

# Investigating the Interplay Between Physical- and Social-Environmental Factors, Eating Habits and Nutrition Status among Nutrition Students at a Kenyan Middle-Level Institution - A Cross-Sectional Study

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## ABSTRACT

**Introduction:** Globally, there has been a recent rise in obesity and overweight among college students. In 2022, 43% of adults aged 18 years and above were reported to be overweight. Many physical- environmental and social- environmental factors contribute to nutritional vulnerability among college students, including peer and family influence, media, access and availability of food. There is inadequate research on these physical- and social-environmental factors among college nutrition students in Kenya. Therefore, this study aimed at establishing the environmental factors that influence the eating habits and nutrition status of students pursuing the nutrition and dietetics in middle-level institutions in Kenya.

**Materials and Methods:** The research was guided by a mixed methods cross-sectional analytical study design, with an interest in both quantitative and qualitative data. 293 students in third- and second-year, and pursuing nutrition and dietetics at Karen, Molo, and Nyandarua Campuses of Kenya Medical Training College were sampled randomly. The study used questionnaires that were content-validated, semi-structured, and self-administered to collect data on social and physical environmental factors and eating habits. Qualitative data was collected using an observation checklist and Focus Group Discussion guides. Eating habits was determined using dietary diversity score and meal frequency. Waist and hip circumference measurements were collected and the Waist Hip Ratio was established. Qualitative data was transcribed and coded for common themes, from which conclusions were drawn. SPSS version 25.0 was used for data analysis. Descriptive statistics and Chi-square test, Man Whitney U test, one-way ANOVA, Bivariate Spearman's rank order correlation, and Multivariate logistic regression analysis were also used in establishing the relationships between study variables. A  $p < 0.05$  was used as the statistical significance level.

**Results:** females (76%) constituted the larger portion of the participants, with a mean age 22.7( $\pm$ 2) years. The meals of the students comprised mainly of *ugali*, kales, rice beans/green grams, *chapati* beans/ green grams, and rice, carrot, peas, *ugali* and cabbage. majority of the respondents (87%) consumed diverse diets, with a daily minimum recommended meal

frequency of five meals. Sub-optimal eating habits were reported including skipping meals. Over half (58%) of the respondents reported negative and positive peer influence in the choice of the foods consumed. A chi-square test established a positive association between eating habits and the nutrition status of the students ( $p=0.009$ ). There was a significant association between the occupation of the parents and the respondents' WHR ( $p=0.004$ ). Furthermore, there was a significant relationship between the amount of pocket money the students received and nutrition status (AOR = 1.917,  $p = 0.044$ ). Students who received higher amounts of pocket money were more likely to be obese (high WHR) (AOR = 1.917,  $p = 0.044$ ).

**Conclusion:** In conclusion, this study has shown that peer and family influence, media, access and availability of food were key factors that influenced the eating habit, and consequently, the nutrition status of the study participants. There is, therefore, need for interventions targeting the physical and social environments for healthier eating habits among college students in middle-level institutions.

**Keywords:** Physical Environment, Social Environment, Eating habits, Overweight, Obesity, Nutrition students, Middle- level Institutions

## INTRODUCTION

### Background Information

Between 1990 and 2022, the prevalence of obesity and overweight has risen more than double globally (WHO, 2024). Worldwide, obesity contributes to 4.72 million deaths every year (The World Counts, 2024). High obesity and overweight prevalence have been established among college students. Oluyombo et. al., (2021) reported that in sub-Saharan Africa, constituting majorly of developing nations, obesity rates have been on a rapid rise compared to other places worldwide. Obesity consequently leads to the increased burden of chronic conditions, inpatient admissions, and morbidity.

A study among students from The Catholic University of Eastern Africa (CUEA), Kenya, documented a prevalence of 27.8% and 19.6% of abdominal and general obesity respectively (Rotich et al., 2023). In a study by Bhawna, Sharma and Sharma (2022), it was reported that college students in Delhi engaged in unhealthy behaviours, more so unhealthy eating behaviours. Healthy eating habits influence not only the feelings of students but also the manner in which they achieve and learn (Khan, Zada & Ismael, 2022). Absence of physical activity and poor eating habits promote poor health that leads to premature death, obesity, and

coronary heart disease (The World Counts, 2024). Oluyombo et al. (2021) attributes obesity to increased physical inactivity in addition to unhealthy diets. The social and physical environment of college students also influences their eating habits.

World Health Organization (WHO) provides recommendations on different foods' intake for young adults (Kim, 2023). Nevertheless, Awoke et al. (2022) noted that for both college men and women, the recommended daily intake was way below the recommendations. Many factors interact in the college environment, which interferes with students' intentions and opportunities for healthy eating. Healthy eating is usually perceived as a complex behavior which is susceptible to different self-regulatory failures, regardless of the presence of solid intentions (Stroebe, 2023). According to Healthy People 2030 (2024), the behavioral and lifestyle patterns that college students develop determine their present health status, and the future risk of chronic diseases during adulthood.

### Problem Statement

Epidemiological studies indicate that change to inappropriate dietary habits over the past years has resulted to higher incidences of chronic conditions. In the college population

(18-29 years), 24.1% are obese or overweight (Ndung'u, Waudu & Kobia, 2024), and demonstrate unhealthy eating habits. Despite the intention to consume healthy diets, many factors interact, contributing to unhealthy dietary practices. Current lifestyle factors can be a risk factor for future chronic diseases. KMTC strictly enforces the rule against cooking in the hostels, making the students identify cheap eateries around the colleges. Food kiosks are more preferable to KMTC students as opposed to the school mess (Odenyo, 2017), whose food is associated with lack of variety and monotony. Although studies have been carried out to assess the eating behaviors among college students (Kariuki, 2021), there is limited information on the dietary practices among nutrition students at KMTC campuses, as influenced by the social and physical environment. Therefore, this research study aimed at exploring the social-environmental and physical-environmental factors, eating habits, and nutrition status among college students pursuing pre-service diploma nutrition courses in middle-level institutions.

### Specific Objectives

1. To establish socio-demographic and -economic characteristics of KMTC nutrition students.
2. To assess the eating habits of KMTC nutrition students.
3. To establish the physical environmental factors (physical food access) associated with eating habits of students.
4. To analyze the social-environmental factors (family, media and peer) associated with eating habits of the KMTC nutrition students.
5. To determine the nutritional status of the KMTC nutrition students using Waist Hip Ratio.
6. Establish the relationship between environmental factors, eating habits and nutrition status among the students.

## MATERIALS & METHODS

### Research Design

A cross-sectional analytical study design was adopted to assess the prevalence of overweight and obesity and eating habits among the study participants. Data collection occurred at one point in time and relationships between variables were explored.

### Study Variables

**Table 1: The Dependent, Independent and Confounding Variables**

Dependent Variables	Indicators
Eating habits (WHO, 2008)	a) Eating healthy foods b) Dietary diversity c) Frequency of food consumption d) Skipping or not skipping meals e) Types of foods eaten
Nutrition status	Waist/hip ratio (>0.85 and >0.90 for women and men respectively)
Independent Variables	
<b>Social environmental factors</b> <ul style="list-style-type: none"> <li>• Peer interactions (pressure/modelling)</li> <li>• Parental control and family influence</li> <li>• Media influence</li> </ul>	<b>Physical environmental factors</b> <ul style="list-style-type: none"> <li>• Access to foods</li> <li>• Eating facilities</li> <li>• Availability of food</li> </ul>

### Location of the Study

The study was conducted in Kenya Medical Training College (KMTC) Karen,

Nyandarua and Molo campuses. KMTC is a state corporation that offers 36 different health-related courses, among them

Nutrition and Dietetics, and at the levels of higher diploma, diploma and certificate levels. The Nutrition and Dietetics department has two categories of students, in-service and pre-service. The approximate number of nutrition students in one campus during a semester is 300.

### **Study Population, Inclusion and Exclusion Criteria**

The study was conducted among nutrition students at the KMTC- Karen, Molo, and Nyandarua Campuses. This study focused on the pre-service diploma students, and were boarders in their campuses. The third- and second- year pre-service students were the focus of this study as their content coverage from the curriculum is enough to enable assessment of nutritional knowledge. Only participants willing to participate were recruited, and all gave their informed consent. However, nutrition students having chronic conditions, those on special dietary regimes, and KMTC students on other programs were excluded from the study.

### **Sampling Techniques and Sample Size**

#### **Sampling Technique**

The sampling frame was composed of the 13 KMTC campuses that offer nutrition, with a total population of 1643 students. KMTC campuses in Karen, Molo, and Nyandarua were selected purposively based on having larger numbers of 2<sup>nd</sup> and 3<sup>rd</sup> year pre-service diploma nutrition students, and their close vicinity to urban areas, where transitions in lifestyle and dietary behaviours has been observed recently. Proportionate sampling was used to determine the student numbers from each campus and class. 160 participants were sampled from Karen campus (76 3<sup>rd</sup> year and 84 2<sup>nd</sup> year). 46 participants were from Molo campus (20 3<sup>rd</sup> year and 26 2<sup>nd</sup> year), while there were 40 3<sup>rd</sup> year and 47 2<sup>nd</sup> year respondents from Nyandarua campus. Consequently, simple random sampling was done to select the respondents from each class using the table of random numbers.

### **Sample Size Determination**

The sample size was determined using the Cochran formula. Based on Peltzer et al. (2014), the prevalence of overweight or obesity among university students aged 16 to 30 years in low and middle-income countries is 22%. This prevalence was used considering that the age of participants in this sample was similar to what is being studied, and Kenya is also a middle-income country.

$$= (1.96^2) (0.22) (0.78) / 0.05^2$$

= 264 respondents. Considering a 10% non-response rate;

Desired sample size (total) = sample size obtained / (1 - non-response rate)

$$n = 264 / (1 - 0.1) = 293$$

### **Data Collection Instruments and Tools**

A content-validated, semi-structured, self-administered questionnaire was used in collecting information on social and physical environmental factors and eating habits. Other instruments were observation checklist that collected information on types of foods consumed and how diverse it was, and Focus Group Discussion guide for qualitative data such as how various factor influence eating habits in college. The criteria for selecting the research assistants were being an undergraduate or diploma holder in nutrition course, or having previous experience. The assistants were trained adequately using PowerPoint presentations, lectures, role plays and demonstrations.

### **Pretesting of Data Collection Instruments and Calibration of Weighing Scales**

10% of the sample size (30 participants) were involved in the pretesting at Thika School of Medical and Health Sciences. Their feedback aided in improving the validity, reliability and accuracy of the instruments used in data collection. The data collection tools were tested for accuracy so that correct readings were obtained. The weighing scale was calibrated every time

before its use and after movement by placing a known 1KG item on it.

### **Validity and Reliability of Tools**

A panel of nutrition experts scrutinised the questions thoroughly for validity. Reliability was tested using the test-retest method for reproducibility of results, with a reliability of 0.8- 0.9. Cronbach's alpha was also used, with a range of 0.7 to 0.9. The pre-test subjects' feedback guided improvements on the data collection instruments.

### **Data Collection Techniques**

Two research assistants, supervised directly by the principal researcher, assisted in data collection. After, the participants were briefed about the research study and their informed consent was sought. Respondents responded to the questionnaires at their respective colleges in spacious halls. The questionnaires were checked for completeness before being collected.

### **Anthropometric Measurements**

Data on the nutrition status was collected using the tape measure. The measurements were taken twice, after which the average was obtained. If measurements were too apart, a third measurement was taken. The hip measurement was taken at the fullest part of hips and buttocks. The waist measurement was taken at the torso's narrowest part, below the ribcage and above the belly button. These two measurements were used to calculate the WHR (Waist Hip Ratio).

### **Focus Group Discussions**

The facilitator started by briefing the participants on the research study, and sought their informed consent. Recorded FGDs were used in collecting qualitative information on eating habits and the influencing factors. A mobile phone assisted in recording the sessions through a video. The FGDs consisted of 6-12 respondents from each of the classes. A total of six FGDs were conducted in the three

campuses; two from each campus. The FGDs were conducted in the campuses' lecture halls that were comfortable and free from disturbance. The facilitator conducted the sessions with the help of a recorder using the FGD guide during discussions while observing for non-verbal communication. Each discussion took an average of 60- 90 minutes. One research assistants recorded the discussion.

### **Observations**

Observation guide was used for collecting additional data on the eating habits. The nutrition students were observed at the food kiosks and their areas of residence as they took their meals. A total of 30 students were observed (10% of the total sample), and proportionate sampling was used in selecting the number from each campus. An observation checklist guided the data collection on dietary intake and their diversity.

### **Data management and Analysis**

Quantitative data was cleaned first and then coded. It was entered into the Ms Excel for WHR calculations. It was then entered into SPSS version 25.0 for the analysis. Descriptive statistics was done for general data characteristics.

Dietary diversity score was calculated on the foundation of the food groups consumed in a 7 days reference period. The food groups considered were starchy staples, legumes – Beans and peas, nuts and seeds, all dairy, meat and meat products, fish and fish products, eggs, dark green leafy vegetables, other vegetables, and fruits (WHO, 2008). A consumption of 3-4 times per week was considered as regular, and consumption of more than 4 food groups was considered to be dietary diverse, as spelt out by WHO (2008). Observation was also done to determine the eating habits. The waist-hip ratio cut-off points by WHO were used, where for women and men, a ratio of  $>0.85$  and  $>0.90$  respectively indicated central obesity.

Thematic analysis was used for analyzing the qualitative data on the physical and social environmental factors and eating habits. The qualitative data collected from the guides and FGDs was transcribed then coded by assigning labels to the variable categories. Common themes were established then clustered in some patterned order. Conclusions were derived from the common themes. Information was then triangulated with data obtained from the questionnaires. Thematic analysis was used on data from observations, and conclusions drawn from findings.

### STATISTICAL ANALYSIS

Chi square test helped in determining the associations and relationships between observed and expected frequencies of nutrition status and eating habits. Man Whitney U test aided in comparing differences between independent (social-environmental and physical-environmental) for variables not normally distributed and dependent variables (eating habits and nutrition status) in the three campuses. Statistical differences between campuses' means were tested using one-way ANOVA tests.

Bivariate Spearman's rank order correlation was used for determining the direction and strength of associations between the eating habits and nutrition status, social

environmental factors and eating habits, and physical environmental factors and eating habits. Multivariate logistic regression analysis was used to determine the predictor of eating habits and nutrition status. A  $p < 0.05$  was set as the statistical significance level.

### RESULTS

#### Socio-demographic and socio-economic characteristics

A total of 293 students participated in the study; Karen (54.8%), Nyandarua (29.8%), and Molo (14.7%) campuses. The respondents' socio-demographic and socio-economic characteristics are presented in Table 1. Over half of the participants (62.5%) were aged between 22- 25 years. A majority of the participants were females (76%). Most of the guardians were married (69.8%) whereas 28.4% were single. The minority were the divorced and widowed (0.3%). Nearly a third of the guardians were either unemployed (34.5%) or in permanent formal employment (35.4%). Over half of the guardians to the participants were university or college graduates (51.2%), while 6.1% never attended school. The participants' mean age was 22.7 ( $\pm 2$ ) years. The mean pocket money for the month preceding the interview was 2533.27 ( $\pm 1740.65$ ) Kshs (Table 1).

**Table 1: Respondents' Socio-demographic and Socio-Economic Characteristics**

Characteristics		(N=293) n (%)
<b>The campus of the respondents</b>		
Karen	160	(54.6)
Molo	46	(15.7)
Nyandarua	87	(29.7)
<b>Age Mean (SD)</b>	22.7 ( $\pm 2$ )	
<b>Age by categories</b>		
18-21	87	(29.7)
22 – 25	183	(62.5)
26-29	23	(7.8)
<b>Gender</b>		
Male	71	(24.2)
Female	222	(75.8)
<b>Monthly pocket money (Kshs) Mean (SD)</b>	2533.27 ( $\pm 1741$ )	
<b>Guardian's marital status</b>		
Married	203	(69.3)
Divorced	1	(0.3)

Single	84	(28.7)
Separated	4	(1.4)
Widow	1	(0.3)
<b>Occupation of the guardian</b>		
Permanent formal employment	104	(35.5)
Contract employment	42	(14.3)
Casual labourer	46	(15.7)
Unemployment	101	(34.5)
<b>Education level of the guardian</b>		
Primary	32	(10.9)
Secondary	93	(31.7)
University/ College	150	(51.2)
Never attended school	18	(6.2)

### Eating Habits among KMTC Nutrition Students

Generally, the findings clearly show that there was a high consumption of starches, and the adequacy and variety diet principles were not observed. Water and fruit juices were also consumed with meals.

### Consumption of breakfast, meal frequency, and water intake among the Respondents

On average, breakfast was consumed six days in a week, while 4.8% of the respondents had skipped it in the last 24 hours. The minimum recommended meal frequency of five meals daily was not met

since on average two meals were consumed in a day. The majority (55.6%) consumed less than three meals per day, while 44.4% attained the recommended meal frequency by consuming five meals per day. On average, the students consumed 5 glasses of water per day, which was below the recommended intake (Table 2). However, 25.2% of the respondents were able to hydrate as recommended. Noteworthy, reports from the FGD indicated that the thumb rule of avoiding fluids (water and fruit juice) during or immediately after meals was also not observed by majority.

**Table 2: Consumption of breakfast, meal frequency, and water intake among nutrition students**

	N=293				
	Min.	Max.	Mean	Std. Dev.	n (%)
The number of days breakfast was consumed in 7 days	0	7	5.9	1.7	
Number of meals consumed Per day	2	8	2.1	3.6	
Number of glasses of water taken daily	1	12	5.2	2.1	
Consumption of 8 or more glasses of water as recommended	1	2	1.75	0.434	74 (25.2)
Skipped breakfast in the last 24 hours	1	2	1.05	0.214	14 (4.8)
Consumed tea only in the last 24 hours	1	2	1.69	0.465	92 (31.4)
Attained the recommended meal frequency of 5 meals in a day	1	2	1.55	0.497	130 (44.4)

### Reasons for skipping meals

Lack of money was quoted by 61.8% of the participants as the reason why the nutrition students skipped meals. Other reasons included; competing activities (20.8%), to maintain body shape (7.8%), religion

(6.2%), and eating place too far (3.4%) (Table 3). Due to inadequate finances, the students purchase cheaper foods such as *ugali* and kales in place of expensive ones such as beef and chicken).

**Table 3: Reasons for skipping meals among nutrition students**

Characteristics	N= 293 n (%)
Because of competing activities	61 (20.8)
Lack of money	181 (61.8)
To maintain body shape	23 (7.8)
Religion	18 (6.2)
Eatery located too far (more than 1 KM)	10 (3.4)

### **Dietary diversity among college students**

Table 4 shows the frequency of consumption of foods from the various food groups. Dietary diversity score was calculated based on the food groups consumed in the 7 days reference period. A consumption of 3-4 times per week was considered a regular (WHO, 2008; Ministry of Health, 2017). Slightly more than a third (35.6%) of the respondents consumed starchy staples daily whereas green leafy vegetables and other vegetables were consumed by 35.5% and 33.8% respectively. Only 26.9% of the respondents consumed fruits where as 29.7% consumed dairy daily. Slightly over a third of the respondents, 36.6% and 42.7%, had never/ rarely consumed nuts and seeds and fish and fish products respectively. There was no regular consumption of nuts and seeds, all dairy, and fish and fish products as these were consumed by less than 10% of the respondents 3-4 times weekly as follows; 10.6%, 10.2%, and 6.1% respectively, implying that a majority of the respondents had an irregular consumption of these foods (Table 4). The least frequently consumed food groups were nuts and seeds, meat and meat products, fish and fish products, and eggs where 28.4%, 43%, 17.1%, and 40.9% of the respondents consumed them  $\geq 3$  times per week.

Reports from the FGD indicated that the main meals' combinations consumed by the students comprised of *ugali* kales, rice beans/green grams, *chapati* beans/ green grams, rice carrot peas and *ugali* cabbage. Moreover, during a single meal, variety and adequacy principles were not observed. For example, there was an overconsumption of rice beans, and no vegetable or fruit was

consumed during the particular meal. The researcher also conducted structured observation sessions in eateries frequented by the students to assess the eating habits of the nutrition students. The observations indicated that there was no reflection of 'My Plate Model' in the meals consumed by the participants, where starches constituted the larger portion, as opposed to fruits and vegetables. The implication from the 'My Plate Model' was that the recommended portion sizes were never observed. Participants also consumed fruits salads or fruit juices in place of the main meals.

A majority of the participants (87%) consumed over four food groups based on a 7-days reference period, and therefore, met the recommended dietary diversity (Table 5).

**Table 5: Dietary Diversity among Nutrition Students**

	Frequency	Percent
< 4 Food Groups	38	12.97
$\geq 4$ Food Groups	255	87.03
Total	293	100.0

**\*WHO (2008) Dietary Diversity Cut Off Points ( $\geq 4$  Food Groups= Diverse; < 4 Food Groups= Not Diverse. Minimum dietary diversity is 4 food groups).**

### **Economic Food Access**

The economic food access of the students was majorly determined by the amount of pocket money. The mean pocket money in the previous month was Kshs 2,533. KMTC college students spent varying amounts of money for the various meals daily. This expenditure was majorly determined by the amount of pocket money (Table 6).

**Table 5: Frequency of Consumption of foods from different food groups**

Food Group	N= 293	Frequency of consumption							
		Never / rarely n (%)	1-2 per week n (%)	3-4 / week n (%)	5-6 / week n (%)	Daily n (%)	2-3 / day n (%)	4-5/ day n (%)	6+ per day n (%)
Starchy staples	18(6.1)	49(16.7)	42(14.3)	26(8.9)	104(35.6)	5(1.7)	5(1.7)	8(2.7)	64.9%
Legumes – Beans and peas	21(7.2)	83(28.3)	73(24.9)	31(10.6)	42(14.3)	7(2.4)	2(0.7)	6(2.0)	54.9%
Nuts and seeds	106(36.6)	49(16.6)	31(10.6)	14(4.8)	16(5.5)	8(2.7)	5(1.7)	9(3.1)	28.4%
All dairy	36(12.3)	45(15.4)	30(10.2)	17(5.8)	87(29.7)	14(4.8)	14(4.8)	6(2.0)	57.3%
Meat and meat products	36(12.3)	88(30.0)	59(20.1)	24(8.2)	15(5.1)	19(6.5)	4(1.4)	5(1.7)	43%
Fish and fish products	125(42.7)	35(11.9)	18(6.1)	10(3.4)	6(2.1)	4(1.4)	7(2.4)	5(1.7)	17.1%
Eggs	51(17.4)	77(26.3)	53(18.1)	26(8.9)	21(7.2)	9(3.0)	6(2.0)	5(1.7)	40.9%
Dark green leafy vegetables	21(7.2)	40(13.6)	50(17.1)	26(8.8)	104(35.5)	12(4.1)	9(3.1)	10(3.4)	72%
Other vegetables	29(9.9)	45(15.4)	43(14.6)	29(9.9)	99(33.8)	15(5.1)	13(4.4)	9(3.1)	70.9%
Fruits	23(7.8)	46(15.7)	47(16.1)	45(15.4)	79(26.9)	14(4.8)	13(4.5)	8(2.7)	70.4%

**Table 6: Monthly pocket money and amount of money spent for various meals**

	N= 293	Min.	Max.	Mean	Std. Deviation
Monthly pocket money		200	9500	2533.2721	1740.654
Amount spent daily on breakfast (Kshs)		0	90	39.5	15.9
Amount spent daily on lunch (Kshs)		0	150	61.5	30.5
Amount spent daily on supper (Kshs)		0	300	76.9	41.8
Meals taken in campus in a week		0	100	10.1	12.3
Number of times meals were taken outside the campus the preceding week		0	55	3.0	5.5

### ***Economic food access and eating habits of nutrition students***

There was a significant association between the amount of pocket money and frequency of consumption of breakfast; those students with higher amounts of pocket were less likely to miss breakfast ( $\chi^2=340.793$ ,  $df=168$ ,  $p=0.001$ ). There was a significance association between the amount pocket money and meal frequency ( $\chi^2=40.847$ ,  $df=24$ ,  $p=0.017$ ). There was a significant relationship between employment status of the parent/ guardian, skipping breakfast ( $\chi^2=50.709$ ,  $df=21$ ,  $p=0.001$ ) and meal frequency ( $\chi^2=113.544$ ,  $df=72$ ,  $p=0.001$ ). Respondents whose parents had permanent jobs were more likely to take breakfast than those of contract employment, casual labourer and unemployed respectively. Moreover, more number of

meals was noted among respondents whose parents had permanent job compared to others (Table 7). The indicates that the social environment, particularly the parental/ family influence, has a great impact on the eating habits.

There was a positive relationship between the amount of money spent daily for breakfast and the frequency of consumption of breakfast weekly (pearson product moment correlation  $r=-0.121$ ,  $p=0.042$ ). If more money was spent, the student also consumed breakfasts in more number of days in a week. Looking at how much was spent for lunch in comparison to the number of days a student prepared meals for himself in a 7-days period, a negative correlation was observed ( $r=-0.021$ ,  $p=0.150$ ). Meal's preparation attracted a higher cost (Table 7).

No cooking was permitted in the students' hostels as reported in the FGDs conducted. Hence, the respondents purchased food from kiosks outside the campus, or ate at the college cafeteria. The students were responsible of making choices about their meals, including where to take the meals from. The break time was not always sufficient to allow access of food, often due to congestion as many students bought food at this particular time. The distance to the kiosks outside the college, where students could afford meals was also far (between 1.5- 2 KM). It was also reported that the cost of food at the college cafeteria was

high. Moreover, the portions were small and lacked variety. Lack of variety in foods was attributed to finances, seasonality of some foods such as vegetables, time spent waiting to be served (as much as one hour), long distances to kiosks, and other times, later comers never got food. One respondent indicated that, "due to lack of adequate finances, eating healthy food is a huge challenge" (FGD participant 1, 2021). Another respondent reported that "the foods of choice are mainly determined by the purchasing power" (FGD participant 2, 2021).

**Table 7: Influence of economic food access on eating habits of nutrition students (skipping breakfast, meeting recommended meal frequency, purchasing food from informal eateries, and consumption of breakfast in 7 days)**

	( $\chi^2$ )	d.f	p-value
<b>Associations between the amount of pocket money and:</b>			
Skipping breakfast	340.793	168	0.001
Meeting recommended meal frequency (5 meals/day)	40.847	24	0.017
Purchasing food from informal food outlets/ eateries	147.195	72	0.012
<b>Association between employment status of the parent/guardian and:</b>			
Skipping breakfast in 7 days	50.709	21	0.001
Meeting recommended meal frequency (5 per day)	113.544	72	0.001
<b>Variables correlated</b>			<b>P-value</b>
Associations between how many days breakfast was eaten in 7 days and amount of money spent daily for breakfast			P value = 0.042 r = 0.121
Associations between amount of money spent for lunch and number of times student prepared meals for himself the previous week			P value = 0.021 r=0.150

### **Social and Physical Environmental Factors associated with eating habits among KMTC students**

#### **Physical food access**

Majority of the KMTC students took their meals from informal food kiosks/ eateries.

Majority of the students also preferred eateries that were between 1.6 and 2 KM away as they offered affordable, even though unhealthy food. This indicates that considerable time was taken to access meals (Table 8).

**Table 8: Physical food access**

	Frequency	Percent
Informal food kiosk	149	50.9
School mess	137	46.8
Restaurant / hotel (outside college)	7	2.3
Total	293	100.0
<b>Distance to preferred eatery</b>		
< 1 km	56	19.1
1- 1.5 km	77	26.3
1.6- 2 km	160	54.6

**Influence of family, media and peers on eating habits of nutrition students**

While 34.8% of the respondents had their dietary habits influenced positively by the college environment, 32.8% were influenced negatively, and 32.4% felt the college environment influenced them in no way. 35.2% of the respondents never received reminders from their families concerning their meals while at college. This indicated that while they were at the college, they were responsible of guarding their eating habits. 89.4% of the respondents were supported by their parents through being sent for pocket money while 3.1% received no support (Table 9). This indicates that the financial status of the parents had a great influence on the eating habits of respondents.

Over half of the respondents (56.7%) took their meals with the fellow nutrition

students while 30.7% ate alone. The fellow nutrition students can either be a positive or negative influence on the eating habits, since 57.7% of the respondents further reported that those, they take meals with normally influenced their food choices. Furthermore, 76.3% indicated that the influence was positive, while 23.7% of the respondents indicated it was negative. On the same note, eating alone might make some students be prone to either positive or negative influences. Slightly over half (51.5%) of the participants reported that their peers influenced their food choices, and 67.5% further reported that this influence was positive. Majority (68.6%) respondents reported that their campus administration did not support healthy diet choices (Table 9).

**Table 9: Influence of family, peer and school environment on the eating habits**

Characteristics	N=293 n (%)
<b>Influence of the school environment on healthy eating habits</b>	
Yes, positively (by providing healthy meals)	102 (34.8%)
Yes, negatively (limited access to healthy foods, time constraints, peer pressure, no cooking)	96 (32.8%)
No	95 (32.4%)
<b>Frequent follow-ups from family about meals while at the college</b>	
Yes	103 (35.2%)
No	190 (64.8%)
<b>How parents support</b>	
Supplying me with food (either raw or cooked)	22 (7.5%)
Send me pocket money	262 (89.4%)
No support offered	9 (3.1%)
<b>Peers influence on food choices</b>	
Yes	151 (51.5%)
No	142 (48.5%)
<b>Nature of the influence by peers (N= 151)</b>	
Positive (positive role modelling, supportive accountability, eating out together)	102 (67.5%)
Negative (unhealthy food choices, skipping meals, peer pressure)	49 (32.5%)
<b>Campus support on meal consumption among the students</b>	
Yes (providing healthy meals)	92 (31.4%)
No	201 (68.6)

Further analysis showed that family control/ influence had a significant association and with selected eating habits; frequency of consuming soft drinks in a week (p=0.01), frequency of consuming fruits and vegetables in a week (p=0.045), frequency of consuming 4PM snack weekly (p=

0.008), frequency of consuming fast-food weekly (p=0.003), and the choice for sausages/ smokies (p=0.004) and chocolate (p=0.007) (Table 10). Pearson product moment correlation established a significant association between media and influence on the choice of cakes (p=0.051), fruits

( $p=0.001$ ), popcorns ( $p=0.023$ ) and doughnuts ( $p=0.019$ ). There was no significant association between family control and choice for cakes and popcorns ( $p < 0.001$ ). A significant association was observed between peers and the

consumption of meals at appropriate time, consuming the 10 AM snack, and choice for popcorns, sweets, sausages/ smokies, and chocolate  $p < 0.05$ . No association was established between choice for doughnuts and peer influence ( $p < 0.001$ ).

**Table 10a: Association between media influence and selected eating habits**

Associations between media influence and selection of eating habits			
	( $\chi^2$ )	d.f	p-value
Number of meals consumed daily in last 24 hours	34.627a	24	0.074
Breakfast consumption over a 7-day period	8.120	7	0.322
Snacking over a 7-Day period	3.297a	5	0.654
Consumption of main meals and snacks at the recommended time	1.350	1	0.245
Regular consumption of cakes	12.539a	6	0.051
Regular consumption of fruits	25.066a	7	0.001
Regular consumption of Popcorns	14.717a	6	0.023
Regular consumption of Sausages/ smokies	2.041a	6	0.916
Regular consumption of Chocolate	12.052a	7	0.099
Regular consumption of Artificial juice	8.581a	7	0.284
Regular consumption of soft drinks	11.751a	6	0.068
Regular consumption of Chips	12.082a	6	0.06
Regular consumption of Doughnuts/ "KDF"	15.141a	6	0.019

**Table 10b: Association between family control and selected eating habits**

Associations between family control and selected eating habits			
	( $\chi^2$ )	d.f	p-value
Breakfast consumption over a 7-day period	17.053a	14	0.253
Glasses of water taken daily	23.702a	18	0.165
Meals consumption at appropriate time	0.985a	2	0.611
Soft drinks consumption over a 7-day period	23.323a	10	0.01
Fruits and vegetables consumption over a 7-day period	15.813a	8	0.045
4 PM snack consumption over a 7-day period	23.858a	10	0.008
10 am snack consumption over a 7-day period	11.254a	10	0.338
Fast food consumption over a 7-day period	26.988a	10	0.003
Where often do you take your meals	4.881a	6	0.559
Choice for cakes	37.420a	12	< 0.001
Popcorns	44.499a	12	< 0.001
Sweets	8.808a	14	0.843
Doughnuts/ KDF	20.221a	12	0.063
Sausages/ Smokies	28.899a	12	0.004
Chocolate	30.304a	14	0.007
Chips	16.784a	12	0.158
Carbonated drinks	15.869a	12	0.197
Artificial juice	21.126a	14	0.098

**Table 10c: Association between peer influence and selected eating habits**

Associations between peer influence and selected eating habits			
	( $\chi^2$ )	d.f	p-value
Fast food consumption over a 7-day period	22.355	15	0.099
Regular place from where meals are consumed	12.261	9	0.199
Glasses of water taken daily	27.209	27	0.453
Consumption of meals at appropriate time	8.765	3	0.033
Soft drinks consumption over a 7-day period	17.889	15	0.269
Fruits and vegetables consumption over a 7-day period	7.869	12	0.795
10 am snack consumption over a 7-day period	27.429	15	0.025433

Fruits or vegetables consumption over a 7-day period as snack	17.689	15	0.279
Food choice for fruits	19.869a	21	0.53
Cakes	28.128a	18	0.06
Popcorns	40.439a	18	0.002
Sweets	32.763a	21	0.049
Doughnuts/ KDF	62.430a	18	< 0.001
Sausages/ smokies	36.001a	18	0.007
Chocolate	46.053a	21	0.001
Chips	10.824a	18	0.902
Carbonated drinks	22.664a	18	0.204
Artificial juice	31.169a	21	0.071

According to the FGD, families to the participants supported them by sending money meant to buy food. However, the pocket money ranged between Kshs. 200 to 9500. This indicates that some students never had adequate money to enable them engage in proper eating habits. Respondents agreed that peers influenced the participants' food choices and preferences. One respondent noted, *“My peers often make me buy expensive food so as to maintain the standards they set, even if it calls for looking for alternative sources of money, including from sponsors”* (FGD participant 3, 2021). However, some participants reported that their peers never influenced them, and that they usually ate what was within their means. Others were influenced positively. The social media also influenced the food choices, including advertisements on YouTube, Instagram and Facebook. One of the participants indicated that, *“social media advertisements are usually very tempting and I have on several*

*occasions tried out the food being advertised”* (FGD participant 4, 2021). Participants reported that the food offered within and around was not always safe as evidenced by diarrhoea. It was also not nutritious as it was often overcooked and too fatty. Acquiring nutritious foods was also highly dependent on one's finances and choice. The food was also expensive for the participants to afford, even though some such as vegetables were affordable. The main factors attributed to food choice and preferences were cost, taste, peer influence, food appearance, appetite, cooking method, psychological state, media, time, and physiological/ health status.

### The Nutrition Status of KMTC Nutrition Students

Based on Waist/ Hip Ratio, central obesity was observed among 17.8% of the respondents. Based on WHR, obesity levels were higher in males (63.4%) compared to females (4.1%) (Table 11).

**Table 11: Nutrition Status Based on WHR and gender**

	TOTAL N=293		Female		Male	
	Frequency	%	Frequency N=222	%	Frequency N=71	%
<b>Obesity</b>	52	17.8	9	4.1	45	63.4
<b>No Obesity</b>	241	82.2	213	95.9	26	36.6

(Central Obesity: >0.85= Women and >0.90= Men)

### Relationship between social and physical environmental factors, eating habits and nutrition status

#### *Relationship between socio-demographic and -economic factors and respondent's nutrition status*

The association between socio-demographic and -economic factors and the nutrition status of the respondents is indicated in table 12. A significant relationship was established between the amount of pocket money and nutrition status (AOR = 1.917),  $p = 0.044$ ).

**Table 12: Relationship between socio-demographic and -economic factors and respondent’s nutrition status**

Factor	Characteristics	N=293 COR (CI)*	P**	N=293 (CI)***	AOR	P
Marital status	Married ref.		0.999			0.403
	Divorced		0.996	1.00(1.00 – 1.00)		1
	Single		0.999	1.222(0.684 – 2.182)		0.498
	Separated		0.996	9.563(0.972 – 3.079)		0.053
	Widow		0.996	1.00(1.00–1.00)		1
Amount of Pocket Money	<2500 ref.			1.00(0.00 – 0.00)		0.001
	≥2500	1.263 (0.491 – 3.249)	0.629	1.917(1.016 - 3.615)		0.044****
Parents employment status	Not employed ref.		0.622			
	Employed	0.836(0.444- 1.573)	0.578	0.856(0.462- 1.586)		0.622
Money spent for breakfast		1.006(0.979- 1.034)	0.655	1.008(0.994 - 1.021)		0.287
Money spent on lunch		1.007(0.986 - 1.028)	0.520	1.005(0.995- 1.016)		0.325
Money spent on supper		1.012(0.997 - 1.027)	0.125	0.998(0.991- 1.005)		0.613
Number of meals taken in campus		0.989(.977 - 1.002)	0.094	1.001(0.978- 1.025)		0.918

COR [CI]\*: acronym for the crude odds ratio and the confidence intervals

\*\* p = p-value: p < 0.05 significance level

\*\*\*AOR [CI] =adjusted odds ratio with the confidence intervals. Adjustments were made for age, gender and physical activities

\*\*\*\*significant relationship with WHR

**Association between individual factors and nutrition status**

A significant association was also observed between age and WHR (p=0.004), and present employment status of the guardian

and WHR (p=0.004) (Table 13). There was also a positive correlation between and dietary diversity and WHR (p=0.004) (Table 13).

**Table 13: Association between nutrition status and students’ individual factors**

Associations between	Chi-square Value ( $\chi^2$ )	df	p-value (Chi-square)
Gender and Waist Hip Ratio	135.142	1	.000
Marital status and Waist Hip Ratio	1.972	4	0.741
Present employment status of guardian and WHR	13.239	3	0.004
Age and WHR	26.17	10	0.004
Reasons for skipping a meal and WHR	2.062	4	0.724
Skipped breakfast in the last 24 hours and WHR	1.090 <sup>a</sup>	1	0.296
Dietary diversity and WHR	11.002	2	0.004

\*WHR= Waist Hip Ratio

**Relationship between physical environmental factors and nutrition status**

On the environmental factors, where respondents often took their meals was noted as a predictor of nutrition status among the respondents. Consumption of food in the school mess had a significant association on nutrition status of the study respondents (AOR 1.10, p<0.05; 95% CI:

0.987-1.013 Multinomial Logistic regression).

Respondents with employed parents were 47% (AOR = 0.534, p = 0.001) less likely to have normal nutrition status compared to those whose parents were not employed. Respondents with more pocket money were 92% (AOR = 1.917, p = 0.044) more likely to be obese (have a high WHR) compared to

those with low amounts of pocket money (Table 14).

**Table 14: Relationship between selected individual factors and respondent's nutrition status**

Factors associated	Characteristics	N=293 COR (CI)*	P**	N=293 AOR (CI)***	P
Parent's employment vs Nutrition status	Waist circumference	0.301(0.121- 0.751)	0.01	0.849(0.485 - 1.487)	0.568
	WHR	0.426(0.147- 1.229)	0.114	0.534(0.113 - 1.429)	<b>0.001</b>
Amount of pocket Money vs Nutrition status	Waist circumference	1.824 (0.796 – 4.18)	0.155	.998(0.570- 1.749)	0.994
	WHR	1.348 (0.500 – 3.636)	0.556	1.917(1.016 - 3.615)	<b>0.044</b>

COR [CI]\*: acronym for the crude odds ratio and the confidence intervals

\*\* p = p-value: p < 0.05 significance level

\*\*\*AOR [CI] =adjusted odds ratio with the confidence intervals. Adjustments were made for age, gender and physical activities

## DISCUSSION

### Socio-Demographic and Socio-Economic Characteristics of KMTC Nutrition Students

Majority (62.5%) of the participants were aged between 22- 25 years, with a mean age of 22.7 ( $\pm 2$ ) years. This was similar to findings by Ndung'u, Waudu and Kobia (2024), where the college-age population was reported to be between 18 and 29 years. More females (76%) pursued the Nutrition and Dietetics diploma course compared to males, which was similar to findings by Annamalai and Gopichandran (2022). The mean monthly pocket money was 2533.27 ( $\pm 1740.65$ ) Kshs, and ranged between 200 and 9500 Kshs. This implies that some students were financially advantaged than others, which greatly affected the eating habits.

Socio-economic characteristics such as guardian's marital status, present employment status, and education level had an association with the eating habits of college students, since they influenced the amount of pocket money sent to a student. The guardian's marital status can influence the eating habits of a student, where married guardians might be well empowered financially to support the college students. At the same time, the education level of a guardian was likely to determine the status and level of employment, which in turn influenced the income and ability to support college students, both in terms of pocket money and advice. This agrees with Hoque,

Hoque and Thanabalan (2018) who noted that the incomes of parents had a significant association with healthy eating habits among students. Unemployed guardians might face challenges in supporting college students with adequate finances.

### Eating Habits of Nutrition Students Consumption of Breakfast, Meal frequency, and Water Intake among the Respondents

In this study, on average, breakfast was consumed six days in a week. However, some respondents skipped the breakfast. Almansour, Allafi and Al-Haifi (2020) also observed the habit of skipping meals among college students. This can be associated with low socio-economic backgrounds. Awoke et al. (2022) also observed that breakfast was substituted with unhealthy alternatives. This poses a challenge since Barnes et al. (2021) noted that adolescents who took breakfast regularly were highly likely to have high nutritious diets compared to those who never had. The minimum recommended meal frequency per day was not met, with about two meals being consumed in a day. The minority (44.4%) attained the recommended meal frequency of five meals per day. About 5 glasses of water were consumed in a day, which was below the recommended dietary allowance of 12 glasses per day. This agrees with the findings of Awoke et al. (2022) who noted that for both college men and women, the

recommended daily intake was way below the recommendations.

### ***Dietary Diversity among Nutrition Students***

Considering foods from the various food groups, the current study found out that there was an under consumption since very few respondents frequently (3-4 times weekly) consumed the foods from the food groups. The recommended dietary diversity score of more than 4 food groups was met by 87.03% of the respondents. The minimum recommended meal frequency per day was met by 44.4% of the respondents only. This agreed with the findings of HealthyPeople.gov. (2018) that a majority of the students do not meet the goals and guidelines of Healthy People 2030, making it important for college institutions to support eating in college.

Therefore, with the suboptimal and inappropriate eating habits, the nutrition college students from KMTC face an increased risk of lifestyle chronic conditions (Jayedi et al., 2020; Almoraie et al., 2024; & Przybyłowicz & Danielewicz, 2022) and poor maternal health in the future among females (Waweru, 2020).

### **Association of physical food access on eating habits of nutrition students**

Among the three campuses, only Karen had the arrangement of a cafeteria in college, from which the students could access meals. However, not all the students consumed their meals from the cafeteria. The distance to the kiosks outside college where students ate their meals was not close. And this was reported to be one of the reasons for skipping breakfast by (4.8%) of the students. Lunch and tea breaktimes were not always adequate for food access, often due to congestion, which could be attributed to skipping of meals. At the same time, students eating from the cafeteria still engaged in inappropriate eating habit, such as taking fruits in place of the main meals, partly because of peer pressure.

In this study, eating in college was quoted as a major challenge due to high cost of food, small portions, lack of variety in foods related to limited finances, seasonality of some foods such as vegetables, time spent waiting to be served (as much as one hour), long distances to kiosks, and other times, later comers never get food. This indicates that the college students really struggled with eating. This is supported by Almoraie et al. (2024) who noted that for the others, although the intent and willingness is there, healthy eating patterns remain theoretical than practical. In this study, students skipped meals due to lack of money, demanding activities, maintain body shape, religion, and eatery too far. Competing activities was quoted by Almasi and Rakicioglu (2021). These findings are similar to Kariuki (2021) who established that eating habits formed a key concern among the Mount Kenya university students in Rwanda, particularly because of the changeover from home environments.

The current study established a positive relationship between the amount of pocket money and the number of meals consumed ( $p=0.001$ ), as well as taking meals on time ( $p=0.017$ ). This indicates that college students should be supported adequately with finances from their guardians for optimal eating habits. Moreover, the study established a positive relationship between the present employment status of the parent and the number of meals consumed daily ( $p=0.001$ ). This indicates that employed guardians were in a better position to support the students financially. Respondents whose parents had permanent jobs had taken more breakfast than those of contract employment, casual labourer and unemployed respectively. Moreover, more number of meals was noted among respondents whose parents had permanent job compared to others. Students with adequate money ended up taking more meals. Almansour, Allafi and Al-Haifi (2020) found out that eating disorders, malnutrition, and under-nutrition among

Kuwait university students was caused by issues such as living in dorms, separation from family, and economic status.

### **Influence of Family, Media and Peers on Eating Habits of KMTC Nutrition Students**

Families to the participants supported them by sending money meant to buy food. However, the amount sent usually influenced the number and quality of meals consumed. Respondents reported that peers influenced the participants' food choices and preferences. However, some participants reported that their peers never influenced them, and that they usually ate what was within their means. The social media also had some positive influence the choice of some foods (cakes, fruits, sausages/ smokies, and doughnuts ( $p < 0.05$ ), including advertisements on YouTube, Instagram and Facebook.

Our findings further indicate 34.9% of the respondents reported that their dietary habits were influenced positively by the school environment, whilst 32.7% were influenced negatively, and 32.4% felt the school environment influenced them in no way. The positive and negative influences of the college environment are supported by Szabo and Piko (2019) who established that the school environment greatly influences eating habits through the foods available, school health and nutrition curricula, nutritional policies, and peer and teacher modeling. Slightly over half (65.2%) of the respondents never received reminders from their families concerning their meals while at college. This indicated that while they were at the college, they were responsible of guarding their eating habits. Most (90.5%) of the respondents were supported by their parents through being sent for pocket money while 2.5% received no support. This indicates that the financial status of the parents had a great influence on the eating habits of respondents. Over half of the respondents (57.1%) took their meals with the fellow nutrition students while 30.8%

ate alone. Of the 151 respondents who agreed that their peers influenced their food choices, 67.5% reported the influence was positive while 32.5% reported a negative influence.

### **Nutritional Status of KMTC Nutrition Students**

Using the Waist/ Hip Ratio, obesity was in 17.8% of the respondents in the current research, suggesting a risk of chronic non-communicable diseases. This compares very closely to the findings by Ndung'u, Waudo and Kobia (2024), who observed a 21.7% of central obesity. Centers for Disease Control and Prevention (2017) reported that the rates of cancer, heart disease, and obesity have remained stagnant among the 18- 24-year-olds over the previous decade. Based on WHR, obesity levels were higher in males (63.4%) compared to females (4.1%), which contrasts to the findings by Ndung'u, Waudo and Kobia (2024) who confirmed a higher female prevalence of abdominal obesity (87%). The current study suggests that central obesity risk factors are gender-based.

### **Relationship Between Social and Physical Environmental Factors, Eating Habits and Weight Status of the Nutrition Students**

*A positive correlation was noted on nutrition status and the present employment status of the parents ( $p = 0.034$ ), where being employed led to an acceptable nutrition status. A significant relationship was established between the amount of pocket money and nutrition status ( $AOR = 1.917$ ),  $p = 0.044$ ). This indicates that students with adequate pocket money were better placed nutritionally compared to students with inadequate money, and supports the findings by Hoque, Hoque and Thanabalan (2018). Respondents with more pocket money was associated with obesity (a high WHR) ( $AOR = 1.917$ ,  $p = 0.044$ ).*

## CONCLUSION

The socioeconomic and socio-demographic characteristics of the guardians were key determinants of the college students' meals. Parents played a crucial role to college students through sending pocket money for purchasing food. The current employment status of a parent was related to the respondents' eating habits and nutrition status.

The nutrition students from KMTC campuses portrayed poor eating habits including suboptimal diets in terms of diversity, taking water and fruit juices during/ immediately after meals, taking fruit salads/ juices in place of main meals, intensive use of unhealthy snacks, and skipping meals. Many of the nutrition students skipped meals for different reasons. Moreover, meal frequency and dietary diversity was not met by all respondents.

Nutrition students at KMTC campuses either obtained food from the college cafeteria or eateries outside the campus. Eating was a major challenge for the college students, including long distance to eateries outside the college. Peers, cost, taste, food appearance, appetite, cooking method, physiological state, time physiological/ health status and the social media have an influence on food choices and preferences. The college environment influenced the eating habits either negatively or positively. The study findings indicate that the students had poor eating habits as portrayed from the social media and peer influence as well as finances, time available, and food preferences.

Using the Waist/ Hip Ratio, 17.8% of the respondents had obesity, and the obesity levels were higher in males (63.4%) compared to females (4.1%), indicating the risk of suffering from chronic conditions in future.

There was a significant relationship between the nutrition status and eating habits. Students who engaged in inappropriate eating habits were likely to be overweight and obese. Having pocket money can boost

the nutrition status of a college student, but can also lead to obesity.

## Declaration by Authors

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