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Research Article

Assessment of Nutrition Knowledge, Perceived Stress, Physical Activity and Nutritional Status of Undergraduate Students of Biochemistry, Ahmadu Bello University, Nigeria

Uche S. Ndidi*, Zeenat B. Kudan, Bernard A. Ajibola, Rukayat O. Aliu, Muhammad A. Abubakar

Department of Biochemistry, Ahmadu Bello University, Zaria, Nigeria

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***CORRESPONDENCE**
Ndidi, U.S.
boukwuenu.sun@gmail.com
+234-818-736-5529

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ABSTRACT

Undergraduate students are so concerned about academic activities that they pay less attention to their nutritional status and general wellbeing. A cross-sectional study aimed at assessing the nutrition knowledge, perceived stress, physical activity and nutritional status was carried out on 142 undergraduate students of the Department of Biochemistry, Ahmadu Bello University, Nigeria. The socio-demographic characteristics, nutrition knowledge and dietary habits, perceived stress (using Perceived Stress Scale, PSS-10), physical activity level (using Global Physical Activity Questionnaire, GPAQ) were assessed through online questionnaire form (survey kobo toolbox). Anthropometric indices were measured using stadiometer and digital weighing scale, haemoglobin and glucose levels were determined using haemoglobin test meter and glucometer, respectively. Results showed that majority of the respondents were males (66.2 %). Most respondents (60.60 %) ate two meals per day. The majority (75.35 %) of the students had very good nutrition knowledge and had mostly (75.4 %) medium perceived stress. Sedentary behaviour for males and females was found to be 325.00 ± 28.26 mins/week 418.00 ± 35.16 mins/week, respectively. Results further revealed that 3.50 % of the students were obese, 4.90 % overweight, 21.20 % underweight. The haemoglobin concentration (g/dL) were 12.93 ± 1.62 for males and 13.25 ± 1.22 for females and the glucose concentration (mmol/L) were 4.75 ± 1.16 for males and 4.66 ± 0.59 for females. Our findings suggest that majority of the students had good nutrition knowledge, normal nutritional status, medium perceived stress but poor physical activity.

Keywords: *Nutrition knowledge, Dietary habits, Perceived stress, Physical activity, Nutritional status*

INTRODUCTION

A healthy diet refers to diet that meets the need for all nutritious elements in adequate amounts taking the age, gender and physical condition of an individual into account (Cena and Calder, 2020). It is important to have a well-balanced diet in order to lead a healthy and quality life (Johansson *et al.*, 2009). The dietary choices of individuals are affected by many factors that are related and/or unrelated to each other. Due to these complex relationships, it becomes harder to put forth a working theory on dietary choices (Tepper *et al.*, 1997). Socio-demographic factors such as age, educational status, marital status and level of knowledge of healthy nutrition affect individuals' nutrition knowledge and eating behaviors (Wardle *et al.*, 2000; Wilson, 2001; Artazcoz *et al.*, 2004).

Nutritional knowledge is considered among the factors that have impact on the nutritional behaviors of individuals and communities (Kruger *et al.*, 2002; Tesfaye *et al.*, 2024). The lack of nutritional knowledge leads individuals to developing bad dietary habits and various health problems (Andere and Kyallo, 2013).

Undergraduates have been described as students studying for their first degree at a college or university.

Many factors come into play as they transition through undergraduate life. These undergraduate students are exposed to numerous academic chores such as continuous assessment, written and oral examinations, tight deadlines and interpersonal conflicts just to mention a few examples of the many events that may induce high levels of stress in students. While stress around the time of learning is thought to enhance memory formation, stress markedly impairs memory retrieval, bearing for instance the risk of underachieving at the end of each academic session and the final grade at graduation. A study among some undergraduate students at the University of Benin, Nigeria suggested that perceived stress was the most common among all health factors that influence academic achievement (Aihie and Ohanaka, 2019). Stress may induce long-lasting frustration and a negative attitude towards school and the individual's abilities (Vogel and Schwabe, 2016). Studying the extent of perceived stress, and the factors responsible for them can give insights into how stress can be managed to improve students' performance.

Furthermore, students' physical activity and eating habits usually shape or change during their undergraduate years. Therefore, establishing good eating habits during this time is critical because these behaviors often continue through adulthood and can be very difficult to change once they are established (Brown *et al.*, 2014). Single sessions and long-term participation in physical activity improve cognitive performance and brain health (Mandolesi *et al.*, 2018).

Biochemistry is believed, by both graduates and students, to be one of the most stressful and challenging undergraduate programmes in Nigeria and the world over (Schmidt *et al.*, 2024; Wood, 1990). It is said that biochemistry is the bane of medical sciences and allied courses (Esan *et al.*, 2019). Therefore, there is need to assess the level of perceived stress, physical activity and nutritional status of undergraduate students studying biochemistry with a view to helping both tutors and students apply measures to improve the general wellbeing of students running the programme.

MATERIALS AND METHODS

Study area

Ahmadu Bello University (ABU) located in Zaria, Kaduna state, Nigeria is a federal government owned and operated institution. It falls within Latitude: 11o 03' 60.00" N Longitude: 70 41' 59.99" E. The University was founded on October 4, 1962, as the University of Northern Nigeria. ABU has 17 faculties, 106 departments, 16 Research Institutes and 3 Colleges of Agriculture. The main campus in Samaru houses the administrative offices, faculties of science, social science, arts and languages, education, environmental design, engineering, medical sciences, agricultural sciences and research facilities. The Kongo campus hosts the faculties of law and administration. This study was conducted among undergraduate students in the department of Biochemistry, Ahmadu Bello University (ABU), Samaru campus.

Study participants

Participants were selected based on a stratified random sampling technique. They were randomly selected from four strata where the first-year students constitute the first stratum, the second-year students constitute the second stratum, the third-year students constitute the third stratum and the fourth-year students constitute the fourth stratum. The sample size was determined to be 120 students based on a previous work on undergraduate students by Lano-Maduagu (2020) and using the Thrusfield (2005) method for sample size determination. However, 142 undergraduate students (considering possible error margins) of the department of Biochemistry with 45 students drawn from 100 level, 34 students drawn from 200 level, 5 students drawn from 300 level and 58 students drawn from the 400 level (using proportion) were recruited for the study. Only students who gave their consent were included in the study while those who are sick or physically challenged or who did not give their consent were excluded from the study.

Ethical considerations

Ethical approval was sought and obtained from Ahmadu Bello University Committee on Use of Human Subject for Research (Approval Number: ABUCUHSR/2023/011). Written Informed consent to participate in the study was sought from all study participants. Only those that gave their consent were enrolled for the study.

Data collection

The socio-demographic characteristics, nutrition knowledge and dietary habits, perceived stress (using Perceived Stress Scale, PSS-10), physical activity level (using Global Physical Activity Questionnaire, GPAQ) were assessed by the students filling an online questionnaire form (survey kobo toolbox). The questionnaire comprises of sections as mentioned above. Nutrition knowledge was measured through open questions, which focused on knowledge of the basic nutritional recommendations, sources and deficiencies of the different classes of foods. Then, the general outcomes were scored as follows: poor (0 – 49), fair (50 – 59), good (60 – 69), very good (70 – 84) and excellent (85 – 100).

Anthropometric measurement of the study participants

Weight and height measurements were taken with an electronic weighing scale and a stadiometer respectively to calculate the Body Mass Index (BMI) of each student. All weight and height measurements were carried out in triplicate and the average obtained in order to minimize errors during the measurement.

Biochemical assessment of the study participants

The haemoglobin concentration was determined with the use of haemoglobin test meter. Blood (10 µL) was collected by fingertip pricking with a sterile lancet and it was then applied to the center of the specimen application area of the test strip which was then inserted into the meter. Haemoglobin concentration results were displayed within 15 seconds in g/dL.

The blood glucose concentration was determined with the use of Accu-Chek glucometer. Blood (10 µL) was collected by fingertip pricking with a sterile lancet and was then applied to the center of the specimen application area of the strip. The test strip was subsequently inserted into the glucometer. The glucose concentration results were displayed within 5 seconds in mmol/L.

Statistical analysis

All data from the questionnaires were cross-checked for errors, edited appropriately, entered and analysed using the SPSS package version 26 (SPSS, Inc. Chicago, USA). Descriptive statistics such as frequencies, percentages and mean were used for all categorical data variables. Chi-Square tests were applied for comparison of proportions and for evaluating associations of categorical variables. Fisher´s exact test was applied where applicable. Statistical significance was taken as p values < 0.05.

RESULTS

As shown in Table 1, the results obtained showed that 66.2% of the undergraduate students in this study were males while 33.8% were females. Majority of the undergraduate students (78.89 %) were between the age of 18 and 25 years, while 18.31% were within the age of 26 – 35 years and 2.82% above 35 years. Majority of the students (71.83%) were from urban background while the rest (28.17%) were from rural background. Majority of the students were in 400 level (40.85%), followed by 100 level (31.69%), 200 level (23.94) and 300 level (3.52%). Only a small proportion of the students were married (5.63%) and the rest were single (94.37%). Majority of the students were sponsored by their parent/guardian (88.70%), while 10.60% were self-sponsored and 0.70% were on scholarship. A good percentage of the students had average monthly income/allowance of less than ten thousand naira (32.39 %), 34.51% between ten to fifteen thousand naira, 14.08% between fifteen to twenty thousand naira, 10.56% between twenty to thirty thousand naira and 8.45% had more than thirty thousand naira as their average monthly income. Majority of the students (62.70%) lived in hostels within the campus while 38.73% lived off-campus.

Table 2 presented the dietary habits of the respondent. As shown in Table 2, only 34.50% ate at least three-square meals. About one quarter of the students (26.06%) missed their breakfast. More than half of the students (52.82%) drank less than six glasses of water. Only a small proportion of the students (4.93%) consumed fruits and vegetables daily. A significant number (21.13%) rarely consumed fruits and vegetables. A good percentage, 57.75% and 68.31% consumed animal and plant protein respectively few times a week. Only 14.79% consumed animal and plant protein daily. About half of the students (47.89%) consumed highly processed foods few times a week while one quarter (25.35%) consumed it only rarely. Most of the students never had alcohol (91.55%). One third of the students (32.39%) always checked expiry date and nutrition facts of packaged food products before purchasing them.

Table 1. Socio-demographics Characteristics of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

Sociodemographic characteristics	Frequency	Percentage (%)
Sex		
Male	94	66.20
Female	48	33.80
Age (in years)		
18 – 25	112	78.87
26 – 35	26	18.31
> 35	4	2.82
Background		
Rural	40	28.17
Urban	102	71.82
Level		
100	45	31.69
200	34	23.94
300	5	3.52
400	58	40.85
Marital status		
Single	134	94.37
Married	8	5.63
Source of income/Allowance		
Parents/Guardian	126	88.70
Self-sponsor	15	10.60
Scholarship	1	0.70
Average monthly income		
< ₦10,000	46	32.39
₦11,000 - ₦15,000	49	34.51
₦16,000 - ₦20,000	20	14.08
₦21,000 - ₦30,000	15	10.56
> ₦30,000	12	8.45
Boarding status		
Hostel	87	61.27
Off-campus	55	38.73

₦ is naira, the symbol of Nigeria currency

As shown in Table 3, most of the students had very good nutrition knowledge (75.35 %), a good percentage (19.01 %) of the students had excellent nutrition knowledge.

The results obtained from questionnaires on perceived stress of the students showed that 20 (14.1%) of the students had a low perceived stress level, with majority (107 students) having a medium perceived stress level of 75.4% and 15 of the students having a high perceived stress level of 10.5% (Figure 1).

Gender, boarding status, departmental level, marital status and background were tested for their association with perceived stress level. The results gotten from the chi-

square descriptive statistic indicated no significant association between perceived stress and socio-demographic variables with p values of 0.372 for gender, 0.473 for boarding, 0.501 for level in the department, 0.536 for marital status, and 0.887 background (Table 4).

Table 2. Dietary Habits of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

Variable	Frequency (n = 142)	Percentage (%)
Number of main meals eaten		
1	7	4.90
2	86	60.60
3	34	23.90
4	15	10.60
Skipped breakfast		
Yes	37	26.06
No	105	73.94
Amount of water drank/Day		
< 6 glasses	75	52.82
6 – 8 glasses	56	39.44
> 8 glasses	11	7.75
Consumption of fruits and vegetables		
Rarely	30	21.13
Once a week	26	18.31
Few times a week	79	55.63
Everyday	7	4.93
Consumption of Eggs/Meat/Fish/Dairy products		
Rarely	19	13.38
Once a week	20	14.08
Few times a week	82	57.75
Everyday	21	14.79
Consumption of Beans/Peas/Nuts		
Rarely	7	4.93
Once a week	17	11.97
Few times a week	97	68.31
Everyday	21	14.79
Consumption of processed Foods		
Rarely	36	25.35
Once a week	8	5.63
Few times a week	68	47.89
Everyday	28	19.72
Consumption of Alcoholic beverages		
Rarely	130	91.55
Once a week	9	6.34
Few times a week	3	2.11
Everyday	0	0.00
Checking for Expiry date and Nutrition facts		
Sometimes	80	56.34
Always	46	32.39
Never	16	11.27

Table 3. Nutritional Knowledge Assessment of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

Graded nutritional knowledge	Frequency (n = 142)	Percentage (%)
Poor (0 – 49)	0	0.00
Fair (50 – 59)	2	1.41
Good (60 – 69)	2	1.41
Very Good (70 – 84)	107	75.35
Excellent (85 – 100)	27	19.01

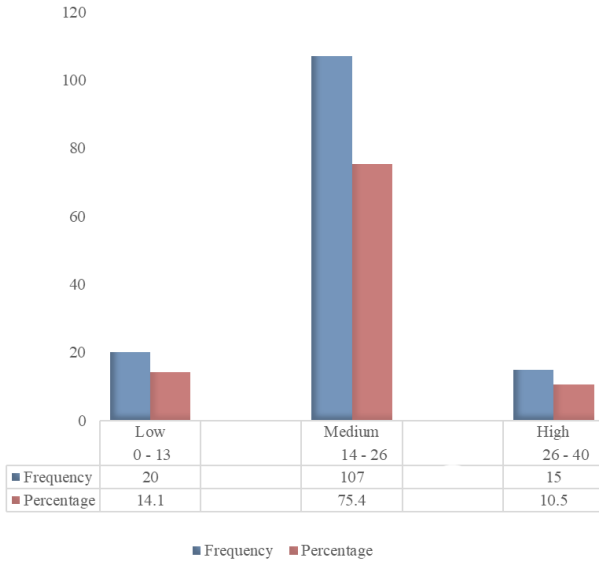

Figure 1. Dietary Habits of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

Sedentary behavior for males and females was found to be 325.00 ± 28.26 mins/week 418.00 ± 35.16 mins/week respectively. Mild, moderate and vigorous activity for males were found to be 185.25 ± 35.67 mins/week, 120.32 ± 22.71 mins/week and 76.35 ± 10.25 mins/week respectively while mild, moderate and vigorous activity for females were found to be 158.66 ± 32.61 mins/week, 80.67 ± 13.46 mins/week and 27.74 ± 3.84 mins/week respectively (Figure 2).

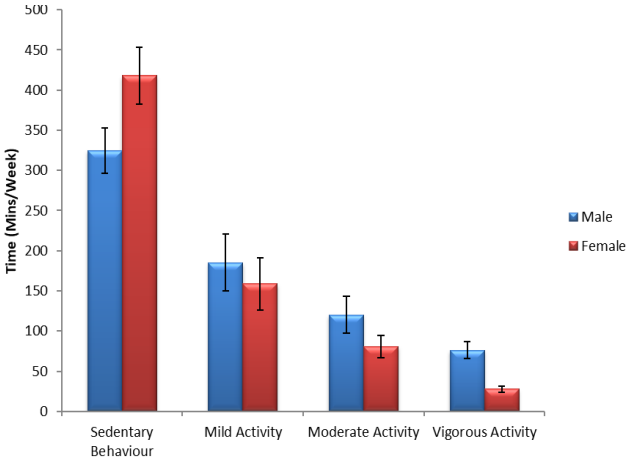

Figure 2. Physical Activity of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

As shown in Figure 3, based on the anthropometric indices, 3.5% of students that participated in this study were

obese while 4.9% were overweight and 21.1% were underweight. The result also showed that 2.08 % of the females were obese and overweight respectively while 4.26 % and 6.38 % of the males were obese and overweight respectively. The result further showed that 29.2 % of the female students were underweight while 17.0 % of the male students were underweight.

Table 4. Association between Perceived Stress Level and Socio-demographics of Biochemistry Students of Ahmadu Bello University, Nigeria

Socio-demographics		Perceived stress level				Chi-Square test
		High n (%)	Low n (%)	Medium n (%)	Total n (%)	
Gender	Male	8 (5.60)	13 (9.20)	73 (51.40)	94 (66.20)	$\chi^2 = 1.979$
	Female	7 (4.90)	7(4.90)	34(23.90)	48 (33.80)	*df* = 2
	Total	15 (10.50)	20 (14.10)	107 (75.40)	142 (100)	p = 0.372
Boarding status	Hostel	8(5.60)	20(9.90)	65(45.80)	87 (61.30)	χ^2 =1.499
	Off-campus	7(4.90)	6(4.2%)	42(29.60)	55 (38.70)	*df* = 2
	Total	15(10.50)	20(14.10)	107(75.40)	142(100)	*p* = 0.473
Departmental level	100	3(2.10)	7(4.90)	35(24.60	45(31.70)	$\chi^2 = 4.714$
	200	7(4.90)	4(2.80)	23(16.20)	34(23.90)	*df* = 6
	300	0(0.00)	1(0.70)	4(2.80)	5(3.50)	*p* = 0.581
	400	5 (3.50)	8(5.60)	45(31.70)	58(40.80)	
	Total	15(10.50)	20(14.10)	107(75.40)	142(100)	
Marital status	Married	2(1.40)	2(1.40)	4(2.80)	8(5.60)	$\chi^2 = 3.130$
	Single	13(9.20)	18(12.70)	103(72.50)	134(94.40)	*df* = 4
	Total	15(10.50)	20(14.10)	107(75.40)	142(100)	*p* = 0.536
Background	Rural	4(2.80)	5(3.50)	31(21.80)	40(28.20)	$\chi^2 = 0.239$
	Urban	11(7.70)	15(10.60)	76(53.50)	102(71.80)	*df* = 2
	Total	15(10.50)	20(14.10)	107(75.40)	142(100)	*p* = 0.887

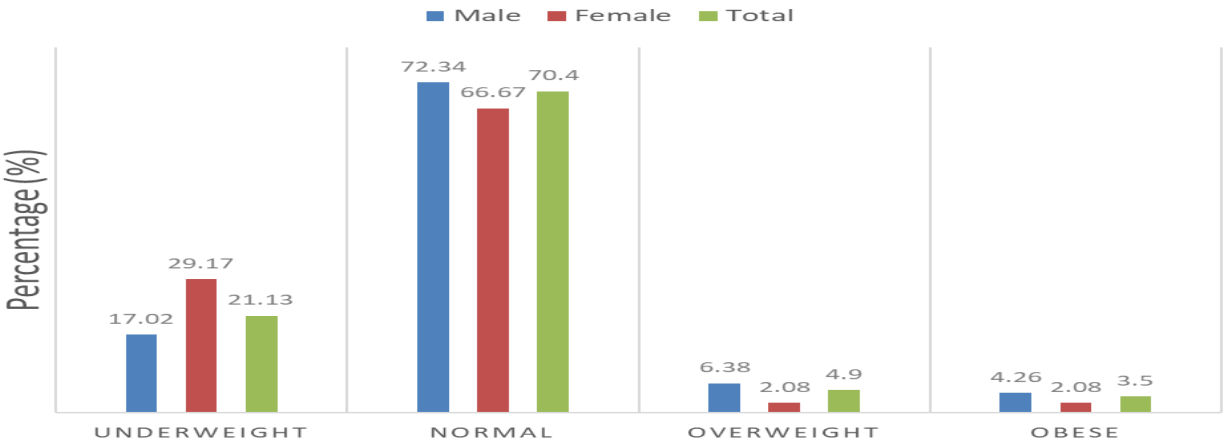

Figure 3. Nutritional Status of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria based on the body mass index (BMI)

As shown in Table 5, the haemoglobin concentrations for male and female were 12.93 ± 1.62 g/dL and 13.25 ± 1.22 g/dL, respectively while the glucose concentrations for male and female were 4.75 ± 1.16 mmol/L and 4.66 ± 0.59 mmol/L, respectively.

Table 6 shows the result of a correlation analysis between body mass index (BMI) and biochemical parameters. Our results show that there is a low positive relationship between BMI and haemoglobin as well as a low positive relationship between the BMI and glucose level in the undergraduate students. However, it was observed that there was an average negative relationship between glucose and haemoglobin among the participants.

Table 5. Haemoglobin and Random Blood Glucose Concentrations of Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria

Biochemical tests	Male (n=94)	Female (n=48)	Total (142)
Haemoglobin concentration (g/dL)	12.93 ± 1.62	13.25 ± 1.22	13.10 ± 1.29
Glucose concentration (mmol/L)	4.75 ± 1.16	4.66 ± 0.59	4.65 ± 0.81

Values were presented as mean ± standard deviation (SD)

Table 6. Correlation of Biochemical parameters of the Undergraduate Students of the Department of Biochemistry, Ahmadu Bello University, Nigeria against their Body Mass Index (BMI)

Variable	BMI	Haemoglobin concentration	Glucose concentration
BMI	1	0.045644	0.00336
Haemoglobin concentration	0.045644	1	-0.43958
Glucose concentration	0.00336	-0.43958	1

DISCUSSION

As the body requires an adequate daily intake (ADI) of all essential nutrients for efficient function, unwholesome dietary habits will lead to impaired functioning of the body. If undergraduate students are unaware of the nutritional requirements to maintain healthy body weight, they can make poor nutritional decisions, which can cause poor weight management and health problems.

Low response, 3.5 %, obtained from 300 level students was due to the fact that most of them were away on Student Industrial Work Experience Scheme (SIWES) at their various places of assignment during the period of this study.

This study showed that most of the students do not meet the recommended three-square meals and this is probably due to the low income of some of the students and lack of time to prepare meals. In a study carried out in undergraduate students in Brazil by Araujo *et al.* (2023), majority ate three meals every day, (79.9 %) which is not similar to our findings.

Nutrition knowledge is essential for ensuring that individuals receive proper nutrition and maintain good health (DiMeglio, 2000). Lack of nutrition knowledge can lead to malnutrition and poor health. Nutrition knowledge has to do with the individual understanding of various kinds of food, their sources, effect of their deficiency and more. Most of the students had very good nutritional knowledge while a few had excellent nutritional knowledge. Our finding is markedly better when compared to a study on university students conducted in the United Kingdom (UK) in which only 46.8 % of the students had good nutrition knowledge (Belogianni *et al.*, 2022).

Physical activity and high aerobic fitness have been reported to enhance basic cognitive functions related to attention and memory (Mandolesi *et al.*, 2018). When physical activity is used as a break from academic learning time, post-engagement affects better attention, increased on-task behaviours and improved academic performance (Weinberg and Gould, 2015). From the results gotten, the students had a low perceived stress level, with majority having a medium perceived stress level and 10.5 % having a high perceived stress level. The majority of students having a medium perceived stress level is quite alarming, as a low perceived stress level is the most optimal. This is similar to the result gotten from the study by Khan *et al.* (2020) which also had majority of the students having a medium perceived stress level.

During the course of the study, no significant association was found between perceived stress level and nutritional status. This result does not support the findings in the study by Bhavani and Devi (2019), where it was found that stress had great impact on consumption of caloric dense food which can in turn lead to overconsumption of calories from processed foods, junks, and carbonated beverages and finally end up in overweight or obesity. Saleem *et al.* (2023) also showed a positive correlation between stress and unhealthy food choices which can impair nutritional status.

There was also no association found among the selected socio-demographics (gender, boarding status, student´s level, marital status and background) of the students in the study with perceived stress. Few studies have similar result to the present study such as Graves *et al.* (2021) whose studies also found no significant differences in the association between stress, gender and background. Our findings, however, is in contrast with the studies of Pitt *et al.* (2018), Al-shagawi *et al.* (2017), Aihie and Ohanaka (2019) and Saleem *et al.* (2023) which showed association between perceived stress and living status, gender and boarding status among college students.

The present study shows that the females had higher sedentary behaviour and less vigorous activity when compared to the males. Several studies have reported similar findings (Alkhateeb *et al.*, 2019) that women were less likely to exercise than men. This could be due to one or more of the various reasons suggested by Benjamin and Donnelly: (a) fatigue and tiredness; (b) a lack of social support, and culturally-limited gender role and behavioral expectations for women, where women are expected to stay at home more than men; (c) a lack of sufficient allocation of funding for women`s sports; and (d) a shortage of suitable exercise facilities (Benjamin and Donnelly, 2013).

The positive correlation between Body Mass Index (BMI) and haemoglobin concentration suggests that people with higher BMI tend to have higher haemoglobin concentration. The correlation coefficient of BMI and blood glucose concentration is also positive suggesting that people with higher BMI tend to have higher glucose concentration. However, the correlation coefficient of blood glucose concentration and haemoglobin concentration is negative suggesting that there is an inverse relationship between them. As the glucose concentration increases, the haemoglobin concentration tends to decrease and vice versa. In a similar cross-sectional study carried out to assess the nutritional status of undergraduate students in three tertiary institutions in Lagos State, it was revealed that 1.7% of 'the subjects were severely underweight, 7.5% were underweight, 69% were normal and 17.5% were overweight, while 4.3% were obese (Lano-Maduagu, 2020) which is similar to our

findings. In another study in Ogun state, Nigeria to determine the double burden of malnutrition among undergraduates, 13.4%, 16.9% and 7.5% were underweight, overweight and obesity respectively (Oladoyinbo and Ekerette, 2015) which is similar to our findings.

CONCLUSION

Our findings indicate that while majority of the undergraduate students in the department of Biochemistry have normal nutritional status, they tend to have poor eating habits due to perceived stress notwithstanding their nutrition knowledge which may not be unconnected to the nature of the programme. Therefore, stress, while sometimes being a motivator for academic success should not exceed a certain threshold, when it could be so high as to impact the physical and mental wellbeing of the individual. Increased regular physical activity is recommended for the students and reduction of sedentary behavior is encouraged for better wellbeing.

AUTHORS' CONTRIBUTIONS

ZBK: Conceptualization, Part Supervision (Passed on during the period of investigation). BAA: Investigation, Statistical Analysis, Writing, Editing. ROA: Investigation, Statistical Analysis, Writing. MAA: Investigation, Statistical Analysis, Writing. USN: Design of the Study, Supervision, Writing, Editing. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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