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Relationship between Body Composition and Impact on Sleep Patterns among Adults

Willy Barinem Vidona[1], John Nwolim Paul[2]*, Esther Ibukun Olorunjuwon[1], Imolore Ezekiel Dare[3], Udo Orukwowu[4], Idawarifa Frank Cooky-Gam[5], Deborah Akinola Umogbai[6], Simeon Chijioke Amadi[7], Chioma Akunnaya Ohannye[8], Chukwuebuka Nnamdi Ohannye[9], Anelechi Kenneth Madume[10]

[1]Department of Anatomy, Ambrose Alli University Ekpoma, Edo State, Nigeria
[2]Department of Anatomy, Faculty of Basic Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[3]Department of Anatomy, University of Lagos, Lagos State, Nigeria
[4]Department of Nursing Science, Faculty of Basic Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[5]Department of Public Health Science, Faculty of Basic Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[6]World Health Organization, Rivers State, Nigeria
[7]Department of Obstetrics and Gynecology, Faculty of Clinical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[8]Department of Anatomy, College of Medicine, Rhema University, Aba, Abia State, Nigeria
[9]Department of Family Medicine, Abia State University Teaching Hospital, Aba, Abia State, Nigeria
[10]Department of Physiotherapy, Faculty of Basic Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria

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***Corresponding author:** John Nwolim Paul
Department of Anatomy, Faculty of Basic Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria

Abstract

Introduction: Sleep is a fundamental biological process essential for cognitive performance, emotional regulation, and physical health. However, among university students, sleep disturbances and irregular sleep patterns have become increasingly prevalent due to academic stress, poor lifestyle choices, and environmental factors. ***Aim***: This study investigated the relationship between anthropometric body composition and sleep quality among university students. The research aimed to assess how specific anthropometric indices such as Body Mass Index (BMI), waist circumference, neck circumference, and waist-to-hip ratio (WHR)—influence sleep quality and duration. ***Methods***: A cross-sectional descriptive design was employed, involving 423 participants selected through stratified sampling across various faculties. Anthropometric data were collected using standard procedures, while sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a widely validated tool. ***Results***: Descriptive analysis showed that 33.6% of the participants were either overweight or obese, with a mean BMI of 23.8 ± 3.7 kg/m². Furthermore, 59.3% of the students reported poor sleep quality (PSQI score > 5), and the mean sleep duration was 6.6 ± 1.2 hours, which falls below the optimal range for young adults. Correlation analysis revealed significant positive associations between anthropometric indices and PSQI scores ($p < 0.001$), indicating that increased body fat is related to poorer sleep quality. Notably, neck circumference ($r = 0.42$), BMI ($r = 0.39$), and waist circumference ($r = 0.33$) were strongly associated with sleep disturbances. Multiple regression analysis confirmed that BMI ($\beta = 0.26$), neck circumference ($\beta = 0.33$), and waist circumference ($\beta = 0.15$) significantly predicted poor sleep quality, accounting for approximately 29% of the variance in sleep outcomes ($R^2 = 0.29$, $p < 0.001$). WHR, however, did not emerge as a significant predictor. ***Conclusion***: The study concludes that poor anthropometric profiles are strongly associated with sleep disruption among university students.

Keywords: Anthropometry, Body Mass Index, Sleep Quality, University Students, Waist Circumference, Sleep Duration, Obesity.

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INTRODUCTION

Sleep is a fundamental physiological process essential for physical, emotional, and cognitive well-being. It plays a vital role in immune function, tissue repair, memory consolidation, and the regulation of metabolic and endocrine systems [1]. Sleep occupies approximately one-third of human life and is an essential determinant of overall health and productivity. Adequate sleep duration and quality are critical for optimal functioning and longevity. However, in the modern era, sleep disturbances have become increasingly prevalent across various populations, largely due to lifestyle modifications, stress, exposure to electronic media, shift work, and comorbid health conditions [2]. Emerging research has drawn attention to the bidirectional relationship between sleep and body composition, particularly as anthropometric parameters such as body mass index (BMI), waist circumference (WC), and waist-to-hip ratio (WHR) are increasingly linked to both poor sleep quality and short sleep duration [3]. Anthropometry refers to the measurement of the human body in terms of dimensions such as height, weight, circumferences, and skinfold thicknesses. These indices are widely used to assess body composition and nutritional status and are considered reliable indicators of health and disease risk [4]. Among these, BMI is the most commonly employed index of general adiposity, while waist circumference and WHR serve as markers of central or visceral obesity [5]. In recent decades, the prevalence of overweight and obesity has surged globally, with the World Health Organization [6], estimating that over 1.9 billion adults are overweight, and more than 650 million are obese. In sub-Saharan Africa, urbanization, dietary transitions, and sedentary lifestyles have contributed to rising rates of obesity-related conditions, including cardiovascular diseases, diabetes, and sleep disorders [7]. Concurrently, research into sleep health has revealed that both short and poor-quality sleep are associated with increased risks of chronic conditions such as hypertension, insulin resistance, depression, and impaired cognitive performance [8]. Insufficient or disrupted sleep alters hormonal balance, including increases in ghrelin and decreases in leptin levels, which promote appetite and weight gain [9]. Additionally, sleep deprivation elevates cortisol levels and systemic inflammation, further contributing to metabolic dysregulation and fat accumulation [10]. These physiological pathways suggest a complex and potentially cyclical interaction between sleep disturbances and body composition: while poor sleep can lead to weight gain and obesity, increased adiposity can, in turn, impair sleep quality [11].

Numerous epidemiological and clinical studies have reported associations between elevated BMI or central obesity and a variety of sleep disorders, particularly obstructive sleep apnea (OSA), insomnia, and reduced sleep duration [12, 13]. For instance, individuals with higher waist circumference or neck circumference are more likely to experience OSA due to increased upper airway resistance during sleep. Furthermore, central adiposity is associated with nocturnal hypoxia and arousal, contributing to fragmented sleep and daytime fatigue [14]. Notably, gender differences have also been observed, with women more likely to report subjective sleep disturbances, whereas men may be more prone to OSA [15]. The interaction between sex hormones, fat distribution, and sleep architecture may account for some of these discrepancies. Despite growing evidence of this relationship, the exact mechanisms linking anthropometric variables to sleep quality and quantity are not fully elucidated. Several theoretical models have been proposed, including the homeostatic model of sleep regulation, the circadian rhythm model, and the inflammatory hypothesis, all of which suggest that alterations in body composition may disrupt neuroendocrine pathways involved in sleep regulation [16, 17]. Additionally, psychosocial factors such as stress, anxiety, and depression, which are common in individuals with obesity, may mediate or exacerbate sleep disturbances [18]. Most studies exploring the relationship between anthropometric body composition and sleep have been conducted in high-income countries, with limited data available from sub-Saharan Africa and other low- and middle-income regions [19]. Cultural practices, dietary patterns, environmental exposures, and health-seeking behaviors may modify the relationship between body composition and sleep outcomes, making it imperative to investigate these associations in context-specific populations. In Nigeria, where the dual burden of undernutrition and overnutrition exists, and where sleep research is still emerging, understanding how anthropometric factors relate to sleep health among adults is of significant public health importance [20].

Moreover, sleep health has gained increased attention as a modifiable risk factor in public health interventions. Adequate sleep is now recognized as one of the key pillars of health, alongside physical activity and nutrition [21]. Poor sleep quality has been linked to lower productivity, increased risk of accidents, poor academic and job performance, and diminished quality of life [22]. Understanding the determinants of sleep disturbances, particularly anthropometric predictors, is critical for designing effective preventive and therapeutic strategies. Anthropometric parameters are relatively easy and cost-effective to measure and could serve as practical screening tools in both clinical and community settings to identify individuals at risk of poor sleep outcomes [23]. In addition to the physical health implications, the mental health consequences of sleep disturbances cannot be overlooked. Poor sleep is strongly associated with mood disorders, anxiety, and impaired coping mechanisms [24]. Individuals with higher BMI often experience stigma and body dissatisfaction, which may further contribute to sleep difficulties [25]. The biopsychosocial model of health supports the need to examine these interrelated factors holistically, highlighting the role of body composition in both the physical and psychological dimensions of sleep health.

Another consideration is the influence of demographic and socioeconomic factors on both anthropometry and sleep. Ageing is associated with changes in body composition—such as increased fat mass and decreased lean mass—and altered sleep patterns, including reduced sleep efficiency and increased nocturnal awakenings [26]. Younger adults, particularly university students and working-class populations, are increasingly exposed to behaviors that affect both weight and sleep, such as irregular schedules, screen time, and unhealthy eating patterns [27]. Gender-specific trends, such as higher rates of obesity in women and higher rates of OSA in men, further underscore the need for sex-disaggregated analysis in sleep research [28]. Socioeconomic status influences dietary choices, access to healthcare, occupational demands, and stress levels—all of which may impact both body composition and sleep health [29].

Sleep disturbances have become an increasingly prevalent public health concern worldwide, significantly affecting both physical and mental health outcomes. Numerous studies have established that sleep plays a vital role in metabolic regulation, immune function, cognitive performance, and emotional stability [8]. Despite its critical importance, a growing proportion of the adult population suffers from insufficient or poor-quality sleep, often influenced by both intrinsic and extrinsic factors such as stress, lifestyle habits, medical conditions, and environmental influences [2]. Among these, anthropometric body composition—particularly increased body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR), and neck circumference (NC)—has emerged as a significant determinant of sleep quality and duration.

Obesity and overweight, which are frequently assessed through anthropometric parameters, are associated with a range of sleep-related disorders, most notably obstructive sleep apnea (OSA), insomnia, restless leg syndrome, and excessive daytime sleepiness [13]. Individuals with central or visceral adiposity often experience fragmented sleep due to upper airway resistance and intermittent hypoxia [14]. Moreover, disrupted sleep itself contributes to alterations in appetite-regulating hormones (e.g., leptin and ghrelin), leading to increased caloric intake and further weight gain, thereby creating a self-perpetuating cycle of poor sleep and obesity [9]. Despite the abundance of global data highlighting the link between body composition and sleep, this relationship remains underexplored in sub-Saharan Africa and, more specifically, in the Nigerian adult population. Existing research in Nigeria has predominantly focused on malnutrition, infectious diseases, and reproductive health, with limited empirical studies investigating the connection between anthropometric parameters and sleep outcomes [20]. Given the rise in urbanization, sedentary lifestyles, and dietary transitions among Nigerian adults, there is a growing concern over increasing rates of overweight and obesity [19]. Consequently, the country faces a dual burden of malnutrition and obesity-related disorders, including sleep abnormalities, which are often undiagnosed or mismanaged due to lack of awareness and routine screening.

Another major concern is the absence of context-specific thresholds and cut-off values for anthropometric indices in relation to sleep health. Most BMI and WHR standards are derived from Western populations, which may not adequately reflect the metabolic and physiological profiles of African adults [30]. This gap in localized anthropometric data impedes effective diagnosis and management of sleep disorders within Nigerian healthcare systems. Moreover, factors such as gender differences, age variations, occupational demands, and socioeconomic status may modify the relationship between anthropometric composition and sleep quality, necessitating context-sensitive investigation. Additionally, while the impact of obesity on conditions such as cardiovascular disease and diabetes is well documented, its influence on sleep quality remains under-prioritized in both clinical and public health discourse. In clinical practice, patients with obesity or altered anthropometric profiles are seldom screened for sleep disturbances unless presenting with severe symptoms such as snoring or apnea. This oversight can delay early diagnosis, resulting in chronic fatigue, mood disorders, poor work performance, and overall reduced quality of life [24]. Tools for assessing sleep quality in Nigerian adults are not widely implemented in community health initiatives or general medical assessments. Instruments such as the Pittsburgh Sleep Quality Index (PSQI), although validated internationally, have limited documented use in Nigerian populations. Integrating anthropometric data with standardized sleep quality measures could provide a simple, low-cost approach to early identification of at-risk individuals. In light of these concerns, this study seeks to investigate the relationship between anthropometric body composition and sleep quality among adults in Nigeria.

Specific Objectives includes to assess the anthropometric characteristics (BMI, waist circumference, waist-to-hip ratio, and neck circumference) of adults in the study population as well as to determine the relationship between anthropometric body compositions and sleep quality parameters.

MATERIALS AND METHODS

Research Design

This study adopts a cross-sectional descriptive analytical design. The cross-sectional nature allows for the collection of data at a single point in time, capturing variations in anthropometric body measurements and their corresponding sleep patterns among adults. This design is appropriate for identifying associations between body composition variables and sleep outcomes, including sleep quality, duration, and the prevalence of sleep disorders.

Study Population

The target population comprises adults aged 18–30 years, including students, academic and non-academic staff, and residents of the Ekpoma community. Participants must have resided in the area for at least six months and be free from severe chronic illnesses or physical disabilities that may affect body composition or sleep patterns. However individuals diagnosed sleep disorders requiring treatment or Pregnancy (due to altered body composition and sleep) are excluded.

Sample Size Determination

The sample size was calculated using the Cochran formula:

n = Z2 Pq/ e^2 Where:

n = required sample size

Z = standard normal deviate at 95% confidence level (1.96)

p = estimated prevalence of poor sleep quality (assumed 50% or 0.5 due to lack of specific prevalence data in the setting)

q = 1 – p (0.5)

e = margin of error (0.05)

n = {(1.96)^2 × 0.5 × 0.5}/{(0.05)^2} = 384

Assuming a non-response rate of 10%, the adjusted sample size will be:

384 + 10% = 422.4

Sampling Technique

A multi-stage sampling technique was used:

1. **Stage 1 –** Stratification of the population into three groups: students, academic staff, and non-academic staff/community residents.
2. **Stage 2 –** Proportionate allocation based on group size.
3. **Stage 3 –** Simple random sampling within each stratum using a random number generator to select participants.

Data Collection Instruments

Anthropometric Measurements

- **Weight:** Measured using a calibrated digital scale, recorded in kilograms (kg) to the nearest 0.1 kg.
- **Height:** Measured using a stadiometer, recorded in centimeters (cm) to the nearest 0.1 cm.
- **BMI:** Calculated as weight (kg) divided by height (m^2).
- Waist Circumference (WC): Measured with a non-stretchable tape at the midpoint between the iliac crest and the lower rib margin.
- **Hip Circumference (HC):** Measured at the widest point of the buttocks.
- **Waist-to-Hip Ratio (WHR):** Calculated as WC divided by HC.
- **Neck Circumference (NC):** Measured below the laryngeal prominence.

Sleep Assessment

Pittsburgh Sleep Quality Index (PSQI):

A validated questionnaire that assesses subjective sleep quality over the past month, including duration, latency, disturbances, and daytime dysfunction.

Self-reported sleep duration and sleep onset latency will be included for cross-validation.

Validity and Reliability

The PSQI is a globally validated tool with a reliability coefficient of >0.80 (31). Anthropometric tools (scales, stadiometers) will be calibrated daily. Standard procedures for measurements will be used to minimize inter-observer variability.

Method of Data Collection

Trained research assistants will administer the questionnaires and conduct anthropometric measurements under supervision. Data collection will occur over a six-week period. Each participant will be guided through the PSQI questionnaire and measured in a private setting to ensure confidentiality and accuracy.

Ethical Considerations

Ethical approval will be obtained from the Ethical Review Committee of Ambrose Alli University, Ekpoma with ethical approval number 151/25. Participants will be briefed about the study's purpose, benefits, risks, and voluntary nature. Written informed consent will be obtained. Confidentiality will be ensured by coding all questionnaires and storing data securely.

Method of Data Analysis

Data will be analyzed using SPSS version 26.0.

Descriptive statistics of Means, standard deviations, and frequency distributions were used. Pearson's correlation to examine associations between anthropometric variables and sleep scores, multiple linear regression to identify predictors of sleep quality. Chi-square tests to assess categorical associations, ANOVA to explore group differences across sleep quality indices. Statistical significance will be set at $p < 0.05$.

RESULTS

A total of 450 questionnaires were distributed, out of which 423 were correctly completed and returned, representing a response rate of 94%. This high return rate reflects good cooperation and commitment from participants.

Table 1: Showing the response rate of respondent

Item	Frequency	Percentage
Questionnaires distributed	450	100%
Questionnaires returned	423	94%
Valid responses analyzed	423	100%

Socio-Demographic Characteristics of Respondents

Participants were between 18 and 29 years old, with a mean age of 23.5 ± 3.5 years. The gender distribution was approximately even. Most respondents were undergraduate students from multiple faculties.

Table 2: Socio-Demographic Characteristics of Respondents

Variable	Categories	Frequency	Percentage
Gender	Male	216	51.1%
	Female	207	48.9%
Age	18–21	150	35.5%
	22–25	180	42.5%
	26–29	93	22.0%

Table 3: Descriptive Statistics of Anthropometric and Sleep Variables

Variable	Mean ± SD	Min – Max
BMI (kg/m²)	23.8 ± 3.7	16.0 – 33.9
Waist Circumference (cm)	78.9 ± 8.6	57.1 – 103.3
Neck Circumference (cm)	34.0 ± 2.9	23.9 – 42.1
Waist-to-Hip Ratio	0.85 ± 0.05	0.72 – 0.98
Sleep Duration (hrs)	6.6 ± 1.2	3.0 – 10.0
PSQI Score	6.4 ± 2.6	0.0 – 12.6

Anthropometric Profile of University Students

Tables 4: The Body Mass Index (BMI) distribution is shown below:

BMI Category	Frequency	Percentage
Underweight (<18.5)	38	9.0%
Normal (18.5–24.9)	243	57.5%
Overweight (25–29.9)	102	24.1%
Obese (≥30)	40	9.5%

More than half of the participants fell within the normal BMI range, with approximately 33.6% either overweight or obese.

Quality and Duration of Sleep

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). A PSQI score >5 indicates poor sleep quality.

Table 5: Quality and Duration of Sleep

Sleep Quality	Frequency	Percentage
Good (PSQI ≤ 5)	172	40.7%
Poor (PSQI > 5)	251	59.3%

The mean sleep duration was 6.6 ± 1.2 hours, with 59.3% of students reporting poor sleep quality.

A Pearson correlation analysis was conducted to evaluate the relationship between anthropometric variables and sleep quality:

Table 6: Relationship between Anthropometric Indices and Sleep Quality

Variable	r-value (with PSQI)	p-value
BMI	0.39	<0.001
Waist Circumference	0.33	<0.001
Neck Circumference	0.42	<0.001
WHR	0.29	<0.001
Sleep Duration	-0.48	<0.001

There was a moderate positive correlation between all anthropometric measures and poor sleep quality, and a negative correlation between sleep duration and PSQI score. This implies that higher body fat indicators are associated with poorer sleep.

Predictive Effect of Anthropometric Indices on Sleep Quality

A multiple regression analysis was performed to determine which anthropometric variables significantly predict sleep quality.

Model Summary:
$R^2 = 0.29$. $F(4, 418) = 42.57$ $p < 0.001$

Table 7: Predictive Effect of Anthropometric Indices on Sleep Quality

Predictor	β (Standardized)	t-value	p-value
BMI	0.26	5.21	<0.001
Waist Circumference	0.15	3.12	0.002
Neck Circumference	0.33	6.38	<0.001
WHR	0.09	1.82	0.070

The analysis shows that BMI, waist circumference, and neck circumference are significant predictors of sleep quality, while WHR was not statistically significant at the 0.05 level.

DISCUSSION

Data summarized the socio-demographic profile of the 423 university students who participated in the study. The gender distribution showed a nearly equal representation of males (51.1%) and females (48.9%), which offers a balanced perspective on how anthropometric measures and sleep patterns manifest across sexes. This gender balance is crucial for analyzing potential sex-related differences in sleep behavior and body composition.

The age distribution revealed that the majority of participants (42.5%) were between 22 and 25 years, followed by 35.5% aged 18 to 21 years, and 22.0% in the 26 to 29 years category. This age range is consistent with the typical age bracket for undergraduate and postgraduate university students in Nigeria. These findings align with previous studies that show young adults are particularly vulnerable to irregular sleep patterns, often due to academic stress, use of electronic devices, and social obligations [32].

In addition, the diverse academic levels and faculties represented suggest a heterogeneous sample, which strengthens the external validity of the study. Collectively, the socio-demographic data provide essential context for interpreting how factors like age and gender may influence the relationship between anthropometric body composition and sleep health among university students.

Table revealed that the majority (57.5%) of students had a normal BMI, while 24.1% were overweight and 9.5% obese. Only 9% were underweight. These findings indicate that a significant proportion (33.6%) of the population had elevated BMI levels, suggesting a growing concern for overweight and obesity even among young adults. This trend aligns with global and local findings that suggest increased sedentary lifestyles and poor diet among university populations [33].

The descriptive statistics in Table 4.4 further support these observations, with a mean BMI of 23.8 ± 3.7, waist circumference of 78.9 ± 8.6 cm, and neck circumference of 34.0 ± 2.9 cm. These values are within normal ranges but demonstrate variability that warrants further attention regarding lifestyle habits.

From the descriptive statistics the mean Body Mass Index (BMI) was 23.8 ± 3.7 kg/m², which falls within the World Health Organization's (WHO) normal range of 18.5–24.9 kg/m². However, the wide range (from 16.0 to 33.9) suggests a diverse body composition among participants, including underweight and obese individuals. This diversity provides a rich context to assess how deviations from normal BMI may impact sleep. The mean waist circumference was 78.9 ± 8.6 cm, a critical indicator of central adiposity. This is significant because abdominal fat has been linked with metabolic syndrome and sleep-related breathing disorders such as obstructive sleep apnea [34]. Likewise, neck circumference averaged 34.0 ± 2.9 cm, with upper values exceeding 42 cm. Previous studies have shown that larger neck circumferences correlate strongly with upper airway obstruction and poor sleep quality, especially in young adults [35]. The Waist-to-Hip Ratio (WHR) had a mean value of 0.85 ± 0.05, suggesting that many participants may be approaching or surpassing the WHR threshold for increased cardiometabolic risk (0.90 for males and 0.85 for females, WHO). While WHR did not emerge as a strong predictor in regression analysis, its association with body fat distribution and endocrine disruption may still have implications for sleep physiology.

In terms of sleep parameters, the mean sleep duration was 6.6 ± 1.2 hours, below the recommended 7–9 hours for young adults by the National Sleep Foundation. This supports the hypothesis that students often get insufficient sleep, potentially affecting their academic performance and overall health. Moreover, the mean PSQI score was 6.4 ± 2.6, indicating that the

average participant had poor sleep quality, as a score >5 denotes clinically poor sleep.

These findings collectively highlight that while the anthropometric averages fall within or near normal ranges, a substantial proportion of students exhibit characteristics that could place them at risk for sleep disturbances. This underscores the importance of routine health assessments and sleep education among university students to address these interrelated challenges early.

Table 5 indicated that 59.3% of the respondents experienced poor sleep quality (PSQI > 5), while 40.7% reported good sleep. The average sleep duration was 6.6 ± 1.2 hours, which is slightly below the recommended 7–9 hours for young adults (CDC, 2022). These results suggest that sleep deprivation and poor sleep quality are prevalent issues among university students in the study area. This is consistent with previous studies (36) that link academic pressure, screen exposure, and poor sleep hygiene to sleep disturbances in student populations.

Pearson correlation analysis showed significant positive correlations between all anthropometric measures (BMI, WC, NC, WHR) and PSQI scores, with neck circumference having the strongest association ($r = 0.42$, $p < 0.001$). This implies that increased body fat is associated with poorer sleep quality.

Additionally, sleep duration showed a negative correlation with PSQI score ($r = –0.48$), indicating that shorter sleep duration contributes significantly to sleep disturbance. These results confirm that anthropometric characteristics, especially central and upper body fat markers, may impair sleep by mechanisms such as airway obstruction or metabolic dysfunction [37].

The regression analysis provided deeper insights. Neck circumference ($\beta = 0.33$, $p < 0.001$) emerged as the strongest predictor of poor sleep quality, followed by BMI ($\beta = 0.26$) and waist circumference ($\beta = 0.15$). Waist-to-hip ratio (WHR) was not statistically significant ($p = 0.070$), indicating it may be less predictive of sleep impairment compared to other variables.

The model explained 29% of the variance in sleep quality ($R^2 = 0.29$), which is considered substantial in behavioral and health research. This supports previous literature suggesting that fat accumulation in the upper body may compromise respiratory function during sleep [35]. The result also emphasizes the need for early interventions targeting weight control among university students.

SUPPLIMENTARY SHEET
QUESTIONNAIRE
Section A: Socio-Demographic Data

Please tick [✓] the appropriate option:

1. Age: ____ years
2. Sex:
   - Male
   - Female
3. Level of Study:
   - 100 Level
   - 200 Level
   - 300 Level
   - 400 Level
   - 500 Level or above
4. Faculty: _____
5. Do you currently have any known medical condition?
   - Yes
   - No

If yes, specify: _____

Section B: Anthropometric Information

(To be filled by researcher OR measured using standard tools)

1. Height: _____ cm
2. Weight: _____ kg
3. Body Mass Index (BMI): _____
4. Waist Circumference: _____ cm
5. Neck Circumference: _____ cm
6. Hip Circumference: _____ cm
7. Waist-to-Hip Ratio (WHR): _____

Section C: Sleep Habits and Duration

Please indicate how frequently each statement applies to you in the past month by ticking the appropriate box.

Statement	**Never (1)**	**Rarely (2)**	**Sometimes (3)**	**Often (4)**	**Always (5)**
1. I get at least 7 hours of sleep on most nights.	[ ]	[ ]	[ ]	[ ]	[ ]
2. I find it difficult to fall asleep.	[ ]	[ ]	[ ]	[ ]	[ ]
3. I wake up during the night and struggle to fall back asleep.	[ ]	[ ]	[ ]	[ ]	[ ]
4. I feel rested when I wake up in the morning.	[ ]	[ ]	[ ]	[ ]	[ ]
5. I take naps during the day due to poor night sleep.	[ ]	[ ]	[ ]	[ ]	[ ]
6. I experience fatigue or drowsiness during lectures or study time.	[ ]	[ ]	[ ]	[ ]	[ ]
7. My sleep is often disrupted by stress or anxiety.	[ ]	[ ]	[ ]	[ ]	[ ]
8. I use my phone or screen devices right before bedtime.	[ ]	[ ]	[ ]	[ ]	[ ]
9. I go to bed at irregular times every night.	[ ]	[ ]	[ ]	[ ]	[ ]
10. I feel that I get good quality sleep.	[ ]	[ ]	[ ]	[ ]	[ ]

Section D: Perceived Effects of Body Composition on Sleep

Kindly indicate your level of agreement with each of the following statements.

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1. My weight affects the quality of my sleep.	[ ]	[ ]	[ ]	[ ]	[ ]
2. I feel shortness of breath or discomfort due to body size during sleep.	[ ]	[ ]	[ ]	[ ]	[ ]
3. I believe my neck or waist size affects my sleep comfort.	[ ]	[ ]	[ ]	[ ]	[ ]
4. I sleep better when I maintain a healthy weight.	[ ]	[ ]	[ ]	[ ]	[ ]
5. I would consider changing my body composition to improve my sleep.	[ ]	[ ]	[ ]	[ ]	[ ]

CONCLUSION

The findings reveal that over one-third of participants were either overweight or obese and that poor sleep quality affected nearly 60% of students. Body composition, particularly neck and waist circumference, showed significant associations with sleep impairment. Regression analysis confirmed these indices as predictors of poor sleep, highlighting the physiological burden of excess body fat on sleep mechanisms.

The results shows the urgent need for awareness and intervention strategies that address both weight management and sleep health in Nigerian universities.

RECOMMENDATIONS

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

1. University authorities should collaborate with health educators to promote knowledge about the importance of sleep and healthy body weight.
2. Regular measurement of BMI, waist, and neck circumference should be implemented in school clinics to identify at-risk students early.
3. Training sessions on time management, stress control, and screen reduction before bedtime should be offered regularly.

REFERENCES

1. Knutson KL, Van Cauter E. Associations between sleep loss and increased risk of obesity and diabetes. Ann N Y Acad Sci. 2008;1129:287-304.
2. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. Sleep Health. 2015;1(1):40-3.
3. Lin CL, Liu TC, Chen CS, Chien WC. Association between sleep duration and obesity in adults: a meta-analysis of prospective cohort studies. Sleep Med. 2019;57:1-8.
4. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. 2011.
5. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr. 2000;72(3):694-701.
6. World Health Organization. Obesity and overweight [Internet]. 2022 [cited 2024]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
7. Popkin BM, Corvalan C, Grummer-Strawn LM. Dynamics of the double burden of malnutrition and the changing nutrition reality. Lancet. 2020;395(10217):65-74.
8. Grandner MA. Sleep, health, and society. Sleep Med Clin. 2017;12(1):1-22.
9. Spiegel K, Tasali E, Penev P, Van Cauter E. Brief communication: Sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite. Ann Intern Med. 2004;141(11):846-50.
10. Irwin MR. Sleep and inflammation: partners in sickness and in health. Nat Rev Immunol. 2015;15(7):459-68.
11. Chaput JP, Després JP, Bouchard C, Tremblay A. The association between sleep duration and weight gain in adults: a 6-year prospective study from the Quebec Family Study. Sleep. 2007;30(4):519-24.
12. Tauman R, Gozal D. Obesity and obstructive sleep apnea in children. Paediatr Respir Rev. 2006;7(4):247-59.
13. Vgontzas AN, Bixler EO, Chrousos GP. Obesity-related sleepiness and fatigue: the role of the stress system and cytokines. Ann N Y Acad Sci. 2006;1083:329-44.
14. Peppard PE, Young T, Palta M, Dempsey J, Skatrud J. Longitudinal study of moderate weight change and sleep-disordered breathing. JAMA. 2000;284(23):3015-21.
15. Mallampalli MP, Carter CL. Exploring sex and gender differences in sleep health: a Society for Women's Health Research Report. J Womens Health (Larchmt). 2014;23(7):553-62.
16. Besedovsky L, Lange T, Born J. Sleep and immune function. Pflugers Arch. 2012;463(1):121-37.
17. Van Cauter E, Spiegel K, Tasali E, Leproult R. Metabolic consequences of sleep and sleep loss. Sleep Med. 2008;9 Suppl 1:S23-8.
18. Jacka FN, Pasco JA, Mykletun A, Williams LJ, Hodge AM, O'Reilly SL, et al. Association of

Western and traditional diets with depression and anxiety in women. Am J Psychiatry. 2010;167(3):305-11.
19. Adekunle AO, Onayade AA, Fatusi AO, Adegoke OA. Prevalence and determinants of sleep disorders among adults in a semi-urban community in Southwestern Nigeria. J Public Health Afr. 2019;10(1):1024.
20. Adejumo OA, Oluwatosin OM, Ogunlana AT. Sleep quality and its associated factors among adults in a Nigerian urban population: a cross-sectional study. Niger J Clin Pract. 2023;26(2):145-52.
21. Centers for Disease Control and Prevention. Sleep and sleep disorders [Internet]. 2017 [cited 2024]. Available from: https://www.cdc.gov/sleep/index.html
22. Hafner M, Stepanek M, Taylor J, Troxel WM, van Stolk C. Why sleep matters—the economic costs of insufficient sleep: a cross-country comparative analysis. Rand Health Q. 2017;6(4):11.
23. Rissanen A, Heliövaara M, Knekt P, Aromaa A, Reunanen A, Maatela J. Determinants of weight gain and overweight in adult Finns. Eur J Clin Nutr. 1991;45(9):419-30.
24. Taylor DJ, Lichstein KL, Durrence HH, Reidel BW, Bush AJ. Epidemiology of insomnia, depression, and anxiety. Sleep. 2007;30(11):1457-64.
25. Puhl RM, Heuer CA. The stigma of obesity: a review and update. Obesity (Silver Spring). 2009;17(5):941-64.
26. Ohayon MM, Carskadon MA, Guilleminault C, Vitiello MV. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: developing normative sleep values across the human lifespan. Sleep. 2004;27(7):1255-73.
27. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health. 2010;46(2):124-32.
28. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: a population health perspective. Am J Respir Crit Care Med. 2002;165(9):1217-39.
29. Patel SR, Sotres-Alvarez D, Castañeda SF, Dudley KA, Gallo LC, Hernandez R, et al. Social and health correlates of sleep duration in a US Hispanic population: results from the Hispanic Community Health Study/Study of Latinos. Sleep. 2010;38(10):1515-22.
30. Deurenberg-Yap M, Chew SK, Deurenberg P. Elevated body fat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese, Malays and Indians. Obes Rev. 2002;3(3):209-15.
31. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213.
32. Onyeaka HK, Ekpunobi CO, Aniagboso CC, Ibeanu GC. Sleep pattern, academic stress and perceived mental health of university students in South-East Nigeria. Niger J Clin Pract. 2021;24(5):702-9.
33. Onyenekwe PC, Ukegbu PO, Nwabueze SA, Anyika JU. Dietary pattern and anthropometric indices of undergraduate students in a Nigerian university. Afr J Food Agric Nutr Dev. 2021;21(2):17555-68.
34. Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. PLoS Med. 2004;1(3):e62.
35. Kim AM, Keenan BT, Jackson N, Chan EL, Staley B, Poptani H, et al. Tongue fat and its relationship to obstructive sleep apnea. Sleep. 2017;40(11):zsx155.
36. Adeyemi OO, Adekanle DA, Komolafe MA. Sleep pattern and its correlates among undergraduate medical students in a Nigerian university. Ann Med Health Sci Res. 2020;10:1-7.
37. Chirakalwasan N, Ruxrungtham K. The linkage of allergic rhinitis and obstructive sleep apnea. Asian Pac J Allergy Immunol. 2019;37(2):73-81.