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Original Research Article

Prevalence of fruit and vegetable intake in relation to weight status among undergraduate public university students in Nairobi City County, Kenya

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ABSTRACT

Background: Students in tertiary institutions such as public universities can make poor dietary choices, leaving them exposed to various kinds of malnutrition. The students could underestimate the dietary significance of fruits and vegetables despite their proven importance. This research aimed at establishing the prevalence of fruit and vegetable intake in relation to weight status among public university students in Nairobi County, Kenya.
Methods: A sample of 385 students was used where a self-administered questionnaire was used to gather data. Besides, a stadiometer and weighing scale were used to ascertain the height and weight of the students. Descriptive and inferential statistical approaches were used to analyse data using SPSS.
Results: The study determined that daily intake of fruits and vegetables by university students was low. Regarding weight status, findings showed 5.2% were underweight, most of the participants (54.9%) were within the normal weight range, 25.3% being overweight, while 14.6% were obese. Correlation results showed that there was a negative and significant linear relationship between intake of fruits and vegetable and BMI.
Conclusions: The study concluded that fruits and vegetables are vital for an ideal weight status. The study recommends to students to ensure that they set aside an amount of the daily consumption expenditure to spend on fruits, as these are critical for the health today and in the future. Besides, students are advised to frequently monitor their BMI and take corrective actions before the situation deteriorates.

Keywords: Fruit and vegetable intake, Kenya, Weight status, Undergraduate public university students

INTRODUCTION

The global prevalence of overweight and obesity has increased substantially since 1980.[1] According to the World Health Organization (WHO), 52 percent of people were overweight or obese in 2016. Among university students, the prevalence of obesity or being overweight is 22% (19.3% for female students and 24.7% for male students.[2] Being overweight or obese increases your chance of developing diet-related chronic illnesses such certain cancers, heart disease, stroke, and type 2 diabetes.[3] The consumption of fruits and vegetables, in particular, is a significant modifiable factor in the prevention of chronic illnesses.[4] As a result, these fiber-rich and nutrient-dense foods have been advocated as essential components of a balanced diet all over the world.[5] WHO recommends a daily intake of 400 grams of fruits and non-starchy vegetables to lessen the global burden of noncommunicable illnesses.[3]

Current global intake levels of fruits and vegetables are below the required recommendation.[6] Various studies have indicated that most university students consume inadequate amounts of vegetables and fruits which could

have a significant impact on health, especially with regard to non-communicable diseases (NCDs).[7-9] In 2015, 71% of the deaths worldwide were credited to NCDs, 48% of these were in low and middle-income countries (LMIC), occurring before the age of 70 years, despite 80% of premature deaths being preventable.[10] According to a study done in LMIC, less than 50% of adolescents were found to consume 5 or more fruits and vegetables per day, suggesting that younger strata of the population are also at risk of diet-related NCDs.[11] The possible consequences of poor dietary habits in Kenya mirror those seen at the global level. Kenya has a growing incidence of obesity and overweight and NCDs, especially in urban areas due to ingesting of foods that are high in calories, sugar, trans- and saturated fats, and salt but low in fruits and vegetables.[12]

Unhealthy eating behavior is a significant contributor to death and disability worldwide.[13] Low intake of vegetable and fruits is among the leading 10 causes of death globally, contributing to an estimate of 3.9 million deaths per year from chronic diseases.[14] This is because there is still a huge disparity between recommended and actual fruit and vegetable consumption in many nations, including Africa.[10,14] This does not only affect the general population but it also affects the university students. Studies by determined that most university students consume inadequate amounts of vegetables and fruits.[7-9] Amongst universities in Nairobi County, Kenya, only 28.45% of students consumed both fruits and vegetables daily and 71.55% did not consume fruits and vegetables daily, leading to overweight (31.24%) and obesity (6.2%) which predisposed them to NCDs. Of note, only 19.2% of the students consumed fruits daily and only 6.2% consumed raw vegetables daily.[15] Insufficient fruit and vegetable consumption among university students is a cause for concern since it may persist into later life, putting them at risk of acquiring chronic illnesses.[16] Also, considering the importance of fruits and vegetable intake, their inadequate intake could threaten the immediate health and consequently the productivity of young people.[12]

Low fruit and vegetable intake are among the top risk factors for chronic diseases globally.[10] Cases of chronic diseases are on the rise in developing countries, owing to westernization and the consequent lifestyle and hence dietary changes. The trend is worse among adolescents and young adults, who barely meet WHO guidelines and recommendations.[16] The findings in a Kenyan STEP-wise survey indicated that students reported an average of 1.3 and 0.8 servings of vegetables and fruits per day respectively. From this report, 28% of the students were overweight or obese.[12] Likewise, in a study done in Nairobi County Universities, even though 40% and 50% of students consumed fruits or vegetables weekly, only 19.2% and 10% took fruits daily.[15] This contributed to 31.2% of students been overweight and 62% obese.

Urgency for governments and other relevant authorities to set up appropriate intervention strategies, policies, and programs to promote healthy dietary patterns among children, youth and young adults.[17] With the increasing prevalence of NCDs and associated deaths and disabilities, the situation in Kenya could be similar to other countries where the intake of fruits and vegetables has decreased, yet only a few studies have addressed this possibility locally and shown results that are similar to the other studies elsewhere.[17] If appropriate interventions are to be set in place, research has to be conducted in this understudied area to determine the prevalence of fruit and vegetable intake in relation to weight status among university students to confirm previous findings and inform policy. It is due to this background that this study on the prevalence of fruit and vegetable intake in relation to weight status among students' public universities in three universities in Nairobi County, Kenya, Kenyatta University, Multimedia University (MMU) of Kenya and Cooperative University (CU), was carried out. Nairobi County, Kenya was chosen as the location of the study since only 28.45% of university students consumed both fruits and vegetables daily and 71.55% did not consume fruits and vegetables daily. These universities were chosen to evaluate whether findings from a study done at Maseno university would be replicated by studies done in other Kenyan public universities. Future studies can pursue the same study in private universities.[17] The study provides evidence on prevalence of fruits and vegetable consumption among university students and its relation to their weight status. This provides insight into the groups that should be targeted and also informs interventions to increase the intake of fruits and vegetables amongst the university students. The main objective of the study was to establish the prevalence of fruit and vegetable intake in relation to weight status among public university students in Nairobi County, Kenya.

METHODS

This was a cross-sectional descriptive research study. It evaluated the prevalence of fruit and vegetable intake in relation to weight status. The data was collected at one point in time among undergraduate public university students. The dependent variable in the study was weight status which was measured using BMI while the independent variable was prevalence of fruit and vegetable intake. The study was conducted from January to March, 2022. The study location was Nairobi County, Kenya and the focus was on Kenyatta University's main campus, Multimedia University of Kenya and Cooperative University. Nairobi County is an urban setting and in the targeted public universities, food including fruits and vegetables are available at the public dining places at subsidized costs. Besides, there are other outlets around the universities where students can access fruits and vegetables while they pay out of pocket.

The study population comprised undergraduate public university students aged between 18-35 years in Nairobi County, Kenya. Criteria for inclusion of undergraduate public university students in the survey included public university students in Kenyatta University, Multimedia University of Kenya and Cooperative University. The students who completed their first year, aged between 18-35 years and gave informed consent to participate in the study. Criteria for exclusion of university students from the survey included the university students who met the inclusion criteria for the survey but who were sick. Multistage sampling technique was used to select 385 student participants. Cluster sampling was used for the selected three public universities with each cluster size proportional to the total number of students in each of the three universities. Using Fischer's exact formula for a population of more than 1000, the sample size was:

$$n = \frac{Z^2 \times P(1-P)}{W^2}$$

Where: n = sample size, z = z score corresponding to a 95% level of confidence which was 1.96 and p is reasonable estimate of the key proportion to be studied. In Nairobi County Universities, only 28.45% of students consumed both fruits and vegetables daily and 71.55% did not consume fruits and vegetables daily.[15] Considering that the sample size that is required to determine the weight status of individuals would be lower on individuals who have normal body weight than that for individuals who were overweight and obesity, a proportion of 36.7% (0.65) was used in this sample size calculation. In this case, a margin of error of 0.05 was used.

$$n = \frac{1.96^2 \times 0.367(1-0.367)}{0.05^2} = 357$$

Twenty-eight (28) students were added to account for non- response of 10% (Mugenda, 2008). Hence, n = 357+28 = 385.

The study instrument was a structured self-administered questionnaire. It was administered to the study participants who consented to participate. The questionnaire used by Bagordo et al was used in this study with a slight modification which allowed collecting biometric data.[18] To collect data for weight status, the study used a height board to measure height in meters, and a digital weighing scale to measure weight in kilograms. The data collection tools were pretested in Jomo Kenyatta University of Agriculture and Technology (JKUAT) in Nairobi, Kenya. The digital weighing scale was pre-tested using the repeatability and weighing test while the stadiometer was pretested using calibration.

The researcher-administered questionnaire was given to all eligible students to determine the prevalence and associated barriers of fruit and vegetable intake. The weight status was assessed through BMI. This entailed measuring the height (in meters) of the study participants using a stadiometer, and the weight (in kilograms) using a digital weighing scale. BMI was then computed by dividing the weight by the height. The collected data was then recorded and transferred to statistical package for social sciences (SPSS software for analyses. Quantitative data was analysed by the use of SPSS version 26. Descriptive statistics were computed for relevant variables, by the use of means, proportions, and frequencies. The BMI was computed using the weight and height measurements. To establish a relationship between dependent and independent variables, Pearson's product-moment correlation was applied. Statistical significance is defined as a p value of less than 0.05.

RESULTS

The study targeted a sample of 385 research participants from three universities (Kenyatta University, Cooperative University and Multimedia University of Kenya) and received 313 responses, which was a response rate of 81.3%. These returned questionnaires were analysed to enable the study accomplish its objectives which were to determine the prevalence of fruit and vegetable intake among public university students in Nairobi County, Kenya, and its association with the weight status of the public university students in Nairobi County, Kenya, determine the level of knowledge on the benefits of fruit and vegetables consumption among public universities students, and investigate initiatives by public universities to promote the intake of fruits and vegetables among public university students in Nairobi County, Kenya. Presented first is the demographic information about the participants and thereafter the results appertaining to the research objectives.

Demographic information

The findings show that 27.5% of the students were aged 19 years and only 1.6% were aged 29 years. These findings show that the study attracted various students between the ages of 18 years and 29 years which is within the population targeted. Regarding gender of students, the findings show that the students comprised of 55% female and 45% male. These findings show that the study had a well-balanced representation of both genders. Concerning year of study of students, findings indicate that 35.8% of the students were in their second year of education in the various universities while 30.7% were in their fourth year of study.

Prevalence of fruit and vegetable intake among public university students

The objective of the study was to determine the prevalence of fruit and vegetable intake among public university students in Nairobi County, Kenya. The study investigated the intake of fresh fruits, raw vegetables, cooked vegetables, and fresh fruit juice. The findings

regarding the uptake of fruits and vegetables are shown in Table 1.

The findings shown in Table 1 show that 47.3% of the students took fresh fruits 1 to 3 times a week while 1.3% indicated to never take fresh fruits. Further, the findings show that 22.7% took raw vegetables 1-2 times a month while 8.9% took them more than once a day. Regarding intake of cooked vegetables, the study results indicate that 32.3% took cooked vegetables 1 to 3 times a week while only 2.2% took them more than once a day. Concerning intake of fresh fruit juice, 39.9% took fresh fruit juice 1 to 3 times a week while only 4.2% took them fresh fruit juice every day.

Table 1: Prevalence of fruit and vegetable intake.

Fresh fruit intake N = 313	n	%
Never	4	1.3
1-2 times a month	29	9.3
1-3 times a week	148	47.3
4 times a week	47	15.0
5-6 times a week	7	2.2
Every day	32	10.2
More than once a day	46	14.7
Raw vegetables intake		
Never	64	20.4
1-2 times a month	71	22.7
1-3 times a week	40	12.8
4 times a week	44	14.1
5-6 times a week	33	10.5
Every day	33	10.5
More than once a day	28	8.9
Intake of cooked vegetables		
1-2 times a month	27	8.6
1-3 times a week	101	32.3
4 times a week	63	20.1
5-6 times a week	36	11.5
Every day	79	25.2
More than once a day	7	2.2
Intake of fresh fruit juice		
Never	15	4.8
1-2 times a month	85	27.2
1-3 times a week	125	39.9
4 times a week	13	4.2
5-6 times a week	31	9.9
Every day	13	4.2
More than once a day	31	9.9

Weight status of public university students

The BMI of the students was computed by using the weight in kilograms and the height in meters. The BMI was categorized according to WHO guidelines. The findings are summarized in Table 2. Findings showed that 41.2% of the students weighed between 51 and 60 kilograms while 10.3% weighed below 50 kilograms. The study results also show that 28.4% of the students had a height between 1.51 to 1.55 meters while 1% had a height of 1.81 meters and above. The findings also showed that most of the students (55%) were within the healthy weight range as they had BMI of between 18.5 to below 25. However, 5.1% were underweight (BMI below 18.5) while 14.7% were obese (30 and above) with 25.2% being overweight (BMI of 25 to less than 30).

Table 2: Weight, height and BMI status of students.

Weight N = 313	n	%
Below 50	32	10.3
51-60	129	41.2
61-70	109	34.8
71-80	43	13.7
Height		
1.50 and below	37	11.8
1.51 to 1.55	89	28.4
1.56 to 1.60	59	18.8
1.61 to 1.65	38	12.1
1.66 to 1.70	24	7.7
1.71 to 1.75	29	9.3
1.76 to 1.80	34	10.9
1.81 and above	3	1.0
BMI		
Below 18.5	16	5.1
18.5 to below 25	172	55.0
25 to less than 30	79	25.2
30 and above	46	14.7

Association between fruit and vegetable intake and BMI

The study sought to determine the association between BMI of the students and intake of fruits and vegetables. The study utilized Pearson correlation analysis and the findings are provided in Table 3.

The results provided in Table 3 show that intake of intake of cooked vegetables had a significant negative and moderate linear relationship with BMI ($r=-0.593$, $p<0.001$). These findings indicate that high intake of cooked vegetables was associated with reduced BMI and vice versa. The study findings also revealed that intake fresh fruits had a significant negative and moderate linear relationship with BMI ($r=-0.499$, $p<0.001$). These findings indicate that high intake of fresh fruits was associated with reduced BMI and vice versa. Besides, the findings indicate that intake of raw vegetables had a significant negative and low linear relationship with BMI ($r=-0.273$, $p<0.05$). These findings indicate that high intake of raw vegetables was to a small extent associated with reduced BMI and vice versa. Further, the findings indicate that intake of fresh fruit juice had a significant negative and low linear relationship with BMI ($r=-0.234$, $p<0.05$). These findings indicate that high intake of fresh fruit juice was to a small extent associated with reduced BMI and vice versa.

Table 3: Association between fruit and vegetable intake and BMI.

		BMI	Fresh fruit	Raw vegetables	Cooked vegetables	Fresh fruit juice
BMI	Correlation coefficient	1.000				
	Sig. (2-tailed)	.				
	N	313				
Fresh fruit	Correlation coefficient	-0.499**	1.000			
	Sig. (2-tailed)	0.000	.			
	N	313	313			
Raw vegetables	Correlation coefficient	-0.273**	0.525**	1.000		
	Sig. (2-tailed)	0.009	0.000	.		
	N	313	313	313		
Cooked vegetables	Correlation coefficient	-0.593**	0.001	-0.070	1.000	
	Sig. (2-tailed)	0.000	0.990	0.288	.	
	N	313	313	313	313	
Fresh fruit juice	Correlation coefficient	-0.234*	0.423**	0.209**	0.229**	1.000
	Sig. (2-tailed)	0.043	0.000	0.001	0.000	.
	N	313	313	313	313	313

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

The study determined that intake of fruits and vegetables was not prevalent amongst students in universities in Kenya since those who took fresh fruits every day or more than once a day were 10.3% and 14.6% respectively. These findings imply that intake of fruits and vegetables by students in public universities was low. These findings support previous findings that low fruit and vegetable consumption was rampant amongst adolescents and young adults, who barely meet WHO guidelines and recommendations.[16] According to a study done in universities from low-, middle- and high-income countries (LMHIC), WHO recommendations are not adhered to as 82.8 percent of university students eat fewer than the required 5 servings of vegetables and fruits, resulting in obesity or being overweight.[19] These findings agree with the findings from the current study and also agrees with findings in a Kenyan STEP-wise survey, where students reported an average of 1.3 and 0.8 servings of vegetables and fruits per day respectively. Likewise, in a study done in Nairobi County Universities, even though 40% and 50% of students consumed fruits or vegetables weekly, only 19.2% and 10% took fruits daily.[20] The findings from the current study indicate that the prevalence of vegetable and fruit intake has not improved.

The study findings on BMI show that most of the students were within the healthy weight range as they had BMI of between 18.5 to below 25. However, a few were underweight, obese or overweight. The results also show that intake of vegetables and fruits had a significant negative and moderate linear relationship with BMI. These findings concur with previous findings that being overweight or obese was associated with low intake of fruits (less than 2-servings daily).[21] Besides, these findings agree with the previous findings that BMI and vegetable consumption had a substantial connection, with overweight people eating fewer vegetables.[22] Further, the findings support the findings by Rolls that increased fruit and vegetable consumption can aid weight reduction, and this can be accomplished through fruits and vegetables consumption.[23]

Though this study provided valuable evidence regarding prevalence of fruit and vegetable intake in relation to weight status among undergraduate public university students in Nairobi City County, Kenya it has a few limitations. First, the study only involved public university students and hence could have limited generalizability to private university students. Moreover, the study only used questionnaires to gather data and more in-depth information could have been provided by other data gathering tools such as interviews and focus group discussions. The interpretation, generalization and application of the study findings should be made with these limitations in mind.

CONCLUSION

The study concluded that intake of fruits and vegetables was not prevalent amongst students in universities in Kenya since most took less than the daily recommended portions. One of the key barriers was financial resources. Therefore, it is recommended to students to ensure that they set aside an amount of the daily consumption expenditure to spend on fruits as these are critical for the health today and in the future. The study also recommends parents and guardians with students in universities to ensure that they provide them with

adequate support in terms of financial resources to ensure that they can afford the daily recommended portions of fruits and vegetables. Moreover, parents and guardians should ensure that their students in public universities live a comparable life to what they are used at home with adequate access to healthy foods, fruits and vegetables. Further, the study determined that, though most of the students were within the healthy weight range, there were some students that were underweight, oversight and obese. The study hence recommends students to frequently monitor their BMI and take corrective actions before the situation deteriorates. This can involve partaking recommended amounts of vegetables and fruits besides taking other physical activities.

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