

**RELATIONSHIP BETWEEN PHYSICAL ACTIVITY
LEVELS AND SPINAL PAIN AMONG BASIC
MEDICAL SCIENCES STUDENTS AT THE
UNIVERSITY OF BENIN**

BY

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BMS2005132

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

OCTOBER 2025.

CERTIFICATION

This dissertation by Adeleye, Favour Samuel is accepted in its present form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences, University of Benin.

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DEDICATION

This dissertation is dedicated to God Almighty, the source of all wisdom and knowledge and to my family, for their unwavering love, sacrifices, and encouragement throughout my academic pursuit.

ABSTRACT

Background: Spinal pain is a prevalent musculoskeletal disorder globally and a major cause of disability among young adults, including university students. Factors such as sedentary lifestyle, prolonged sitting, poor posture and physical inactivity have been implicated. This study investigated the relationship between physical activity levels and spinal pain among students of the school of Basic Medical Sciences, University of Benin.

Methods: A cross-sectional descriptive study was conducted among 356 undergraduate students of the School of Basic Medical Sciences, University of Benin. Participants were selected using a stratified random sampling technique. Data on sociodemographic characteristics, anthropometric indices, physical activity levels and spinal pain prevalence were collected using standardized questionnaires. Statistical analyses included descriptive statistics, Chi-square test, independent t-test, one-way ANOVA and Pearson correlation with significance set at $p < 0.05$.

Results: The mean age of the respondents was 21.49 ± 2.22 years. Most participants (74.4%) engaged in physical activity, and the majority had moderate (45.5%) or high (37.9%) activity levels. The 12-month prevalence of lower back pain was 50.5%, neck pain 34.8% and upper back pain 27.5%. There was no significant association between physical activity level and the prevalence of spinal pain ($p < 0.05$). However, gender showed a significant association with lower back pain ($p < 0.001$).

Conclusion: Spinal pain, especially low back pain, is common among students of the School of Basic Medical Sciences, University of Benin, irrespective of physical activity level. Preventive interventions focusing on posture, ergonomics and spinal health education are recommended.

Keywords: Spinal pain, Physical activity, Lower back pain, Undergraduates students, Ergonomics.

ACKNOWLEDGEMENTS

I sincerely acknowledge the almighty God for His grace, wisdom and strength throughout the course of this research work and my academic journey on this campus.

My profound gratitude goes to my supervisor MrOkhuaheuyiEguagie for his guidance, mentorship and constructive feedback that made this project a success.

My heartfelt thanks go to my parents, Mr and Mrs Adeleye, my brothers and sister for their love, encouragement, financial support and prayers. I will also like to appreciate my friends, Kamimi, Ehrun, Great-destiny, Oludare, Gabriel for their assistant during the period of my data collection. Special thanks to my colleagues and all the students that volunteered to participate in my study.

I also appreciate all lecturers and staff of the department of Physiotherapy, University of Benin, for their support and academic contributions throughout my training. May God bless you all abundantly.

TABLE OF CONTENTS

| | |
|---|-----|
| TITLE PAGE | i |
| CERTIFICATION | ii |
| DEDICATION | iii |
| ABSTRACT | iv |
| ACKNOWLEDGEMENTS | v |
| TABLE OF CONTENTS | vi |
| INTRODUCTION | 1 |
| 1.1 Background of the study | 1 |
| 1.2 Statement of the problem | 4 |
| 1.3 Aim of the study | 6 |
| 1.3.1 Specific Objectives | 6 |
| 1.4 Hypothesis | 7 |
| 1.4.1 Main Hypothesis | 7 |
| 1.4.2 Sub Hypothesis | 7 |
| 1.5 Significance / Justification of study | 8 |
| 1.6 Scope and Delimitation | 9 |
| 1.7 Limitations of the Study | 9 |
| 1.8 Definition of terms / Operational Definition of Terms | 10 |
| 1.9 List of Abbreviations | 11 |
| CHAPTER TWO | 11 |
| LITERATURE REVIEW | 11 |
| 2.1 Introduction | 11 |
| 2.1.1 Epidemiology | 12 |
| 2.2 Anatomy of the Back | 14 |
| 2.2.1 The Vertebral Column | 14 |
| 2.2.1.1 The Vertebrae | 15 |
| 2.2.1.2 Curvatures of the Vertebral Column | 15 |
| 2.2.2 Muscles of the Back | 18 |
| 2.3 Spinal Pain | 19 |
| 2.3.1 Prevalence and patterns | 20 |

| | |
|--|----|
| 2.3.2 Contributing Factors in the Academic Environment | 21 |
| 2.4 Physical activity | 22 |
| 2.4.1 Determinants of Physical Activity in University students | 23 |
| 2.4.2 Health implications of Low physical activity | 24 |
| 2.5 Relationship between spinal pain and physical activity | 25 |
| 2.5.1 Conflicting Evidence and Moderating Factors | 26 |
| 2.6 Theoretical Framework | 27 |
| 2.6.1 The Biopsychosocial Model | 27 |
| 2.6.2 Disuse Syndrome Theory | 28 |
| 2.6.3 Relevance of the Theories to the Present Study | 29 |
| 2.7 Empirical Review of Literature | 29 |
| CHAPTER THREE | 36 |
| MATERIALS AND METHODS | 36 |
| 3.1 Participants | 36 |
| 3.1.1 Inclusion Criteria | 36 |
| 3.1.2 Exclusion Criteria | 36 |
| 3.2 Materials | 37 |
| 3.2.1 Description of Instruments | 37 |
| 3.3 Methods | 37 |
| 3.3.1 Research Design | 37 |
| 3.3.2 Sampling Technique | 38 |
| 3.3.3 Sample Size Calculation | 38 |
| 3.3.4 Procedure for Data Collection | 38 |
| 3.3.5 Ethical Considerations | 39 |
| 3.3.6 Data Analysis | 39 |
| CHAPTER FOUR | 41 |
| RESULTS | 41 |
| 4.1 Results | 41 |
| 4.1.1 Sociodemographic variable of the participants | 41 |
| 4.1.2 Anthropometric characteristics of the participants | 43 |
| 4.1.3 Physical activity level of the participants | 45 |
| 4.1.4 7 days and 12-month Prevalence of spinal pain | 47 |

| | |
|--|----|
| 4.1.5 One-way ANOVA comparing the physical activity level across the various departments | 49 |
| 4.1.6 Association between physical activity levels and the prevalence of spinal pain | 51 |
| 4.1.7 Association between the prevalence of spinal pain and the departments of the respondents | 53 |
| 4.1.8 Pearson correlation between age and physical activity levels | 55 |
| 4.1.9 Independent t test comparing the difference in the physical activity level between the male and female respondents | 57 |
| 4.1.10 Association between prevalence of spinal pain and the gender of the respondents | 59 |
| 4.2 Hypothesis testing | 61 |
| CHAPTER FIVE | 70 |
| DISCUSSION, CONCLUSION AND RECOMMENDATIONS | 70 |
| 5.1 Discussion | 70 |
| 5.2 Conclusion | 73 |
| 5.3 Recommendations | 74 |
| 5.4 Implications for Further Studies | 76 |
| REFERENCES | 77 |
| APPENDICES | 88 |
| APPENDIX I | 88 |
| APPENDIX II | 89 |
| APPENDIX III | 91 |
| ETHICAL APPROVAL | 91 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1: Lateral view of the Vertebral Column showing the four spinal curvatures..... | 17 |
|--|----|

LIST OF TABLES

| | |
|--|----|
| Table 1: Empirical review of literature..... | 31 |
| Table 2: Sociodemographic variable of the participants..... | 42 |
| Table 3: Anthropometric characteristics of the participants..... | 44 |
| Table 4: Physical activity level of the participants..... | 46 |
| Table 5: 7 days and 12-month Prevalence of spinal pain..... | 48 |

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Spinal pain, comprising discomfort in the neck, upper back, and lower back represented a significant health concern at global, regional, and local levels, particularly within student populations characterized by sedentary habits. Globally, Spinal pain, and especially low back pain, represented a significant contributor to disability and a decline in quality of life. Findings from the Global Burden of Disease Study in 2019 classified low back pain as the major factor that affected years lived with disability since 1990 (IASP, 2021). Epidemiological research suggested that approximately 40% of individuals would experience low back pain at some point in their lifetime, with prevalence rates of 23% over the past month and 38% over the last year (Dutmer, 2019). In the student population, factors such as prolonged sitting and improper posture further aggravate spinal pain. Aartun et al. (2014) found that neck, mid-back, and low-back pain were common in adolescents aged 11–15, with more severe and frequent pain in a subgroup of 14–20%, and noted a spread of pain locations over two years. Likewise, research focusing on medical students in Saudi Arabia indicated a 94% prevalence of low back pain, attributing prolonged sitting as a notable risk factor (Alshammari et al., 2023). The results of this research underscore the worldwide prevalence of spinal pain, especially in young adults and students, where sedentary lifestyles are common. Engaging in physical activity was frequently recommended as a potential alleviating measure, with the study (Shiri et al., 2019) indicated that

consistent exercise might diminish both the occurrence and intensity of spinal pain; however, the evidence was not entirely conclusive.

In Africa, spinal pain represented a considerable public health issue, with Nigeria playing a vital role in regional research efforts. A systematic review encompassed 65 studies conducted across Africa, included 31 from Nigeria, highlighted the widespread occurrence of low back pain among various populations (Morris et al., 2018). Akinpelu & Oyewole (2013) reported that over 50% of adolescent students in Ibadan experienced low back pain, with prolonged sitting posture cited as the most common predisposing factor. Adolescents were also significantly impacted, as the rates of back pain tend to increase with age, often correlated with sedentary lifestyle habits (Adegoke et al., 2011). For example, a study conducted in Ibadan revealed a notable prevalence of low back pain among secondary school students, which was attributed to extended periods of sitting and inadequate ergonomic practices (Adegoke et al., 2015). In an investigation of occupational groups, a study from a Southern Nigerian hospital reported a point prevalence of low back pain of 42% among staff, particularly among those engaged in sedentary professions (Ogunlana et al., 2019). In Nigeria, a study (Adegoke et al., 2015) highlighted a notable prevalence of spinal pain among undergraduate students, with poor posture, long study hours, and inadequate physical activity identified as contributing factors. Physical activity played a crucial role in the prevention and management of musculoskeletal pain. Regular movement strengthened spinal-supporting musculature, improved flexibility, and enhanced overall postural balance (Warburton & Bredin, 2017). Conversely,

low levels of physical activity had been associated with increased reports of spinal discomfort and pain, especially among students engaged in sedentary lifestyles (Rodrigues, 2019). These findings suggested that spinal pain was a widespread issue in Nigeria, in which factors such as sedentary behavior and occupational demands could also be a risk factor. Physical activity levels were critical, as low activity was often associated with higher pain prevalence, though regional studies on students were limited. At the University of Benin, students enrolled in Basic Medical Sciences including departments such as: Anatomy, Physiology, Physiotherapy, Radiography, Nursing, Medical laboratory science and Medical biochemistry, appeared to be at an increased risk for spinal pain attributed to the rigorous demands of their studies. These individuals frequently engaged in prolonged periods of sitting during lectures, laboratory activities, and studying, which might have lead to sub-optimal posture and resultant spinal strain. Although specific data regarding this demographic was limited, insights could be drawn from national trends and research conducted within similar populations. For instance, the notably high incidence of low back pain among Nigerian adolescents and medical students in other regions (Akinpelu & Oyewole, 2013) indicated that students at the University of Benin might encounter corresponding difficulties. The sedentary lifestyle characteristic of medical education, compounded by stress and insufficient opportunities for physical exercise, likely contributed to the prevalence of spinal pain in this group. Physical activity could play a protective role, as suggested by global studies where regular exercise was linked to reduced pain (Shiri et al., 2019). To the best of the researcher's

knowledge, the specific relationship between physical activity levels and spinal pain among Basic Medical Sciences students at the University of Benin remained underexplored, highlighting the need for this study.

According to the (World Health Organization, 2020) adults aged 18–64 should engage in at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic physical activity per week to maintain optimal health and reduce the risk of musculoskeletal problems, including spinal pain. However, adherence to these recommendations was often low among university students, especially those in demanding academic disciplines. The academic demands on basic medical sciences students often led to reduced time for exercise and increased sedentary behaviour, thereby elevating the risk of spinal problems (Haile, 2019). Understanding the relationship between spinal pain and physical activity levels in this population was crucial to informing preventive strategies and promoting healthier habits. Given the high physical and cognitive demands faced by students in the basic medical sciences at the University of Benin, there was a need to investigate the extent to which their physical activity levels correlated with the presence and severity of spinal pain. Such findings could contribute to targeted interventions, health education, and ergonomic adjustments to improve student well-being and academic performance.

1.2 Statement of the problem

Spinal pain was a significant health concern among university students, particularly those in demanding academic programs like Basic Medical Sciences. A cross - sectional study of over 1,300 Polish university students

found that physically inactive students reported significantly high rates of back pain, comparable to or even exceeding those of their more active peers, suggested a direct link between low physical activity and increased spinal pain (Kędra et al., 2021). Physical activity was known to be protective against spinal pain, and to the best of the researcher's knowledge, the extent of this relationship within the student population remained underexplored in Nigerian universities, including the University of Benin. Understanding this relationship was essential for developing preventive strategies and promoting healthy academic lifestyles. Previous studies had highlighted a significant association between low physical activity levels and increased musculoskeletal pain in student populations (Smith et al., 2018; AlShayhan&Saadeddin, 2018). However, local data specific to Basic Medical Sciences students in Nigeria was limited, thus warranting this investigation.

This study would therefore aim to answer the following questions:

- i. What was the prevalence of spinal pain (neck, upper back and lower back) among Basic Medical Sciences students at the University of Benin?
- ii. What were the physical activity levels of Basic Medical Sciences students at the University of Benin?
- iii. Was there a significant relationship between physical activity levels and the presence of spinal pain among these students?

- iv. What demographic and lifestyle factors (e.g., age, gender, posture, study hours) influenced the relationship between spinal pain and physical activity?
- v. What types of spinal pain (e.g., neck pain, low back pain) were most commonly reported in this population?
- vi. Did students who meet the WHO physical activity recommendations reported less spinal pain compared to those who do not?

1.3 Aim of the study

To investigate the relationship between physical activity levels and spinal pain among Basic Medical Sciences students at the University of Benin, with a view to determining the prevalence, patterns, and associated demographic and lifestyle factors influencing spinal pain.

1.3.1 Specific Objectives

- i. Determined the prevalence of spinal pain (including neck, upper back, and lower back pain) among Basic Medical Sciences students at the University of Benin
- ii. Assessed the physical activity levels of Basic Medical Sciences students at the University of Benin using established guidelines (e.g., WHO recommendation)
- iii. Examined the relationship between physical activity levels and the presence of spinal pain among Basic Medical Sciences (BMS) students
- iv. Identified the most commonly reported types of spinal pain (e.g., neck pain, upper back pain or low back pain) within this student population

- v. Explored demographic and lifestyle factors (such as age, gender, academic workload, posture and study habits) that might influence the relationship between physical activity and spinal pain.
- vi. Evaluated adherence to WHO physical activity recommendations among students and explored its association with spinal pain prevalence and severity.

1.4 Hypothesis

1.4.1 Main Hypothesis

There was a significant relationship between physical activity levels and the prevalence of spinal pain among Basic Medical Sciences students at the University of Benin.

1.4.2 Sub Hypothesis

- i. Spinal pain was not prevalent among Basic Medical Sciences students at the University of Benin.
- ii. Basic Medical Sciences students at the University of Benin did not significantly differ in their physical activity levels.
- iii. There was no significant relationship between physical activity levels and the presence of spinal pain among Basic Medical Sciences students.
- iv. There was no significant difference in the prevalence of neck pain, upper back pain and lower back pain among Basic Medical Sciences students.
- v. Demographic and lifestyle factors (e.g., age, gender, posture and study hours) did not significantly influence the relationship between physical activity and spinal pain.

- vi. There was no significant difference in spinal pain prevalence between students who met the WHO physical activity recommendations and those who did not.

1.5 Significance / Justification of study

- i. This research was aimed to enhance the understanding of the connection between physical activity and spinal discomfort among university students, particularly those enrolled in Basic Medical Sciences at the University of Benin.
- ii. This research yielded evidence that can guide the formulation of university health policies and campus wellness initiatives, advocating for measures such as ergonomic study settings, scheduled physical activity breaks, and increased awareness of spinal health.
- iii. The outcome of this study provided valuable insights for subsequent research focused on musculoskeletal health among university students, particularly within Nigerian institutions. Moreover, this research served as a framework for other universities to explore similar challenges within diverse student demographics.
- iv. The outcome of this study assisted physiotherapists, health educators, and other healthcare professionals in designing targeted interventions and preventive measures for students experiencing spinal discomfort.

1.6 Scope and Delimitation

This study was delimited to:

- i. Undergraduate students enrolled in the faculty of Basic Medical Sciences at the University of Benin.
- ii. Students in 200-500 level at the faculty of Basic Medical Science, University of Benin, Edo State, Nigeria.
- iii. Students of aged 16 years and above.

1.7 Limitations of the Study

The limitations of this study include:

- i. The study focused solely on students of the school of Basic Medical Sciences, University of Benin, thereby limiting the generalizability of the findings to other faculties or Schools.
- ii. The cross-sectional nature of the study limited the ability to establish a cause-and-effect relationship between physical activity levels and spinal pain.
- iii. Factors such as posture, ergonomic exposure, academic stress and sleep quality were not assessed even though they may influence spinal pain.
- iv. Physical activity levels were not objectively measured using instruments such as accelerometers which might have provided more accurate data.

- v. Differences in pain perception and reporting between male and female participants could have influenced the reported prevalence of spinal pain.

1.8 Definition of terms / Operational Definition of Terms

- **Spinal Pain:** Spinal pain refers to discomfort, aching, or pain experienced in the regions of the neck (cervical spine), upper back (thoracic spine), or lower back (lumbar spine), which may vary in intensity, duration, and frequency. It is often associated with musculoskeletal issues, sedentary behavior, or poor posture.(Dutmer, 2019).
- **Physical activity:** Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure, including activities such as walking, running, or structured exercise, which can be categorized by intensity (low, moderate, or vigorous). (WHO, 2020).
- **Ergonomics:** Ergonomics is the study of designing workstations and environments that fit the physical needs and capabilities of individuals. It aims to minimize strain and injury. In the context of this study, ergonomics refers to the study of how the academic environment (e.g., study desks, chairs) may contribute to spinal pain. (Salvendy G, 2012).

1.9 List of Abbreviations

- WHO – World Health Organization
- BMS – Basic Medical Sciences

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Among young adults and university students, spinal pain and physical inactivity are significant general health challenges. As noted by the World Health Organization (2020) musculoskeletal disorders, especially lower back

and neck pain, are key factors that contributed to global years lived with disability (YLDs). Spinal pain, presented distinct challenges because of its intricate causes, recurrent nature, and the social and economic burdens it placed on both individuals and institutions (Wu, 2020).

In school settings, students in the Basic Medical Sciences faced substantial risks, emanating from the mental strain and postural challenges associated with their learning habits and not only from their sedentary lifestyle (Mbada, 2015). At the same time, Pengpid & Peltzer (2014) also noted that decreasing levels of physical activity in this cohorts intensified musculoskeletal discomfort, lower functional abilities, and interfered with overall health and well-being.

2.1.1 Epidemiology

The prevalence of spinal pain showed considerable variability among different populations in Nigeria. A lifespan prevalence of low back pain (LBP) of 47% and also a yearly prevalence of 57% across various African countries, as observed in Nigeria contributed to these statistics, owing to its substantial population and diverse occupational exposures, had been shown by a systematic review carried out in 2018. The research focused on Nigerian university students showed increased prevalence rates, especially among those studying physiotherapy, Mbada, 2015 noted a prevalence exceeding 60%, in contrast to 35% among undergraduates in Malaysia. These differences may be related to variations in academic demands, ergonomic practices, or an increased awareness of spinal pain among physiotherapy students stemming from their educational training. Furthermore, in Nigeria a 2021 study

conducted showed a 16.4% prevalence of chronic spinal pain within the general population, also, significantly higher rates were observed in individuals older than 60 years, this indicated that age was a critical risk factor. Spinal pain was aggravated by its association with comorbidities and socioeconomic factors. Increased risks of mood disorders, anxiety, and other musculoskeletal disorders were linked to chronic spinal pain, which increased its impact on functional role performance. Also, Nigeria, one of low- and middle-income countries, with limited access to healthcare and occupational hazards, such as manual labor and water carriage, contributed to higher prevalence and severity of LBP, particularly among women. These findings pointed out the need for targeted epidemiological studies to identify population-specific risk factors and customized interventions for spinal pain among Nigerian university students.

Physical inactivity represented a significant factor in the global disease burden. Approximately 25% of adults worldwide, according to Hallal (2012), did not meet the World Health Organization's suggestion of engaging in a minimum of 150 minutes of moderate-intensity physical activity in a week. Urbanization, diminished active transportation, and increased screen time further complicated the landscape of physical activity in low and middle income nations. This situation was particularly concerning among university students. 40% and 70% of students in sub-Saharan Africa showed physical inactivity, this was revealed by a survey conducted by (Pengpid& Peltzer, 2014). Awotidebe et al. (2016) found that spinal pain was common among Nigerian

university students, with the low back and neck being the most frequently affected areas.

2.2 Anatomy of the Back

In the posterior part of the trunk is, the back, it lies between the neck inferiorly and superiorly to the buttocks (Moore et al., 2013). The back has the following structures;

- I. The skin and subcutaneous tissue**
- II. Muscles:** It consists of two layers:
 - A superficial layer, which primarily helps with movement and positioning of the upper limbs, and
 - Deep layers, also known as the true muscles of the back, which are more concerned with maintaining the body posture.
- III. The Vertebral Column:** It consists of the vertebral bodies, the intervertebral discs and the associated ligaments.
- IV. The ribs:** Located in the thoracic region
- V. Spinal cord and the associated meninges**
- VI. Segmental nerves and blood vessels** (Moore et al., 2013; Modes & Fahrioglu, 2020)

2.2.1 The Vertebral Column

The Vertebral Column is made up of the vertebrae and the intervertebral discs. It extends from the cranium to the apex of the coccyx. The vertebral column consists of 33 vertebrae, approximately 71 – 75cm of length in adults and the intervertebral discs form one – quarter of the vertebral column's length. The vertebral column serves the following function;

- I. It protects the spinal cord and the spinal nerves
- II. It supports the weight and physical structures of the body (above the level of the pelvis)
- III. It provides an axis for the movement of the body, and a base for the head.
- IV. It is important for the locomotion and posture of the body (Valovska, 2011; Moore et al., 2013; DeSai et al., 2020).

2.2.1.1 The Vertebrae

This is a structure consisting of 33 vertebrae categorized into five distinct regions:

- I. The cervical region, made up of seven vertebrae
- II. The thoracic region, made up of twelve vertebrae
- III. The lumbar region, made up of five vertebrae
- IV. The sacral region, made up of five vertebrae, fused to form a rigid sacrum.
- V. And the coccygeal region, made up of four vertebrae, fused to form the coccyx

Lumbosacral region is the junction between the lumbar vertebrae and the sacrum. (Valovska, 2011; Moore et al., 2013). Each of these regions possesses specific anatomical and functional traits that play a significant role in the spine's overall biomechanical performance.

2.2.1.2 Curvatures of the Vertebral Column

When viewed laterally, an adult's spinal column has four curvatures in the cervical, thoracic, lumbar and sacral regions. The thoracic and sacral regions

exhibit kyphosis, a curvature in which the vertebral column is convex posteriorly and concave anteriorly. Lordosis, a curvature in which the vertebral column is concave posteriorly and convex anteriorly, occurs in the cervical and lumbar region. The curvature of the vertebral column and the flexibility and elasticity of the intervertebral discs allows for greater degree of movement. Intervertebral discs provides passive flexibility due to the resistance of zygapophyseal joints, spinal curvatures provides dynamic flexibility due to resistance of the antagonist muscle groups to the movement of the curvature e.g long extensors of the back restricts thoracic kyphosis and abdominal flexors restricts lumbar lordosis. (Valovska, 2011; Moore et al., 2013).

The spinal curvatures can be increased by carrying additional weights anterior to the normal gravitational axis of the body, aching of the muscles that are antagonistic to the movement of the curvature starts when such weights are carried for a long duration (Moore et al.,2013).

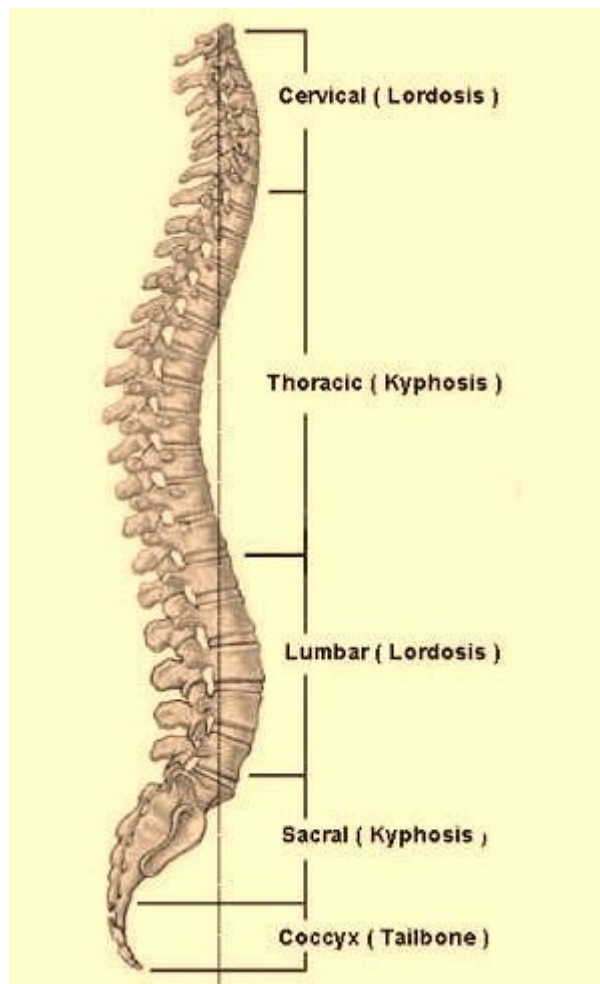


Figure 1: Lateral view of the Vertebral Column showing the four spinal curvatures

Image source: www.pinterest.at

2.2.2 Muscles of the Back

Two major groups of muscles are in the back, which are:

- I. The intrinsic back muscles and
- II. The extrinsic back muscles

The superficial and intermediate muscle groups of the extrinsic back muscles are responsible for initiating and controlling respiratory movement as well as limb movement.

- The superficial muscle groups (levator scapulae rhomboids, latissimus dorsi and trapezius) function to start and regulate upper limb movement. This group of muscles receives its nerve supply from the anterior rami of the cervical nerves except for the trapezius, which is innervated by the spinal accessory nerve.(Moore et al.,2013; Modes &Fahrioglu, 2020).
- The intermediate muscle groups which contains the serratus posterior muscles (superior and inferior muscle) control respiratory action. The intercostal nerves innervate both muscles.(Moore et al.,2013; Modes &Fahrioglu, 2020).

However, Henson et al. (2020) categorized muscles of the back into three groups with the superficial and intermediate muscle groups categorized separately along with the intrinsic muscle groups. The intrinsic muscle groups are attached to the vertebral column and are involved in controlling the movement of the vertebral column along with helping to maintain body's

posture. They are supplied with nerve fibers by the posterior rami of the spinal cord. (Modes &Fahrioglu, 2020; Moore et al.,2013). There are 3 layers of intrinsic back muscles:

- I. The superficial layer (the splenius cervicis and the splenius capitis)
- II. The intermediate layer (the erector spinae muscles – the iliocostalis, longissimus and spinalis muscle)
- III. The deep layer (the transversospinalis muscles – the semispinalis, multifidus and rotator muscles) Moore et al., 2013; Modes &Fahrioglu, 2020.

2.3 Spinal Pain

Spinal pain entails a broad spectrum of discomfort or pain that arises from any segment of the vertebral column: cervical, thoracic, lumbar, sacral, or coccygeal regions along with its associated anatomical structures: muscles, ligaments, intervertebral discs, and nerves (Bogduk, 2005). Typically, it is delineated according to the specific region affected, with low back pain (LBP) and neck pain (NP) identified as the most common subtypes, particularly prevalent among younger individuals and those of working age (Hoy, 2014). Spinal pain originated from a multitude of factors, encompassing biomechanical, physiological, psychological, and environmental components. Dagenais et al. (2008) indicated that this type of pain can stem from structural injuries, including muscle strains, disc herniation, ligament sprains, and vertebral degeneration.

2.3.1 Prevalence and patterns

The incidence of spinal pain among tertiary students is notably disparate across various settings. A systematic review conducted by (Alshagga, 2013) indicated that the global prevalence of low back pain among university students fluctuated between 28% and 74%, influenced by variables such as academic discipline, ergonomic conditions, and levels of physical activity. In the Nigerian context, research by (Mbada, 2015) revealed a significant prevalence rate of 66.7% among physiotherapy undergraduates, which they attributed to both physical and psychological stressors.

Additionally, research indicated that the onset of spinal pain frequently occurs during the initial years of university education and tends to continue throughout one's academic journey if not effectively managed (Adegoke et al., 2008). These conditions were commonly observed in higher education environments, where students often participate in extended study sessions or spend considerable time in front of screens.

Gender and age also influenced prevalence. Females, for instance, often reported higher pain intensity and frequency, which might be due to biological, hormonal, or psychosocial factors (Hoy, 2012).

The distribution of pain also tended to follow common patterns: neck pain was typically linked to computer use and forward head posture, while low back pain was associated with sitting posture and core muscle deconditioning (Côté et al., 2008).

2.3.2 Contributing Factors in the Academic Environment

Numerous environmental and behavioral factors significantly influenced the prevalence of spinal pain among university students. A critical concern was the lack of ergonomic design, as chairs and desks in lecture halls were seldom adjustable or optimized for extended periods of sitting, resulting in sustained non-neutral spinal postures (Dawson, 2007). Additionally, certain study habits such as engaging in continuous reading without taking breaks, excessive last-minute studying, and prolonged use of laptops or mobile devices imposed static loads on the spine. Straker (2008) asserted that the overuse of digital devices while in slumped positions disrupted the natural curvature of the spine, thereby exacerbating compressive forces on the intervertebral discs..

Psychosocial stress, frequently occurred in highly competitive academic environments, had the potential to heighten the perception of pain. Linton (2000) contended that young adults facing academic pressures commonly exhibit muscle tension induced by stress and diminished pain thresholds. Furthermore, students overlooked initial symptoms due to insufficient awareness or lack of available resources for timely intervention, resulting in the escalation of mild discomfort into chronic pain conditions. Moreover, lifestyle factors such as inadequate sleep, substance use, and insufficient physical activity were significantly linked to musculoskeletal pain (Hakala et al., 2006). These behaviors tend to intensify during examination periods, coinciding with heightened academic stress.

2.4 Physical activity

Physical activity was comprehensively characterized as any movement generated by skeletal muscles that leads to energy expenditure exceeding baseline levels (Caspersen et al., 1985). This concept included a diverse array of movements, spanning from routine daily activities (including walking, stair climbing, and domestic tasks) to organized exercise and competitive sports. The World Health Organization (2020) categorized physical activity according to its intensity—light, moderate, and vigorous—utilizing **Metabolic Equivalent**s (METs) as a means to estimate the associated energy expenditure.

The physical activity levels of students in higher education had become an increasingly pressing issue, largely attributed to the sedentary lifestyle that often accompanied academic pursuits. Despite a general understanding of the numerous health advantages associated with regular exercise, many university students did not meet the established recommendations for physical activity. The World Health Organization (2020) stipulated that adults aged 18 to 64 should engage in a minimum of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity each week. Nevertheless, recent research indicated that a substantial percentage of university students did not reach these benchmarks (Guthold et al., 2018).

Physical activity can be further classified into four domains:

- I. Occupational (e.g., work tasks)
- II. Transport-related (e.g., walking, cycling)
- III. Household (e.g., cleaning, gardening)
- IV. Leisure-time (e.g., sports, exercise).

2.4.1 Determinants of Physical Activity in University students

A variety of interconnected factors influenced the level of physical activity among students in higher education. These factors encompass personal, social, environmental, and institutional dimensions.

- I. **Personal factors:** elements such as time limitations, academic responsibilities, lack of motivation, and stress were commonly identified as obstacles to consistent physical activity. Irwin (2004) observed that students frequently prioritized their academic commitments over health-related behaviors, such as exercise, particularly during examination periods.
- II. **Social and environmental factors:** including the behaviors of peers, cultural expectations, and available support networks, significantly affect the promotion or inhibition of physical activity. Research by Sallis et al. (2000) indicated that students who associated with physically active peers or are involved in sports organizations are more inclined to engage in active lifestyles.
- III. **Institutional dimensions:** The university setting can play a crucial role in either facilitating or hindering physical activity. Factors such as limited availability of recreational facilities, insufficient green spaces, inadequate infrastructure, and the absence of institutional policies that promote exercise were all associated with decreased levels of physical activity (Keating, 2005). It was evident among university students in health-related fields, such as Nursing, physiotherapy etc. where a heightened awareness of the benefits of physical activity did not

necessarily result in regular participation. Such inconsistencies could be attributed to time limitations, curriculum pressures, and stress levels (Haase et al., 2004).

2.4.2 Health implications of Low physical activity

Inadequate levels of physical activity among university students had been associated with a range of negative health impacts. These consequences encompassed weight gain, diminished cardiovascular fitness, decreased muscle strength, and a heightened prevalence of lower back and neck pain (Shiri & Falah-Hassani, 2010). Additionally, a sedentary lifestyle resulted in psychological issues such as anxiety and depression, which further inhibited students' motivation to engage in physical activity (Biddle & Asare, 2011).

It is particularly important to note that decreased physical activity adversely affected spinal health. This reduction led to the deconditioning of the core and postural muscles that provide stabilization for the spine, thereby increasing the risk of poor posture and spinal strain among students (McGill, 2007). Implementing strengthening exercises and incorporating regular movement breaks during study sessions have demonstrated effectiveness in alleviating these risks and enhancing musculoskeletal health (Heneweer et al., 2009).

Numerous studies indicated that individuals who engage in regular physical activity report experiencing fewer occurrences of spinal pain, reduced duration of pain, and enhanced functional outcomes when compared to their sedentary counterparts (Heneweer et al., 2009). Furthermore, the World Health Organization's Global Action Plan on Physical Activity 2018–2030

highlighted the importance of encouraging physical activity among young people to alleviate long-term health risks and promote overall well-being (WHO, 2018).

2.5 Relationship between spinal pain and physical activity

The relationship between physical activity and spinal pain is complex and has been the subject of extensive research across diverse populations, including university students. Generally, physical activity was viewed as a protective factor against musculoskeletal disorders; however, this relationship was not always clearly defined. A considerable body of research indicated that sufficient and consistent physical activity mitigated both the frequency and intensity of spinal pain, particularly in the lumbar and cervical regions (Shiri & Falah-Hassani, 2010). Conversely, a lack of physical activity, as well as excessive or poorly designed exercise regimens, led to the development or exacerbation of spinal pain (Heneweer et al., 2009).

Engaging in physical activity played a crucial role in maintaining spinal health by enhancing muscle strength, flexibility, posture, joint mobility, and core stability. Research indicated that consistent participation in moderate aerobic or resistance training exercises decreased the load on the spine, promoted hydration of intervertebral discs, and improved spinal alignment (McGill, 2007). These elements served to alleviate mechanical stress and lowered the risk of injury.

A study conducted by Heneweer et al. (2009) demonstrated that individuals involved in moderate physical activity experience reduced levels of low back

pain when compared to those who lived a sedentary lifestyle. Furthermore, the same research highlighted that the activation of core muscles through exercises such as planks, bridges, and resistance training bolsters support for the lumbar spine. This protective effect was particularly relevant for students, who frequently found themselves seated for extended periods while studying often in environments lacking optimal ergonomic standards.

Extended periods of physical inactivity were associated with muscle atrophy, particularly affecting the postural and core muscles that provided support to the spine. Moreover, sedentary lifestyles resulted in inadequate blood circulation, diminished joint lubrication, and the weakening of spinal ligaments, all of which heightened the risk of experiencing spinal pain (Booth et al., 2012). This issue was exacerbated in students due to extensive screen time, suboptimal postural practices, and a lack of organized physical activity.

A study conducted by (Mbada, 2015) at a higher education institution in Nigeria revealed that students with low levels of physical activity were more prone to report symptoms of spinal pain, particularly in the lumbar region. In a similar vein, Adegoke et al. (2008) identified a statistically significant inverse correlation between levels of physical activity and the intensity of back pain among students in health sciences.

2.5.1 Conflicting Evidence and Moderating Factors

A broad agreement exists regarding the beneficial effects of physical activity; however, certain studies yielded contradictory results. For example, Alzahrani (2019) found that excessive physical activity, particularly in the context of high-impact sports or improper lifting techniques, may lead to or exacerbate

spinal pain, especially in individuals lacking training. This indicated the possibility of a U-shaped association, wherein both insufficient and excessive levels of physical activity heightened the risk of spinal pain, while moderate activity appeared to be the most advantageous.

Furthermore, psychosocial and individual variables including stress, sleep quality, body mass index (BMI), and prior injury history influenced the relationship between physical activity and spinal pain. Linton (2000) emphasized that psychological stress and emotional distress intensified pain perception and diminished pain tolerance, potentially obscuring the isolated impact of physical activity.

2.6 Theoretical Framework

In examining the relationship between spinal pain and physical activity levels, several models and theories had been proposed to explain how physical, psychological, and behavioral factors interacted to influence musculoskeletal health. Two key theories that were particularly relevant to this study were the Biopsychosocial Model and the Disuse Syndrome Theory

2.6.1 The Biopsychosocial Model

The Biopsychosocial Model, initially introduced by Engel in 1977, highlighted that health and illness were influenced not only by biological components but also by psychological and social factors. When examining spinal pain in the student population, this model offered a holistic perspective by incorporating:

- I. Biological aspects, including posture, muscle strength, core stability, and levels of physical activity;

- II. Psychological elements, such as stress, anxiety, pain perception, and academic pressures;
- III. Social determinants, encompassing the study environment, peer interactions, familial expectations, and cultural perspectives on pain and exercise.

In practical terms, this model explained how a student experiencing prolonged sitting (biological), exam-related stress (psychological), and lack of support for physical activity on campus (social) was at greater risk for developing spinal pain. According to Gatchel et al. (2007), this model was particularly useful in explaining chronic pain conditions, which persisted beyond tissue healing and are influenced by emotional and cognitive variables.

2.6.2 Disuse Syndrome Theory

The Disuse Syndrome Theory, initially introduced by Hatze in 1976 and subsequently elaborated upon by Booth and colleagues in 2002, postulated that insufficient physical activity contributed to physiological decline, manifesting as muscle atrophy, joint rigidity, and diminished cardiovascular health. In the context of spinal pain, the disuse syndrome elucidated how sedentary lifestyles which is prevalent among students led to the weakening of postural muscles and a decrease in spinal stability.

In their research, Booth et al. (2012) highlighted that sedentary habits, particularly among young adults, result in metabolic and musculoskeletal deconditioning, thereby heightening the risk of experiencing low back and neck pain. This theoretical framework underscored the apprehension that

inadequate levels of physical activity among students in the basic medical sciences increased their susceptibility to spinal disorders

.Furthermore, the disuse theory supported interventions aimed at early movement, posture correction, and strengthening exercises as part of spinal pain prevention. It also underpinned why structured physical activity is essential not just for general health but for preserving spinal integrity.

2.6.3 Relevance of the Theories to the Present Study

The Biopsychosocial Model and the Disuse Syndrome Theory served as complementary frameworks for elucidating the intricate, multifaceted relationship between spinal pain and physical activity in student populations. The Biopsychosocial Model addressed the comprehensive nature of pain, incorporating factors such as academic stress and lifestyle choices, while the Disuse Theory emphasized the physiological repercussions associated with physical inactivity.

Collectively, these theories provide a solid conceptual basis for the present study, reinforcing the notion that spinal pain experienced by students in basic medical sciences transcended mere biomechanical considerations. Instead, it encompassed behavioral and psychosocial dimensions that were intricately linked to their engagement in physical activities and their academic lifestyles.

2.7 Empirical Review of Literature

The studies reviewed provided compelling evidence of a significant link between levels of physical activity and spinal pain, especially in student and young adult demographics. Numerous studies from Nigeria, including those

conducted by (Mbada, 2015), (Awotidebe et al., 2015) consistently documented a high incidence of low back pain among university students, particularly within sedentary academic settings. These observations were consistent with global research with studies such as (Shiri & Falah-Hassani, 2010; Heneweer et al., 2009), which indicated that a lack of physical activity raises the likelihood of developing chronic spinal pain. A notable trend identified in these studies was the negative relationship between physical inactivity and spinal health. Students who engaged in little physical activity frequently report musculoskeletal issues, especially in the lumbar and cervical regions of the spine. This supported the ideas presented in the disuse syndrome theory, which posited that decreased activity led to musculoskeletal deconditioning, potentially increasing susceptibility to pain.

Table 1: Empirical review of literature

| Study | Title of the study | Study objectives | Method | Conclusion |
|------------------------|--|--|---|--|
| Adegoke et al., 2015 | Physical activity levels of university students in Nigeria | To assess the physical activity levels of Nigerian university students | this cross-sectional study, Nigerian undergraduates were recruited and physical inactivity as a predisposing factor of health risk was assessed | Many students exhibited low levels of physical activity, highlighting the need for targeted interventions. |
| Alzahrani, 2019 | Physical activity and low back pain: A systematic review | To investigate the link between PA and LBP | In this systematic review, published observational studies were analyzed and physical activity as a protective or risk factor for LBP was assessed. | PA reduces LBP risk, but effects vary by intensity and type. |
| Caspersen et al., 1985 | Definitions and distinctions of physical activity | To clarify PA and fitness definitions for research | In this literature review, conceptual papers were analyzed and distinctions in physical activity | Clear distinctions guide better physical activity research design. |

| | | | | |
|------------------------------------|--|---|---|---|
| | | | terminology were assessed | |
| Cochrane Back and Neck Group, 2023 | Exercise therapy for acute LBP | To evaluate exercise efficacy in treating acute low back pain | In this systematic review of RCTs, patients with acute LBP were studied and exercise therapy as a treatment approach was assessed | Exercise therapy improves function and shortens pain duration. |
| Guthold et al., 2018 | Worldwide trends in insufficient physical activity | To track inactivity globally over 15 years | In this pooled global analysis, adult participants from 358 surveys were recruited and insufficient PA as a global trend was assessed. | Over 25% of adults were insufficiently active, especially women and young adults. |
| Hallal, 2012 | Global physical activity levels | To evaluate global physical activity trends and their health implications | In this global review study, international surveillance data were analyzed and insufficient physical activity as a risk factor was assessed | Physical inactivity is a major global health threat, especially among youth |
| Hernandez- Lucas et al., 2024 | Core control exercises reduce discomfort in | To assess whether core activation reduces back | In this RCT, sedentary adults were recruited and | Core control exercises significantly lowered |

| | | | | |
|---------------|--|---|---|--|
| | prolonged sitting | discomfort from sitting | core exercises as an intervention for back discomfort were assessed | back discomfort |
| Hoy, 2014 | Global burden of low back pain | To quantify LBP burden using GBD 2010 data | In this systematic review, global burden data were analyzed and low back pain as a leading cause of disability was assessed | LBP is the leading global cause of years lived with disability. |
| Ibeneme, 2017 | Prevalence of musculoskeletal pain among undergraduates in Nigeria | To determine the prevalence and risk factors of musculoskeletal pain in Nigerian undergraduates | In this cross-sectional study, university students were recruited and musculoskeletal pain as a predisposing factor of functional impairment was assessed | High prevalence of pain, especially among students with sedentary lifestyles and prolonged sitting |
| Kamwend, 2000 | Physical activity in prevention of back pain | To assess PA in LBP prevention | In this literature review and case series, patients at risk for LBP were studied and physical activity as a preventive strategy was | PA has both preventive and therapeutic value for LBP. |

| | | | | |
|-----------------------------|---|---|--|--|
| | | | assessed | |
| Okafor, 2022 | Relationship between spinal pain and physical activity among Nigerian university students | To examine the link between physical activity levels and reported spinal pain | In this cross-sectional study, Nigerian undergraduates were recruited and physical inactivity as a predisposing factor for spinal pain was assessed | Lower physical activity levels were associated with increased spinal pain complaints. |
| Shiri & Falah-Hassani, 2017 | Does physical activity protect against low back pain? | To examine if physical activity protects against LBP | In this meta-analysis, data from multiple cohort studies were reviewed and physical activity as a protective factor against low back pain was assessed | Moderate physical activity reduces LBP risk; excessive or minimal activity increases it. |
| Smith, 2024 | Walking reduces recurrence of low back pain: A 3-year randomized controlled trial | To test the long-term effect of walking on recurrent low back pain | In this randomized controlled trial, adults with recurrent low back pain were recruited and walking as a protective factor was assessed | Regular walking reduced recurrence of low back pain by 28% |
| Vancini, 2022 | Physical activity levels | To compare | In this cross-sectional study, | Sedentary students were |

| | | | | |
|-----------|---|--|---|--|
| | and musculoskeletal pain among medical students | musculoskeletal pain among physically active and inactive students | medical students were recruited and physical inactivity as a predisposing factor for musculoskeletal pain was assessed | more likely to report musculoskeletal pain |
| WHO, 2020 | WHO Guidelines on Physical Activity | To provide global guidelines for PA and sedentary behavior | In this global policy review, health data were synthesized and physical activity recommendations as preventive guidelines were assessed | Adults should engage in 150–300 minutes of moderate activity weekly. |

CHAPTER THREE

MATERIALS AND METHODS

3.1 Participants

This study involved undergraduate students of the School of Basic Medical Sciences (SBMS), College of Medical Sciences, University of Benin. The SBMS comprises several departments whose academic activities and requirements were often associated with prolonged sedentary behavior and physical exertion, making its students an appropriate population for this investigation. The departments within the SBMS, includes; Physiotherapy, Nursing, Medical Laboratory Science, Radiography, Anatomy, Physiology and Medical Biochemistry. These departments were chosen to provide a diverse representation of the academic and physical demands experienced by students in Basic Medical Sciences.

3.1.1 Inclusion Criteria

Participants eligible for inclusion in the study met the following criteria;

- I. Must be registered undergraduate students of School of Basic Medical Sciences, University of Benin.
- II. Must be in 200-level and above at the time of data collection.
- III. Must be willing to give informed consent to participate in the study.

3.1.2 Exclusion Criteria

The following participants were excluded from this study:

- I. Students who were not enrolled in the School of Basic Medical Sciences

- II. Students who declined to provide informed consent
- III. Students with clinically diagnosed musculoskeletal disorders or spinal injuries not attributable to lifestyle or physical activity patterns.

3.2 Materials

3.2.1 Description of Instruments

The primary research instrument for this study was a structured, self-administered questionnaire. It was organized into three sections:

- **Section A:** Demographic information – included age, gender, department, level of study and other relevant background details.
- **Section B:** Spinal Pain Assessment – utilized a modified version of the Nordic Musculoskeletal Questionnaire (NMQ), which is widely validated for evaluating musculoskeletal discomfort across body regions.
- **Section C:** Physical Activity Assessment – used the International Physical Activity Questionnaire – Short Form (IPAQ-SF), a globally recognized tool estimating physical activity levels across multiple domains (work, transport, household and leisure).

3.3 Methods

3.3.1 Research Design

This study adopted cross-sectional analytical design, which allowed for the assessment of the prevalence and patterns of spinal pain and their association with physical activity levels at a specific point in time.

3.3.2 Sampling Technique

A **stratified random sampling technique** was employed to ensure fair representation across the different departments within the school of Basic Medical Sciences. Each department represented stratum, and within each stratum participants were purposively selected.

3.3.3 Sample Size Calculation

The sample size was calculated using **Yamane's formula** (Yamane, 1967):

$$n = N/(1 + N(e)^2)$$

Where:

n = required sample size

N = total population of undergraduate students in SBMS = 3285

e = margin of error (set at 0.05 for 95% confidence level)

$$\begin{aligned} n &= 3285/(1+3285*0.0025) \\ &= 3285/9.2125 \end{aligned}$$

$$n \approx 356$$

3.3.4 Procedure for Data Collection

Printed copies of questionnaire was distributed by the researcher to students during lectures, faculty gatherings and through class representatives. The purpose of the study was explained to potential participants, and those who expressed willingness to participate were asked to provide informed consent.

Participants were encouraged to complete the questionnaire honestly and were returned to the researcher on the same day. Data collection was conducted over a period of **2 to 3 weeks**.

3.3.5 Ethical Considerations

The following ethical measures were strictly observed:

- i. **Ethical approval** was obtained from the Research and Ethics Committee, **UNIBEN**.
- ii. **Informed consent** was sought from all participants in writing, after a clear explanation of the study's purpose, risks and benefits.
- iii. **Voluntary participation** was emphasized with participants allowed to withdraw at any point without any consequences.
- iv. **Confidentiality and anonymity** of participant was maintained throughout the research process and all information collected was used solely for academic purposes.

3.3.6 Data Analysis

Data obtained from the completed questionnaires was analyzed using **IBM Statistical Package for the Social Sciences (SPSS) Version 27**. The following statistical methods was employed:

- **Descriptive statistics** (including frequencies, percentages, means, standard deviations) was used to summarize demographic characteristics, physical activity levels and prevalence of spinal pain.

- **Chi-square (χ^2) tests** was used to determine the association between physical activity levels (categorized) and the presence or absence of spinal pain.
- **Binary logistic regression** was used to identify demographic and lifestyle predictors of spinal pain
- The level of **statistical significance** was set at **$p < 0.05$** .

CHAPTER FOUR

RESULTS

4.1 Results

The primary aim of this study was to investigate the relationship between physical activity levels and spinal pain among Basic Medical Sciences students at the University of Benin, with a view to determining the prevalence, patterns, and associated demographic and lifestyle factors influencing spinal pain. A total of 356 undergraduate students of the School of Basic Medical Sciences (SBMS), College of Medical Sciences, University of Benin were recruited for this study

4.1.1 Sociodemographic variable of the participants

Out of the three-hundred and fifty-six participants recruited for this study, 182(51.1%) were males, 174(48.9%) were females. 137(38.5%) were in 200L, 92(25.8%) were in 500L. 96(27.0%) were physiotherapy students, 67(18.8%) were nursing students. 294(74.4%) of the respondents reported to engage in physical activity. The ages of the respondents ranged from 17 to 31years with a mean age 21.49(\pm 2.22) years as shown in table 2.

Table 2: Sociodemographic variable of the participants

| Variable | Frequency | Percentages |
|--|------------------|--------------------|
| Gender | | |
| Female | 174 | 48.9 |
| Male | 182 | 51.1 |
| Level of study | | |
| 200 | 137 | 38.5 |
| 300 | 77 | 21.6 |
| 400 | 50 | 14.0 |
| 500 | 92 | 25.8 |
| Department | | |
| Anatomy | 42 | 11.8 |
| Medical biochemistry | 37 | 10.4 |
| Medical laboratory science | 55 | 15.4 |
| Nursing | 67 | 18.8 |
| Physiology | 28 | 7.9 |
| Physiotherapy | 96 | 27.0 |
| Radiography | 31 | 8.7 |
| Engage in any physical activity | | |
| No | 91 | 25.6 |
| Yes | 295 | 74.4 |
| | Range | Mean±SD |
| Age | 17-31 | 21.49±2.22 |

4.1.2 Anthropometric characteristics of the participants

The average weight, height and Body Mass Index of the respondents were 62.65 ± 11.83 , 1.68 ± 0.10 and 22.21 ± 4.87 respectively. 175(49.2%) of the respondents had normal weight, 88(24.7%) were underweight, 65(18.3%) were overweight as shown in table 3.

Table 3: Anthropometric characteristics of the participants

| Variable | Range | Mean \pm SD |
|---------------------|--------------|---------------------------------|
| Weight (kg) | 40-100 | 62.65 \pm 11.83 |
| Height (m) | 1.50-1.97 | 1.68 \pm 0.10 |
| BMI | 13.21-39.30 | 22.21 \pm 4.87 |
| BMI category | | |
| Underweight | 88 | 24.7 |
| Normal weight | 175 | 49.2 |
| Overweight | 65 | 18.3 |
| Obese | 28 | 7.9 |

4.1.3 Physical activity level of the participants

The MET score of the respondents ranged from 99 to 12119 with a mean of 3375 ± 3193.32 . 163(45.5%) of the respondents had moderate physical activity level, 135(37.9%) had high physical activity level while 59(16.6%) had low physical activity level as shown in table 4.

Table 4: Physical activity level of the participants

| Variable | Range | Mean±SD |
|-----------------|--------------|----------------|
| MET score | 99-12119 | 3375±3193.32 |
| Levels | | |
| High | 135 | 37.9 |
| Low | 59 | 16.6 |
| Moderate | 162 | 45.5 |

4.1.4 7 days and 12-month Prevalence of spinal pain

The 12-month prevalence of neck pain, upper back pain and lower back pain were 34.8%, 27.5% and 50.5% respectively. The 7-day prevalence of neck pain, upper back pain and lower back pain were 20.8%, 17.7%, and 38.5% respectively. 54(15.2%) of the respondents reported that this spinal pain had impaired their activity at some point and 21(5.9%) had visited a healthcare provider with complains of spinal pain and 33(9.3%) had taken medications to address the pain and discomfort as shown in table 5.

Table 5: 7 days and 12-month Prevalence of spinal pain

| Variable | Frequency | Percentages |
|--|------------------|--------------------|
| 12-month prevalence | | |
| Neck pain | | |
| No | 232 | 65.2 |
| Yes | 124 | 34.8 |
| Upper back pain | | |
| No | 258 | 72.5 |
| Yes | 98 | 27.5 |
| Lower back | | |
| No | 177 | 49.7 |
| Yes | 179 | 50.3 |
| 7-days Prevalence | | |
| Neck pain | | |
| No | 282 | 79.2 |
| Yes | 74 | 20.8 |
| Upper back pain | | |
| No | 293 | 82.3 |
| Yes | 63 | 17.7 |
| Lower back | | |
| No | 219 | 61.5 |
| Yes | 137 | 38.5 |
| Visited an Health care provider | | |
| No | 335 | 94.1 |
| Yes | 21 | 5.9 |
| Taken medications | | |
| No | 323 | 90.7 |
| Yes | 33 | 9.3 |
| Impaired activity | | |
| No | 302 | 84.8 |
| Yes | 54 | 15.2 |

4.1.5 One-way ANOVA comparing the physical activity level across the various departments

One-way ANOVA was conducted to examine the difference in the physical activity level across the various departments. The findings revealed there was no significant difference in the physical activity level across the various departments as shown in table 6.

Table 6: One-way ANOVA comparing the physical activity level across the various departments

| MET score | Sum of squares | Mean square | f | p |
|-----------------------|-----------------------|--------------------|----------|----------|
| Between groups | 114791496.9 | 19131916.13 | 1.905 | 0.079 |
| Within groups | 3505252765 | 10043704.20 | | |

4.1.6 Association between physical activity levels and the prevalence of spinal pain

Chi-square was done to examine the association between physical activity levels and the prevalence of spinal pain among the respondents. The findings revealed there was no significant association between the physical activity levels and the 12-month and 7days prevalence of neck, upper back and lower back pain ($p>0.05$) as shown in table 7.

Table 7: Association between physical activity levels and the prevalence of spinal pain

| Variable | | High | Low | Moderate | X² | P |
|------------------------|-----|-------------|------------|-----------------|----------------------|----------|
| 12-month | | | | | | |
| Neck pain | No | 81 | 45 | 106 | 4.789 | 0.091 |
| | Yes | 54 | 14 | 56 | | |
| Upper back pain | No | 98 | 43 | 117 | 0.011 | 0.995 |
| | Yes | 37 | 16 | 45 | | |
| Lower back pain | No | 64 | 29 | 84 | 0.591 | 0.744 |
| | Yes | 71 | 30 | 78 | | |
| 7days | | | | | | |
| Neck pain | No | 104 | 48 | 130 | 0.658 | 0.720 |
| | Yes | 31 | 11 | 32 | | |
| Upper back pain | No | 117 | 48 | 128 | 3.006 | 0.222 |
| | Yes | 18 | 11 | 34 | | |
| Lower back pain | No | 80 | 36 | 103 | 0.588 | 0.745 |
| | Yes | 55 | 23 | 59 | | |

4.1.7 Association between the prevalence of spinal pain and the departments of the respondents

Chi-square was done to examine the association between the prevalence of spinal pain and the department of the respondents. The findings revealed there was no significant association between the 12-month and 7days prevalence of neck, upper back and lower back pain ($p>0.05$) and the department of the respondents as shown in table 8.

Table 8: Association between the prevalence of spinal pain and the departments of the respondents

| Variable | | ANA | MBC | MLS | NUR | PHS | PST | RAD | X ² | p |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|----------------|-------|
| 12-month | | | | | | | | | | |
| Neck pain | No | 33 | 22 | 33 | 41 | 19 | 65 | 19 | 5.536 | 0.477 |
| | Yes | 9 | 15 | 22 | 26 | 9 | 31 | 12 | | |
| Upper back pain | No | 34 | 24 | 37 | 49 | 19 | 73 | 22 | 4.294 | 0.637 |
| | Yes | 8 | 13 | 18 | 18 | 9 | 23 | 9 | | |
| Lower back pain | No | 19 | 17 | 31 | 31 | 16 | 49 | 14 | 2.781 | 0.836 |
| | Yes | 23 | 20 | 24 | 24 | 12 | 47 | 17 | | |
| 7days | | | | | | | | | | |
| Neck pain | No | 34 | 28 | 41 | 50 | 22 | 81 | 26 | 3.911 | 0.689 |
| | Yes | 8 | 9 | 14 | 17 | 6 | 15 | 5 | | |
| Upper back pain | No | 37 | 30 | 42 | 53 | 24 | 82 | 25 | 3.729 | 0.713 |
| | Yes | 5 | 7 | 13 | 14 | 4 | 14 | 6 | | |
| Lower back pain | No | 24 | 22 | 38 | 36 | 20 | 59 | 20 | 4.734 | 0.578 |
| | Yes | 18 | 15 | 17 | 31 | 8 | 37 | 11 | | |

4.1.8 Pearson correlation between age and physical activity levels

Table 9 showed the Pearson correlation between the age of the respondents and their physical activity level. The finding revealed there was no significant relationship between the age of the respondents and their physical activity levels ($p=0.556$)

Table 9: Pearson correlation between age and physical activity levels

| variable | r | p |
|-------------------------|----------|----------|
| Age * Physical activity | -0.031 | 0.556 |

4.1.9 Independent t test comparing the difference in the physical activity level between the male and female respondents

Table 10 showed the independent t test conducted to examine the difference in the physical activity levels between the male and female respondents. The findings revealed there was no significant difference in the physical activity level between the male and female respondents.

Table 10: Independent t test comparing the difference in the physical activity level between the male and female respondents

| Variable | | Mean | t | p |
|-------------------------|--------|-------------|----------|----------|
| Physical activity level | Male | 3231.67 | 0.869 | 0.385 |
| | Female | 3526.15 | | |

4.1.10 Association between prevalence of spinal pain and the gender of the respondents

Chi-square was done to examine the association between the prevalence of spinal pain and the gender of the respondents. The findings revealed there was no significant association between the 12-month and 7days prevalence of neck, upper back ($p>0.05$) and the gender of the respondents. However, there was a significant association between the 12-month and 7-days prevalence of lower back pain and the gender of the respondents ($p=<0.001$) as shown in table 11.

Table 11: Association between prevalence of spinal pain and the gender of the respondents

| Variable | | Female | Male | X² | p |
|------------------------|-----|---------------|-------------|----------------------|----------|
| 12-month | | | | | |
| Neck pain | No | 118 | 114 | 1.051 | 0.305 |
| | yes | 56 | 68 | | |
| Upper back pain | No | 125 | 133 | 0.068 | 0.794 |
| | yes | 49 | 49 | | |
| Lower back pain | No | 66 | 111 | 18.919 | <0.001 |
| | yes | 108 | 71 | | |
| 7days | | | | | |
| Neck pain | No | 142 | 140 | 1.186 | 0.276 |
| | yes | 32 | 42 | | |
| Upper back pain | No | 144 | 149 | 0.048 | 0.826 |
| | yes | 30 | 33 | | |
| Lower back pain | No | 87 | 132 | 19.069 | <0.001 |
| | yes | 87 | 50 | | |

4.2 Hypothesis testing

1. There was no significant difference in the physical activity level of the respondents across the various departments

Test: One-way ANOVA

Alpha level: 0.05

Observed p value: 0.075

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

2. There was no significant association between the physical activity level and the 12-month prevalence of neck pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.091

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

3. There was no significant association between the physical activity level and the 12-month prevalence of upper back pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.995

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

4. There was no significant association between the physical activity level and the 12-month prevalence of lower back pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.744

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

5. There was no significant association between the physical activity level and the 7-day prevalence of neck pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.720

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

6. There was no significant association between the physical activity level and the 7-day prevalence of upper back pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.222

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

7. There was no significant association between the physical activity level and the 7-day prevalence of lower back pain

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.745

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

8. There was no significant association between the 12-month prevalence of neck pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.477

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

9. There was no significant association between the 12-month prevalence of upper back pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.637

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

10. There was no significant association between the 12-month prevalence of lower back pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.836

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

11. There was no significant association between the 7-day prevalence of neck pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.689

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

12. There was no significant association between the 7-day prevalence of upper back pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.713

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

13. There was no significant association between the 7-day prevalence of lower back pain and the departments of the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.578

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

14. There was no significant association between age and the physical activity levels of the respondents

Test: Pearson

Alpha level: 0.05

Observed p value: 0.556

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

15. There was no significant association between the physical activity level and the gender of the respondents

Test: Independent t test

Alpha level: 0.05

Observed p value: 0.385

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

16. There was no significant association between the gender and the 12-month prevalence of neck pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.305

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

17. There was no significant association between the gender and the 12-month prevalence of upper back pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.794

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

18. There was no significant association between the gender and the 12-month prevalence of lower back pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: <0.001

Judgement: Since the observed p value was less than 0.05, the null hypothesis was therefore REJECTED

19. There was no significant association between the gender and the 7-day prevalence of neck pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.276

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

20. There was no significant association between the gender and the 7-day prevalence of upper back pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: 0.826

Judgement: Since the observed p value was greater than 0.05, the null hypothesis was therefore ACCEPTED

21. There was no significant association between the gender and the 7-days prevalence of lower back pain among the respondents

Test: Chi-square

Alpha level: 0.05

Observed p value: <0.001

Judgement: Since the observed p value was less than 0.05, the null hypothesis was therefore REJECTED

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The primary aim of this study was to investigate the association between physical activity levels and spinal pain among University of Benin School of Basic Medical Sciences students, with a focus on identifying the prevalence, trends, and related demographic factors. The results are discussed below in conformity with the study's goals and previous empirical evidence.

5.1.1 Sociodemographic Characteristics of Participants

The study comprised 356 participants, of which 51.1% were males and 48.9% were females, indicating a nearly equal gender distribution. The mean age of participants (21.49 ± 2.22 years) shows a youthful population typical of undergraduate populations. Similar demographic patterns have been reported in comparable Nigerian university-based studies exploring musculoskeletal pain and lifestyle behaviors (Mbada et al., 2017; Eze et al., 2020). The fact that 74.4% of respondents were physically active, goes in line with research showing that students studying medicine and health sciences frequently participate in more physical activity than students studying other subjects (Aweto et al., 2015; Alsubaie et al., 2021). Increased knowledge of the advantages of exercise for musculoskeletal and overall health may be the cause of this.

5.1.2 Anthropometric Characteristics

The mean BMI of 22.21 ± 4.87 kg/m² indicated that most participants fell within the normal weight range, conforming with findings from previous studies conducted among Nigerian undergraduates (Adedoyin et al., 2016; Nwafor et al., 2021). However, a small proportion were either underweight (24.7%) or overweight (18.3%), suggesting variability in nutritional and activity behaviors. Body composition had been associated with musculoskeletal pain risk, particularly low back pain, as higher BMI may increase spinal loading and postural stress (Hoy et al., 2018; Heneweer et al., 2012).

5.1.3 Physical Activity Levels and prevalence of Spinal Pain among Participants

The mean MET score (3375 ± 3193.32) revealed that the majority of participants had moderate (45.5%) or high (37.9%) physical activity levels, while a minority had low activity (16.6%). This finding mirrors the global distribution among university students, where sedentary lifestyles are less prevalent among health science students (Deliens et al., 2015; Fagaras et al., 2015). Participation in moderate to vigorous physical activity was beneficial for musculoskeletal and spinal health (Heneweer et al., 2011). Nonetheless, despite the generally active profile, spinal pain prevalence remained high among respondents, indicating that factors beyond activity level such as posture, academic workload, or psychosocial stress may have also contributed to spinal discomfort (Sanya et al., 2005; Lis et al., 2007).

The study revealed a 12-month prevalence of 50.5% for lower back pain, 34.8% for neck pain, and 27.5% for upper back pain. The 7-day prevalence

rates were 38.5%, 20.8%, and 17.7% for lower, neck, and upper back pain respectively. These findings show that spinal pain was highly prevalent among students, particularly in the lumbar region. Comparable findings had been reported in earlier studies among university students in Nigeria and other countries (Adegoke et al., 2014; Nordin et al., 2016; Gopura et al., 2020). The high prevalence of lower back pain among physiotherapy and other health science students had been attributed to prolonged sitting during lectures, study sessions, and clinical postings activities that often involve static postures (Alshagga et al., 2013; Mbada et al., 2017). The relatively lower prevalence of neck and upper back pain in this study compared to lumbar pain were consistent with previous literature suggesting that mechanical strain was most pronounced in the lumbar spine due to its load-bearing role (Hoy et al., 2018).

5.1.4 Relationship Between Physical Activity and Spinal Pain

In contrast to expectations, this study found no significant association between physical activity levels and either 12-month or 7-day prevalence of spinal pain ($p > 0.05$). This suggested that while physical activity was beneficial for general health, its protective effect against spinal pain in this population might be limited or mediated by other factors such as posture, ergonomics, or academic stress. This finding was consistent with studies by Heneweer et al. (2011) and Shiri et al. (2018), which reported weak or inconsistent associations between overall physical activity and back pain prevalence in young adults. On the other hand, some authors such as Sanya et al. (2005) and Hartvigsen et al. (2020) had reported that regular physical activity reduces the risk and recurrence of spinal pain. The variation might be due to differences in activity type, intensity, and individual biomechanics.

5.1.5 Departmental and Gender Differences

Although physical activity levels varied across departments, the differences were not statistically significant, aligning with observations by Eze et al. (2020) that academic program alone did not determine activity habits. Similarly, no significant difference was found between male and female respondents in physical activity levels, which agreed with findings by Aweto et al. (2015). However, gender showed a significant association with lower back pain ($p < 0.001$), with females reporting higher prevalence. This fitted with the broader literature which suggested that women experience musculoskeletal pain more frequently, possibly due to differences in muscle strength, hormonal influences, and ergonomic exposure (Hoy et al., 2018; Nordin et al., 2016). The gender variation in pain perception and coping mechanisms might also explain this pattern (Rollman & Lautenbacher, 2001).

5.1.6 Association Between Age and Physical Activity

No significant relationship was observed between age and physical activity level ($p = 0.556$), likely due to the narrow age range (17–31 years) of the sample. This corresponded with findings from Alsubaie et al. (2021), which reported that age-related variation in activity level tended to manifest more distinctly in older adult populations rather than among young adults.

5.2 Conclusion

This study investigated the relationship between physical activity levels and spinal pain among undergraduate students of the School of Basic Medical Sciences, University of Benin. The findings revealed a high prevalence of spinal pain, particularly lower back pain, among students, despite most of

them engaging in moderate to high levels of physical activity. There was no significant association between physical activity levels and the prevalence of neck, upper back, or lower back pain, indicating that factors other than activity level such as prolonged sitting posture, poor ergonomics, and study-related stress might play major roles in the emergence of spinal discomfort among this population. Furthermore, gender was found to be significantly associated with lower back pain, with female students showing higher prevalence than their male peers. However, age and academic department were not significantly related to either physical activity levels or spinal pain.

In conclusion, the results highlighted that while maintaining physical activity was important, it might not alone be sufficient to prevent spinal pain among university students. A more holistic approach addressing postural habits, ergonomic awareness, and stress management might be required to efficiently reduce the burden of spinal pain in this group.

5.3 Recommendations

Based on the findings of this study, the following recommendations were proposed:

- **Ergonomic Education and Postural Training:** The University of Benin should integrate ergonomic education programs within the curriculum or as extracurricular workshops for Basic Medical Sciences students. Training on proper sitting posture, use of ergonomic furniture, and safe lifting techniques could help decrease spinal stress and musculoskeletal strain.

- **Promotion of Structured Physical Activity Programs:** While most students were physically active, the type, frequency, and intensity of physical activity should be refined. The Faculty should encourage participation in structured exercise programs that specifically target core stability, spinal flexibility, and strength training, which had been shown to minimize spinal pain risk.
- **Routine Spinal Health Screening:** The Faculty should conduct periodic spinal assessments for students, especially during intensive academic sessions or clinical postings, to enable early diagnosis and management of musculoskeletal disorders.
- **Awareness and Preventive Campaigns:** Awareness programs should be organized in the Faculty to educate students on the risk factors of spinal pain, including prolonged sitting, poor posture, and inappropriate study ergonomics. Priority should also be placed on active breaks during long lectures and reading sessions.
- **Psychosocial Support and Stress Management:** Since stress can exacerbate pain perception and muscle tension, it was recommended that the faculty health services provide mental health and stress management support to students through counseling and mindfulness sessions.
- **Further Research and Sequential Monitoring:** Future studies should employ longitudinal designs to better understand causal relationships between physical activity and spinal pain over time, including the role of ergonomics, posture, and academic workload.

5.4 Implications for Further Studies

The findings from this study have several implications for future research:

- **Biomechanical and Ergonomic Analysis:** Further research should incorporate objective ergonomic assessments including workstation design, study posture, and load carriage habits to quantify their contribution to spinal pain, rather than relying totally on self-reported measures.
- **Gender Specific Investigations:** Given the significant association between gender and lower back pain observed in this study, future studies should consider hormonal, postural, and strength-related factors that might explain these differences, particularly among female students.
- **Psychosocial and Academic Stress Variables:** Future investigations should also incorporate psychosocial dimensions such as perceived academic stress, coping styles, and mental well being metrics to better understand their association with spinal pain among undergraduates.
- **Development of Preventive Frameworks:** Research efforts should aim at developing and validating spinal health promotion models suitable for university settings, combining physical activity optimization, ergonomic education, and behavioral interventions.

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APPENDICES

APPENDIX I

INFORMED CONSENT FORM

My name is ADELEYE FAVOUR SAMUEL, I am a final year student of the department of physiotherapy, School of Basic Medical Sciences, University of Benin. I am conducting a study on “RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVELS AND SPINAL PAIN AMONG BASIC MEDICAL SCIENCES STUDENTS AT THE UNIVERSITY OF BENIN” You are invited to participate in a research study aimed at assessing the relationship between spinal pain and physical activity among students of the School of Basic Medical Sciences, University of Benin. Participation involves filling a brief questionnaire that will take about 10 – 15 minutes. Your answers will be kept strictly confidential and used only for academic purposes. There is no risk associated with participation, and note that your participation in this study is voluntary and participants may withdraw at any time without any consequences.

Consent: I have read and understood the above information. I voluntarily agree to take part in this study and understand that my responses will remain confidential.

Signature of participant/date

Signature of researcher/date

APPENDIX II

QUESTIONNAIRE:

Demographics data

Kindly fill this questionnaire honestly. All information will be kept confidential and used strictly for academic purposes.

1. Age: _____ years
2. Gender: Male Female
3. Department: _____
4. Level of Study: 100L 200L 300L 400L 500L
5. Height (in metres): _____
6. Weight (in kg): _____
7. Do you engage in any regular physical activity or exercise? Yes No
8. If yes, what type of physical activity? _____
9. Have you been diagnosed with any musculoskeletal or spinal condition in the past? Yes No

Modified Nordic Musculoskeletal Questionnaire (Spinal Region Only)

Instructions: Tick (✓) the appropriate boxes that apply to you.

In the last 12 months, have you had discomfort (ache, pain, or numbness) in the following areas of your spine?

| Body Region | Yes | No |
|-------------|--------------------------|--------------------------|
| Neck | <input type="checkbox"/> | <input type="checkbox"/> |
| Upper back | <input type="checkbox"/> | <input type="checkbox"/> |
| Lower back | <input type="checkbox"/> | <input type="checkbox"/> |

In the last 7 days, have you experienced pain in these areas?

| Body Region | Yes | No |
|-------------|--------------------------|--------------------------|
| Neck | <input type="checkbox"/> | <input type="checkbox"/> |
| Upper back | <input type="checkbox"/> | <input type="checkbox"/> |
| Lower back | <input type="checkbox"/> | <input type="checkbox"/> |

Has the pain in any of these regions caused you to:

| Activity Impaired | Yes | No |
|--|--------------------------|--------------------------|
| Avoid daily school or social activities? | <input type="checkbox"/> | <input type="checkbox"/> |
| Visit a health professional? | <input type="checkbox"/> | <input type="checkbox"/> |
| Take medication for pain? | <input type="checkbox"/> | <input type="checkbox"/> |

International Physical Activity Questionnaire – Short Form (IPAQ-SF)

Instructions: Please answer based on your activities in the last 7 days.

1. Vigorous Physical Activity (e.g., running, aerobics, football)

- Did you do any vigorous activity? Yes No
- If yes, how many days? _____ days
- On those days, how many minutes per day? _____ minutes

2. Moderate Physical Activity (e.g., brisk walking, cycling at a regular pace)

- Did you do any moderate activity? Yes No
- If yes, how many days? _____ days
- On those days, how many minutes per day? _____ minutes

3. Walking

- Did you walk for at least 10 minutes at a time? Yes No
- If yes, how many days? _____ days
- On those days, how many minutes per day? _____ minutes

4. Sitting Time

- On a typical day, how much time do you spend sitting? _____ hours
_____ minutes

APPENDIX III
ETHICAL APPROVAL



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.2/843

Date: 5th September, 2025

Re: RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVELS AND SPINAL PAIN AMONG BASIC MEDICAL SCIENCES STUDENTS AT THE UNIVERSITY OF BENIN

Name of Principal Investigator: **ADELEYE, FAVOUR SAMUEL**
Department Of Physiotherapy,
School of Basic Medical Science
College of Medical Sciences,
University of Benin

REC Approval No: CMS/REC/2025/843

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 5th September, 2025 to 4th 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