. Usual sleep posture: ☐ Back ☐ Side ☐ Stomach ☐ Varies
8. Average hours of sleep per night: _______ hours
9. Do you wake up at night due to discomfort? ☐ Yes ☐ No If yes, how often? ______ times/week
10. Use of extra pillows for support? ☐ Yes ☐ No Where? ☐ Neck ☐ Back ☐ Legs ☐ Other: __________