Assessment of Nutritional Status Among Undergraduate Students at a Nairobi Tertiary Institution Using BMI and Waist Circumference Metrics

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ABSTRACT

This study investigated the impact of dietary and lifestyle changes on the nutritional status of undergraduate students during their transition to university life and the associated risk for non-communicable diseases. A review of global studies indicated varying prevalence rates of overweight and obesity among university students, influenced by diet, physical activity, and sleep patterns. This research specifically assessed the nutritional status of Kenyatta University students in Nairobi, Kenya, with an emphasis on the limited studies utilizing both BMI and waist circumference for assessment. Employing a cross-sectional, analytical design, the study was conducted at Kenyatta University Main Campus in Nairobi County. This public research university, founded in 1970, was selected for its urban setting and its representation of young adults. The target population comprised undergraduate students pursuing bachelor's degrees, with inclusion criteria of voluntary participation and at least six months on campus. Multi-stage stratified sampling was used to select 260 participants. Data were collected through a structured questionnaire, pretested on 10% of the sample, with reliability assessed via a test-retest method. Anthropometric measurements were taken by trained research assistants. Data analysis was performed using SPSS version 24, evaluating nutritional status with BMI and waist circumference. Ethical considerations and COVID-19 protocols were rigorously observed. Findings revealed that, based on BMI, 67.5% of respondents had normal weight, while 8.4%, 16.5%, and 7.6% were underweight, overweight, and obese, respectively. The overall prevalence of overweight and obesity (BMI $\geq$ 25) was 24.1%. Female respondents showed a higher prevalence of obesity (63.2%) and overweight (73.2%) compared to males. In the underweight category, more males were underweight (57.1%) than females. Waist circumference assessment indicated that 21.7% had abdominal obesity, with a higher prevalence among females (87%) compared to males (13%), highlighting a gender-based risk factor for abdominal obesity. The study's BMI analysis revealed a substantial proportion of respondents within the normal weight range, with significant gender disparities in obesity and overweight prevalence. The waist circumference assessment underscored a notable occurrence of abdominal obesity, particularly among females, indicating gender-specific susceptibility to this health concern.

Keywords: *Nutritional Status, Obesity, Waist Circumference, BMI, Undergraduate Students, Gender Disparities.*

INTRODUCTION

The life of a study at the university represents a transitory period during which students tend to interact with a multitude of individuals with different cultural background and personal traits. Beaudry et al. (2019) noted that university undergraduate students are comprised mainly of young females and males who undergo a transition in dietary and lifestyle changes. Consequently, this impacts their nutritional status and general wellbeing; subsequently defining whether they are at risk of developing diseases (particularly non-communicable diseases). The study by Mwangi et al. (2019) found that 59.6%, 31.2%, 6.2% and 3.1% of the undergraduate students had normal weight, overweight, obese and underweight respectively. Even though obesity is seen to commence during childhood, university students' lifestyle habits experience a rapid transformation that predisposes them to elevated BMI and associated consequences. Noteworthy, it is during this transition period that most adolescents become independent from their parents and start taking care of themselves. They become responsible for their eating patterns, physical activities, and sleep patterns. (Almutairi et al., 2018). Transiting from high school to university comes with increased freedom and choices in diet, physical activities, and sleep patterns which affects their nutritional status. Evidently, its common to see more students consuming fast foods which are high in calories and predisposes them to obesity. There has been a notable trend in escalating prevalence of obesity among university students globally.

According to a study conducted in Palestine by Ali et al. (2022)including Palestine. Consumption of energy drinks (EDs over a third of students had central/abdominal obesity (35.75%) based on Waist Circumference. About 28% of the male university students were overweight while 13.4% were obese. Similarly, in a cross-sectional study of Kenyan university students, Nyanchoka et al. (2022) found that 13.9% and 4.3% were overweight and obese respectively. Females had a higher likelihood of being overweight and had higher waist circumference compared to males. Among Iranian university students, 16.5% and 4.5% were overweight and obese respectively (Tokaç Er et al., 2021). In Morocco, Benaich

et al. (2021) found that 14.8% and 1.6% were overweight and obese respectively. More males were overweight while more females were obese. In Cameroon, based on BMI, 4.9%, 70.4%, 21.7% and 3% were underweight, normal, overweight and obese respectively. The prevalence of abdominal obesity was 21.2% (Bede et al., 2020)determine the prevalence of malnutrition among medical students and factors associated with malnutrition. METHODS: we carried out a cross-sectional study from December 2013 to March 2014 involving 203 consenting students in the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, Faculties of Health Sciences of the Universities of Bamenda and Buea. A three-part questionnaire (socio-demographic profile, eating practices, and anthropometric parameters. In a study conducted by Amruth and Kumar (2019) among Indian university students, 18.2% were overweight while 2.1% were obese. Sundaram et al. (2018) found that 54.9%, 26.8% and 8.9% of Malaysian university students reported normal weight, overweight and obesity respectively. A study conducted by Zamsad et al. (2019) in Bangladesh reported that 14.9% and 11.9% of the respondents were overweight and obese respectively. Yun et al. (2018) reported that 18.2%, 10.6% and 58.1% were overweight, obese and normal respectively.

A study conducted by Martinez-Lacoba et al. (2018) reported that nearly three-quarters (74.5%), 6.4%, 16.9% and 3.2% of the university students had normal weight, underweight, overweight and obese respectively. More (10.2%) women were underweight compared to 1.2% of men while a higher percentage of men (3.5%) were overweight compared to women (2.8%). Furthermore, findings from Tapera et al. (2017) reported that 36.8% of University of Botswana students were obese (24.9%) and overweight (11.9%). To sum up obesity and overweight account average between 20-30% based on BMI. The need for continuous characterization of nutritional status of students is paramount has it impacts their health and ultimately the ability to remain productive in society. Fewer studies examined have used both BMI and Waist Circumference to determine

nutritional status. We assessed the nutritional status of undergraduate university students at Kenyatta University in Nairobi County, Kenya.

METHODS

Study Design and Setting

A cross-sectional, analytical study design was employed. Kenyatta University Main Campus in Nairobi County was the study location. Kenyatta University (KU) is a public research university founded in 1970 as a college and later as a university in 1985. The university's main campus is located 20 km outside Nairobi city. The main campus is set on over 1,000 acres, has 19 schools, and a student population of over 70,000 students spread over postgraduate and undergraduate programs. The university was selected based on its population representation of young adults and its urban lifestyle.

Characteristics of Participants

Target population for this study comprised of undergraduate students undertaking bachelor's degrees at Kenyatta University Main Campus in Nairobi County, Kenya. In order to participate in this study, participants had to: voluntarily agreed to take part in the study; were undergraduate students at Kenyatta University in all academic years and had completed at least 6 months on campus. This inclusion criterion was based on the awareness that dietary habits take some time to develop. Further, respondents with chronic medical illnesses were excluded from the study. Individuals on special diets (e.g., DASH diet, ketogenic diet) and eating disorders were also exempted.

Sample Size Calculation and Sampling Technique

Multi-stage stratified sampling was used to sample the 17 schools while random sampling was used to select the students who participated in this study. According to the Kenyatta University Admission coordinator, the main campus had a population of 45,348 (active students) registered for the 2020/2021 academic year. Sample size was calculated to be 260 using the following formula:

$$n = \frac{z^2 pq}{e^2}$$

Where: n= sample size, z = value from standard normal distribution corresponding to 95% confidence, q=1-p, e = precision (0.05) and p= sample proportion=0.19

$$n = \frac{1.96^2 \times 0.19 \times 0.81}{0.05^2}$$

$$n= 236$$

A non-response of 10% (24 students) was added. Therefore, 260 students were used as study respondents.

Data Collection Tool

A structured questionnaire having two sections was used to collect data. Section A collected data on information regarding socio-demographic and socioeconomic status such as age, gender, residential status and education level while section B gathered information on the nutritional status (BMI and waist circumference) of the respondents. The questionnaire was pretested before commencement of actual data collection using 10% of the sample (26 students) from Kenyatta University. Sample used for pretesting was not included in the main study and remained anonymous to the main study sample.

Validity and Reliability of Research Instrument

The data collection tools were subjected to review by nutrition experts including thesis supervisors for review to ensure their content validity. The nutritional instruments were calibrated and questionnaire completeness was assured at the field site and there was double data entry to avoid errors. Data was also cleaned before analysis. To evaluate the reliability of the instrument, the test-retest method was useful in determining the consistency of the instrument during pretesting using 10% of the expected respondents equivalent to 26 students at Kenyatta University Main Campus. A correlation coefficient of above 0.7 was considered an acceptable threshold (Singh et al., 2012). All anthropometric instruments were recalibrated after every measurement. Research Assistant anthropometric and other measurements conducted during pre-testing were compared with those of an expert and a margin error < 5% was deemed appropriate.

Data Collection Procedures

Two research assistants (male and female)

with minimum qualifications of a diploma in nutrition and dietetics, good communication skills and with over two years of experience were recruited and trained by the researcher on study objectives, purpose, interviewing skills, taking anthropometric measurements, Covid-19 guidelines and ethics of a researcher. The training was done during pretesting phase over a period of 3 days.

After the random selection of the study respondents, they were invited to a central place (FND Clinical Skills Lab) provided by the chairperson of the Food, Nutrition & Dietetics department. The researcher took each respondent through an informed consent form and when satisfied he or she understood, the respondent signed the informed consent before the interview process began. Each respondent had ample time to adequately respond to the questions. The interview room was conducive for conducting anthropometric assessments such as waist circumference. The researcher and his assistants proceeded to take the respondent's weight and height in light clothing, without shoes, thick socks or jewellery. All measurements were done repeatedly using a calibrated digital floor scale for weight while stature was measured using a Harpenden digital stadiometer in a straight posture and recorded in meters. The average for each anthropometric measurement was computed and recorded to the nearest 0.1cm. Waist circumference was measured around the waist through a point one-third of the distance between the xiphoid process and the umbilicus, using a non-stretchable tape measure and recorded to the nearest 0.5cm. BMI will be computed by finding the ratio of weight to height in the following units (kg)/height (m) ^{2} (WHO, 2021). The data collected was stored in a password-protected computer and data collection tools were stored in a locked cabinet. The researcher administered the questionnaire in a serene room.

Statistical Data Analysis
Data was entered and analyzed using SPSS version 24 as shown in Table 1. nutritional status was assessed using BMI (kg/m²) and Waist Circumference (cm). BMI values < 18.5, 18.5 to < 25, 25 to < 30 and ≥ 30 were classified as underweight, normal, overweight and obese respectively. Only waist circumference ≥ 80 cm

and ≥ 94 cm for men was considered central obesity (WHO, 2021).

Table 1:
Data Analysis of the Study Variables

Variables	Means of Analysis	Interpretation
Nutritional Status (BMI)	< 18.5	Underweight
	18.5 - < 25	Normal
	25 to < 30	Overweight
	≥ 30	Obesity
Nutritional Status (WC)	Men: ≥ 94 cm	Abdominal obesity
	Women: ≥ 80 cm	Abdominal obesity

Ethical Considerations
The authority to conduct the research was obtained from the National Council for Science Technology and Innovation. Ethical clearance was obtained from Ethical Review Committee of Kenyatta University. Approval to conduct the study was sought from the Kenyatta University Graduate School. Data collection approval at Kenyatta University was sought from the Office of the Deputy Vice-Chancellor of Research, Innovation and Outreach. Further, informed consent was obtained from the respondents before the interviews are conducted. All data collection tools and study participants' names and details were kept anonymous throughout this study and thereafter. Information provided to the researcher was only used for the study and was not shared for any other purposes or projects. COVID-19 protocols and guidelines such as wearing properly fitted masks when physical distancing was not possible, cleaning hands with alcohol-based sanitizer and avoiding crowded areas were observed.

RESULTS
A total of 249 respondents of the 260 calculated sample size participated in the study, representing a 95.8% response rate.

Demographic and Socio-Economic Characteristics
The study involved 22.5 ± 2.4 years old respondents, with ages ranging from 18 to 31 years. A significant majority (85.1%) fell within the 18-24 age bracket. Females constituted 61%

of the sample, reflecting a higher percentage compared to the 2020/2021 academic year gender distribution. Notably, specific academic disciplines, such as pure and applied sciences, economics, agriculture, and engineering, had a greater representation of male students. The fourth-year students comprised 49% of respondents, possibly due to the study being conducted during the phased resumption after the COVID-19 lockdown. The data collection period, October-November 2020, captured a diverse representation from various schools, with the School of Education accounting for the largest share (34.1%). Residential patterns, academic levels, and school distributions showcased demographic diversity within the study population, providing a comprehensive overview of the undergraduate student body.

Table 2:

Demographic and Socio-Economic Characteristics of the Respondents

Category	M	F	n=249	%
Sex				
Male	-	-	97	39
Female	-	-	152	61
Total	-	-	249	100
Age (years)				
18-24	78	134	212	85.1
25-31	19	18	37	14.9
Total	97	152	249	100
Year of Study				
Year 1	23	42	65	26.1
Year 2	09	09	18	7.2
Year 3	10	34	44	17.7
Year 4	55	67	122	49.0
	97	152	249	100
Programme of Study				
Humanities & Social Sciences	11	31	42	16.9
Creative & Performng Arts	10	13	23	9.2
Pure & Applied Sciences	07	03	10	4.0
Hospitality, Tourism & Leisure	07	11	18	7.2
Education	28	57	85	34.1
Public Health & Applied Sciences	11	12	23	9.2
Business	11	11	22	8.8
Economics	06	04	10	4.0
Agriculture & Enterprise Devpt	03	02	05	2.0
Environmental Studies	00	06	06	2.4
Engineering & Technology	03	02	05	2.0
Total Eduation	28	57	85	34.1
Public Health and Applied Sciences	11	12	23	9.2
Business	11	11	22	8.8
Economics	06	04	10	4.0
Agriculture & Enterprise Devpt.	03	02	05	2.0
Environmental Studies	00	06	06	2.4

Engineering & Technology	03	02	05	2.0
Total	97	152	249	100
Residence Status				
On-campus	27	36	63	25.3
Off-campus (hostel)	16	17	33	13.3
Home with family	05	21	26	10.4
Off-campus (own house)	45	78	127	51.1
Total	97	152	249	100
Source of meals				
Own preparation	59	114	173	69.5
University cafeteria	13	15	28	11.2
Restaurant	25	23	48	19.3
Total	97	152	249	100

Nutritional Status of University Students based on BMI Classification

The average weight and height of the respondent were 62.7 ± 11.3 kgs and 1.6 ± 0.1 meters respectively. Table 3 and Figure 1 show that based on body mass index, 8.4%, 67.5%, 16.5% and 7.6% of the respondents were underweight, normal, overweight and obese respectively. The prevalence of obesity and overweight (BMI ≥ 25) was 24.1%. A higher percentage of males were underweight compared to females (57.1% males vs. 42.9% females). In contrast, a higher percentage of females were obese compared to males (36.8% males vs. 63.3% females).
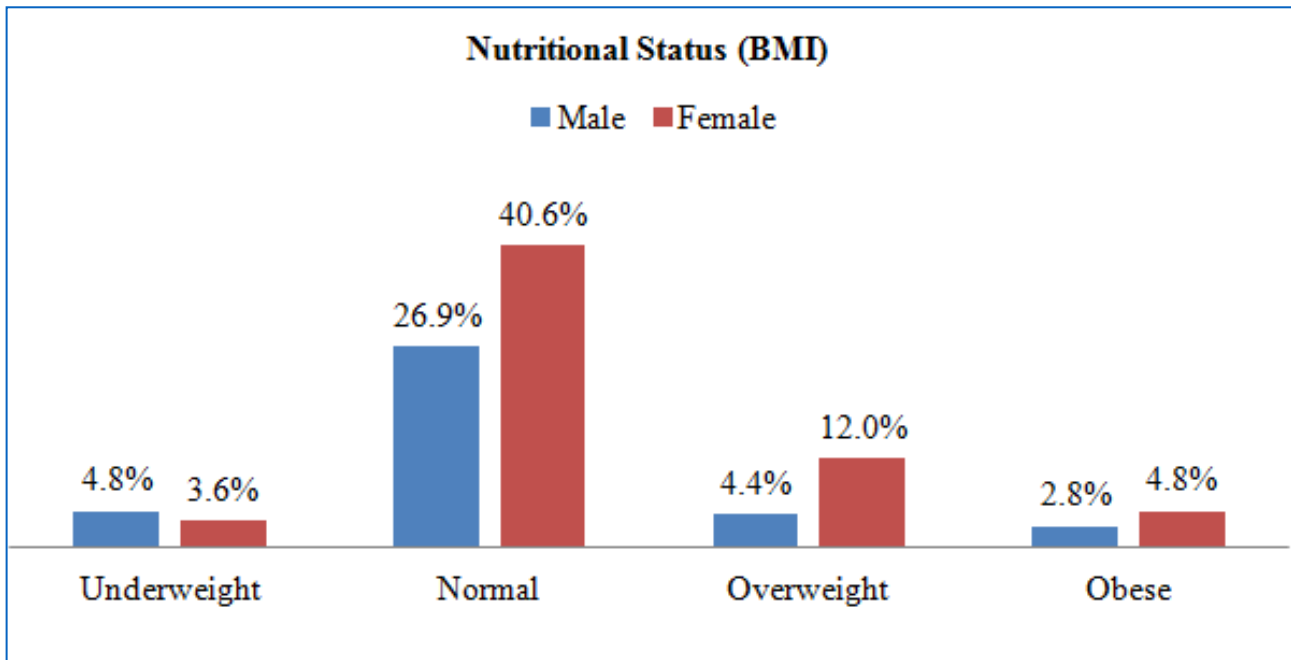
Table 3:

Nutritional Status (BMI) of the Respondents

	Nutritional Status (BMI)					
Category	**<18.5**	**18.5-<25**	**≥25-<30**	**≥30**	**n**	**%**
Age						
18-24	16	154	28	14	212	85.1
25-31	05	14	13	09	37	14.9
Sex						
Male	12	67	11	07	97	39
Female	09	101	30	12	152	61
Total	21	168	41	19	249	100
Year of Study						
Year 1	07	52	05	01	65	26.1
Year 2	01	15	01	01	18	7.2
Year 3	05	28	10	01	44	17.7
Year 4	08	73	25	16	122	49.0
Total	21	168	41	19	249	100
Residential Status						
Rental house	08	84	25	10	127	51
At home	03	15	05	03	26	10.4
Rental-Hostels	05	22	04	02	33	13.3
On-Campus	05	47	07	04	63	25.3

Total	21	168	41	19	249	100
Source of meals						
Restaurant	04	38	04	02	48	19.3
Student mess	01	21	01	05	28	11.2
Own food	16	109	36	12	173	69.5
Total	21	168	41	19	249	100

Figure 1:
Nutritional Status of the Respondents Based on BMI Classification

### Nutritional Status of University Students based on Waist Circumference

Based on Waist Circumference, 21.7% had abdominal obesity while the majority (78.3%) had no abdominal obesity as shown in Table 4. The average waist circumference was 77.8 ± 9.7 cm implying the majority of the students were not a risk of abdominal obesity. A higher percentage of females were obese compared to males (87% females vs. 13% males). Between ages 18-24 years, 79.7% were normal while 20.3% had abdominal obesity. In the age category between 25-31 years, 70.3% and 29.7% were normal and obese respectively. This means advanced age increased waist circumference. About 36.1% and 2.8% of the males were normal and obese respectively. In the female category, 42.2% and 18.9% were normal and obese respectively as shown in Figure 2. The prevalence of central obesity (based on waist circumference) was lower compared to overweight and general obesity (based on BMI) (21.7% vs. 24.1%). This observation can be explained by BMI overestimating the risk of obesity such as among muscular people.

Table 4:

Nutritional Status (Waist Circumference) of the Respondents

	Nutritional Status (Waist Circumference)			
Category	Normal	Abdominal Obesity	n	%
Age				
18-24	169	43	212	85.1
25-31	26	11	37	14.9
Total	195	54	249	100
Sex				
Male	90	07	97	39
Female	105	47	152	61
Total	195	54	249	100
Year of Study				
Year 1	55	10	65	26.1
Year 2	15	03	18	7.2
Year 3	39	05	44	17.7
Year 4	86	36	122	49.0
Total	195	54	249	100
Residential Status				
Rental house	97	30	127	51
At home	16	10	26	10.4
Rental-Hostels	30	03	33	13.3
On-Campus	52	11	54	25.3
Total	195	54	249	100
Source of meals				
Restaurant	41	07	48	19.3
University mess	22	06	28	11.2
Own preparation	132	41	173	69.5
Total	195	54	249	100

Figure 2:

Nutritional Status of the Respondents Based on Waist Circumference Classification
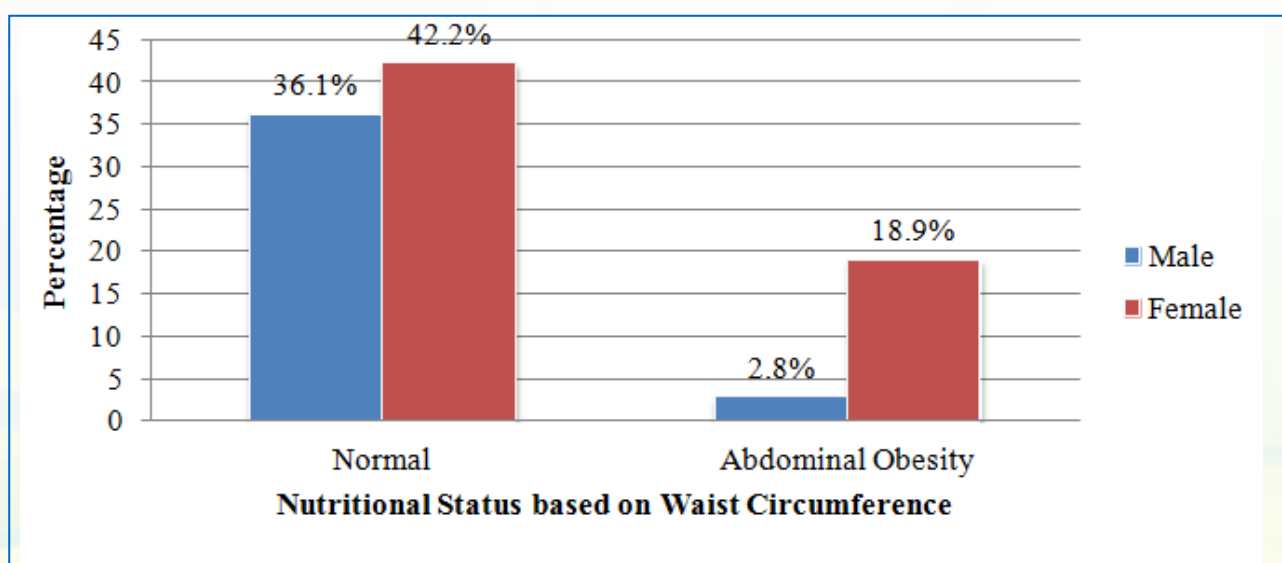
Association between Demographic Factors, Socio Economic Status and Body Mass Index

Age (p=0.001), year of study (p=0.0049) and source of meals (p=0.021) were significantly associated with BMI (Table 4.18). Regarding age, those students in the age category of 18-24 years were close to 4 times more likely to have a normal nutrition status (BMI) as compared to those in the age category of 25-31 years (p-value = 0.021; OR= 3.929, C.I- 1.233-12.513). A significant correlation between the age of the students and their respective BMI was established. As the age of the student increased, there was an increase in BMI (p-value = 0.024, r = 0.143). In conclusion, age is an important determinant of BMI. Being in 2nd year of study increased the likelihood of being underweight by 14 times compared to 4th year of study (p-value = 0.022; OR= 14.000, C.I- 1.460-134.250). In addition, being in 1st year of the study increased the likelihood of having normal nutrition status (BMI) by 11 times compared to 4th year of the study (p-value = 0.020; OR= 11.397, C.I- 1.465-88.653). Additionally, taking meals at the university cafeteria decreased the likelihood of having normal nutrition status (BMI) compared to taking meals at the restaurant (p-value = 0.036; OR= 0.221, C.I- 0.039-1.240).

Adjusted logistical regression showed that sex and year of study had significant associations with BMI. Males were 5 times more likely to be underweight compared to females (p-value = 0.030; AOR= 4.956, C.I- 1.168-21.028). First years were 31 times more likely to be underweight as compared to the fourth years (p-value = 0.006; AOR= 31.655, C.I- 1.490-372.405). Moreover, Students in the third year were 33 times more likely to be underweight as compared to those in the fourth year (p-value = 0.007; AOR= 33.794, C.I- 2.627-434.681). Being in the first year increased the likelihood of having normal nutritional status by 13 times compared to the fourth year (p-value = 0.021; AOR= 13.411, C.I- 2.691-120.727). Moreover, Students in the third year were 11 times more likely to have a normal nutrition status (BMI) as compared to those in the fourth year (p-value = 0.032; AOR= 11.803, C.I- 1.231-113.126).

Table 5:

Relationship Between Demographic, SES and BMI of the Respondents

Variables		χ2/Likelihood ratio	df	p-value
BMI vs.				
	Sex	5.553	3	0.136
	Age	16.740	3	0.001*
	Year of study	23.457	9	0.0049*
	Programme of study	30.450	30	0.443
	Residence status	6.587	9	0.680
	Source of meals	14.952	6	0.021*
	* : Significant (p<0.005)			

Demographic Factors, Socio Economic Status and Waist Circumference

Table 6 shows that sex (p=0.001), year of study (p=0.027) and residence status (p=0.040) were significantly associated with Waist Circumference. Males were 5 times more likely to have a normal nutrition status (waist circumference) as compared to females (p-value=0.001; OR= 5.755, C.I- 2.478-13.364). Regarding the year of study, first years were 2 times more likely to have normal nutrition status (waist circumference) as compared to fourth years (p-value = 0.036; OR= 2.302, C.I- 1.057-5.013).

In addition, being in the third year of study were 3 times more likely to have normal nutrition status (waist circumference) compared to fourth years (p-value = 0.022; OR= 3.265, C.I- 1.190-8.956). Those students living off campus (hostel) were 3 times more likely to have a normal nutrition status (waist circumference) compared to those

living off-campus (own house) (p-value = 0.048; OR= 3.093, C.I- 0.881-10.854).

Adjusted logistical regression showed that sex and year of study had significant associations with waist circumference. Males were 8 times more likely to have a normal nutrition status (waist circumference) as compared to females (p-value <0.001; AOR= 8.018, C.I- 3.190-20.151). First years were close to 5 times more likely to have a normal nutrition status (waist circumference) as compared to fourth years (p-value = 0.006; AOR= 4.957, C.I- 1.575-15.605). Moreover, third years were 5 times more likely to have a normal nutrition status (waist circumference) compared to those fourth years (p-value = 0.003; AOR= 5.267, C.I- 1.772-15.658).

Table 6:

Relationship Between Demographic, SES and Waist Circumference of the Respondents'

Variables	χ2/Likelihood ratio	df	p-value
Waist Circumference vs.			
Sex	19.591	1	0.001*
Age	1.655	3	0.200
Year of study	9.203	3	0.027*
Programme of study	13.164	10	0.215
Residence status	8.333	3	0.040*
Source of meals	1.840	2	0.399
* : Significant (p<0.005)			

DISCUSSION

In the current study, based on Body Mass Index, 8.4%, 67.5%, 16.5% and 7.6% of the respondents were underweight, normal, overweight and obese respectively. The prevalence of obesity and overweight (BMI ≥ 25) was 24.1%. Females had a higher prevalence of obesity (63.2% females vs. 36.8% males) and overweight (73.2% females vs. 26.8% males) category. In the underweight category, more males were underweight compared to females (57.1% males vs. 42.9% females). Based on waist circumference, 21.7% had abdominal obesity. Similar to Waist circumference, a higher percentage of females had abdominal obesity compared to males (87% females vs. 13% males). The mean BMI was 23.1 ± 4.0 kg/m² while waist circumference was about 77.8 ± 9.7 cm.

A study conducted in Palestine by Ali et al. (2022) including Palestine. Consumption of energy drinks (EDs found over a third of students had central/abdominal obesity (35.75%) based on Waist Circumference which was higher than the present study of 21.7%. Based on BMI, they found over a quarter (28.8%) of the male university students were overweight while 13.4% were obese. The prevalence of obesity and overweight (BMI ≥ 25) was lower (24.1%) compared to the findings of the Palestine study. Similar findings to the present study findings were reported by Tokaç Er et al. (2021) among Iranian students. About 16.5% and 4.5% of the respondents were overweight and obese respectively. A study by Benaich et al. (2021) reported a lower prevalence of obesity (1.6%) and overweight (14.8%). In contrast, more males were overweight compared to females in that study.

Several studies reported similar findings. A study among Cameroon students by Bede et al. (2020) found that based on BMI 4.9%, 70.4%, 21.7% and 3% were underweight, normal, overweight and obese respectively. The prevalence of abdominal obesity was 21.2%. A study conducted by Amruth and Kumar (2019) among Indian university students, 18.2% were overweight while 2.1% were obese. A study conducted by Zamsad et al. (2019) in Bangladesh reported that 14.9% and 11.9% of the respondents were overweight and obese respectively. A study conducted by Martinez-Lacoba et al. (2018) reported that 74.5%, 6.41%, 16.9% and 3.2% of the university

students had normal weight, underweight, overweight and obese respectively. More (10.2%) women were underweight compared to 1.2% of men while a higher percentage of men (3.49%) were overweight compared to women (2.81%). However, the current study reported underweight was higher in males while more females were overweight and obese.

Higher than study prevalence of obesity was reported in other studies. A study by Sundaram et al. (2018) reported that 54.9%, 26.8% and 8.9% of Malaysian university students had normal weight, overweight and obese respectively. Yun et al. (2018) reported that 18.2%, 10.6% and 58.1% were overweight, obese and normal respectively. In Kenya, 59.6%, 31.2%, 6.2% and 3.1% of the undergraduate students had normal, overweight, obese and underweight respectively (Mwangi et al., 2019). Furthermore, according to Tapera et al. (2017) over a third (36.8%) of University of Botswana students were obese (24.9%) and overweight (11.9%).

In the current study, advanced age, being in the fourth year and taking meals at a restaurant were associated with a higher BMI. Adjusted logistical regression showed that being a female and the fourth year of study was associated with higher BMI. Being a male and in the first year of study increased the likelihood of being underweight. Similar findings have been reported by several other studies. A study in Peru by Quiliche et al. (2021) found that overweight and obesity were significantly associated with age (>27) and undertaking engineering but not gender among Peruvian university students. Lopez and colleagues reported that gender was statistically significant with body weight (López-Moreno et al., 2021). Bede et al. (2020) determine the prevalence of malnutrition among medical students and factors associated with malnutrition. METHODS: we carried out a cross-sectional study from December 2013 to March 2014 involving 203 consenting students in the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, Faculties of Health Sciences of the Universities of Bamenda and Buea. A three-part questionnaire (socio-demographic profile, eating practices, and anthropometric parameters reported that among Cameroon medical students, obesity and

overweight were significantly associated with female gender. Hong et al. (2018) concluded that advanced age and education statuses were positively associated with higher BMI values. Furthermore, Marija et al. (2018) found that gender, age and education were correlated with BMI values among Serbian nationals. Mitra et al. (2018) observed males had lower BMI values compared to females.

However, other studies reported insignificant relation between age, year of study and source of meals with BMI. Tokaç Er et al. (2021) and Bradbury et al. (2017)in the general population, physically active adults have less body fat after taking body mass index (BMI conducted studies in Iran and Canada. Being male increased the risk of higher BMI among Iranian and Canadian undergraduate students respectively. Zamsad et al. (2019) found that overweight and obesity were significantly associated with the male gender among Bangladeshi university students. Additionally, Waweru and Marete (2017) in their study among Rwandese university students found that residential status was correlated with BMI among university students.

Female Sex, being in the fourth year of study, living off-campus in own their house were correlated with higher Waist Circumference. Adjusted logistical regression showed that the female sex and the fourth year of study had significant associations with waist circumference. Similar findings were reported among Canadian, Iranian and Kenyans. A Kenyan study conducted by Mbugua et al. (2017) concluded that gender (being female) was statistically significant with females recording a higher waist circumference compared to males.

Other studies reported contrasting findings. Tokaç Er et al. (2021) and Bradbury et al. (2017) in the general population, physically active adults have less body fat after taking body mass index (BMI conducted studies in Iran and Canada. Being male increased the risk of higher WC among Iranian and Canadian undergraduate students respectively. A study by Hamam et al. (2017) found that sex, year of study (academic year), and living with family had no significant associations with Waist Circumference. Moreover, according to a study conducted

among students at the University of Botswana by Tapera et al. (2017), gender and programme of study were not significantly associated with obesity.

CONCLUSION

Gender plays a significant role in the prevalence of obesity and overweight among university students, with females exhibiting higher rates compared to males. Additionally, factors like advanced age, being in the fourth year of study, and dining at restaurants are associated with elevated BMI levels. These findings underscore the importance of targeted interventions tailored to address gender-specific health disparities and promote healthier lifestyle choices among students at our institution.

RECOMMENDATION

Based on our study findings, implementing campus-wide initiatives that promote healthy eating habits, encourage regular physical activity, and provide accessible resources for weight management can effectively address the elevated prevalence of obesity and overweight among university students, particularly focusing on gender-specific interventions. Additionally, integrating nutrition education programs into the curriculum and creating supportive environments that facilitate healthy behaviors can contribute to long-term improvements in students' overall health and well-being.

Conflict of Interest
Authors declare no conflict of interest.

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