

Coping strategies to food insecurity employed by students of karatina university, kenya

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Abstract

It has been reported that 1 in 3 Kenyans suffers from severe food insecurity and poor nutrition. This study aimed to establish the level of food insecurity among Karatina University students and coping strategies employed. A nutrition survey research design and random sampling was done with a sample size of 94 undergraduate students, who resided within the university. The students filled questionnaires for the details required. The proximate composition of frequently consumed foods was estimated by AOAC methods. Dietary and non-dietary coping strategies to food insecurity and diets consumed by students were established. The percentage of students who were food insecure was 27.85% as evidenced by skipping a meal due to lack of money variously for 1-3 days in a month. Also, 22.3% borrowed foods from friends and neighbors, 48.9% stuck to simple and affordable meals, which were either, rice+beans/green grams or ugali+cabbage/ leafy green vegetables) or ugali+beans/green grams. The non-dietary strategy showed 18.1% students reducing expenditure on airtime, while 2.1% sold assets-mobile phones and laptops. The most commonly consumed meals by both genders were chapatti + beans/green grams at 24.5% or rice + beans/ green grams or cabbage/kales/spinach either at 12.8%. The dimension of food security that was not met by students was food affordability.

Keywords: coping strategies; food insecurity; university students; kenya

Introduction

Food security is defined as a state of having reliable access to sufficient quantity of affordable and nutritious food (FAO, 2015). Despite the right of every person to be free from effects of food insecurity being declared during the World Food Conference of 1974 (GOK, 2008a), the effects linger in the global society. While it is well documented that food insecurity impacts many children and families, there is limited research on prevalence and impact of food insecurity among university students. In Kenya, 10 million persons and their households are highly food insecure (Kenya Food Security Steering Group, 2008). Families may qualify for relief food programme from government or non-governmental organizations to help them become food secure. However, university students have not been included in food assistance programmes. This leaves a large proportion of young adults aged 18–25 ineligible for food aid assistance in a stage of life where finances are limited (SNAP, 2016). Kenya looks towards achieving the Sustainable Development Goals. The first goal is “alleviation of extreme poverty and hunger”, which the country plans to achieve by reducing the proportion of people who suffer from hunger by half (GOK, 2008). To achieve this, implementing the SDG’s plans at the grass root levels is imperative. This could ensure

reduction of food insecurity. Food insecurity at higher learning institutions is not a new phenomenon, but it is not openly addressed especially at an institutional leadership level (Scholey, 2001). A key question is how the universities in collaboration with other relevant stakeholders can engage in finding common workable interventions on food insecurity at institutions of higher learning (IHL) (Munro, 2013). There should be some emphasis on the distribution of resources to populations that are vulnerable such as the student population at IHL, so as to alleviate food insecurity. Food security studies at Universities have used different methods of measuring and analyzing food insecurity. Estimates of food insecurity among university students ranged from 11% to 38.3% in South Africa (Munro, 2013), 12.7% to 46.5% in Australia (Masutha, 2011), 21% in Hawaii (Crush, 2010) and 39.2% in New York, USA (Freudenberg et al., 2001). Karatina University, where this study is going to be done, is a Chartered public university in Kenya, and is situated 15 km North of Karatina town in Nyeri County, Kenya. The University has six Academic Schools and has Campuses in Kagochi (Main), the School of Business at Karatina town and School of Education and Social Sciences at Itiati. The research methods used by the above other studies included considering the relationship between food insecurity and item expenditures and the use of trained students to do the interviews and

gather data. Our study assessed the coping strategies by the students when they are unable to acquire food and establish the dimension of food security that the students do not meet. We used questionnaires administered randomly to students by the first author. Foods commonly consumed by students and food composition studies were carried out using food bought at the University cafeteria as students would buy normally for consumption. The detailed methods are further described in the appropriate sections below.

The objectives of the study were:

1. To establish coping strategies to food insecurity employed by Karatina university students
2. To establish foods commonly consumed by students of Karatina University
3. To estimate the typical daily energy intake by a student
4. To determine the dimension of food security that is not met by food insecure students

Methods and Procedures

A nutrition survey research design, random sampling and quantitative nutrient analysis was used to determine the dietary and non -dietary coping strategies to food insecurity and diets consumed by students when they are both food secure and insecure. The nutrient analysis determined the nutrients: carbohydrates, proteins and lipids in frequently consumed foods in order to be able to calculate the daily energy intake from a daily food plan for both female and male students.

Questionnaires were administered to the sample of the student population residing in the main campus hostels and off main campus private hostels. Students were randomly picked within the university hostels to participate in the study after signing an informed consent.

The student population consisted of approximately 8000 students from diverse cultures mainly from Kenya. Students who reside within the university buy their food mainly from the University cafeteria, which offers meals at subsidized prices. The meals can be purchased using meal cards administered by the university catering department or payment in cash on service.

Sample size determination

The sample size comprised of 94 students (47 male and 47 female students). The sample size was calculated using the Yamane formula (2015). The total number of students residing in the main campus is approximately 1500 students. $n = N \div 1 + N (e)^2$. Where n is the corrected sample size, N is the population size and e is the precision rate. $n = 1500 / 1 + 1500(0.1)^2 = 94$ respondents (47 male + 47 female). The food samples were purchased at the university cafeteria and then measured using a 250 ml standard cup to ascertain the volume of liquid foods. A digital weighing scale calibrated to the zero mark was used to weigh food.

Proximate Analysis of Composite Common Foods

Protein, fat (using Soxhlet’s extraction method) and carbohydrate composition (using Anthrone method) were determined as described in AOAC (2005).

Protein

This was determined by the method in AOAC (2017) a procedure that is based on the Kjeldahl Method.

Determination of fat content

Fat content of the foods analyzed was determined by Soxhlet’s extraction method 920.85 (AOAC, 2018), using a 5-g sample and petroleum ether (B.P. 40-60°C) as the solvent. The amount of fat extracted was calculated as follows.

$$\text{Fat \%} = \frac{\text{weight of fat extracted}}{\text{weight of sample}} \times 100$$

Determination of carbohydrates

Carbohydrates are first hydrolyzed into simple sugars using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxymethyl furfural. The compound forms a green colored product with anthrone and its amount was determined at an absorption wavelength of 630 nm using an Atomic Absorption spectrophotometer (Devindra, 2015).

Results and Discussion

Table 1 illustrates the strategies used by students to cope with food insecurity. The most used way of adjusting to food insecurity was sticking to simple and affordable meals such as ugali + cabbage/kales/spinach, or chapatti + beans stew, or rice + beans stew and rice+ cabbage/kales/spinach. Others are illustrated in Table 1.

Coping strategies	Number of students (%)
Borrowed food from friends	22.3
Stuck to simple and affordable food items	48.9
Reduced expenditure on airtime	18.1
Skipped a meal in a day	8.5
Used all of the above strategies over different periods (1 day-3 months)	2.2

Table 1: Students’ Coping Strategies to Food Insecurity

Note: the first four coping strategies were used by 97.8% of the sample student population. The remaining 2.2% of the respondent population used some of the four coping strategies inconsistently.

Table 2 shows the meals and quantity consumed based on gender. The most consumed meal was chapatti + beans/green grams at 73.4% and 68.1% for male and female students, respectively. Chapatti is normally a hard-to-get food as wheat flour tends to be expensive to buy and the process of making it is tedious and so it tends to be expensive to buy. So

when it is sold cheaply at the University cafeteria, students take advantage of its availability.

It is high in fat because liberal amounts of oil or fat is used to make them, unlike the Indian Nan. As it is cooked with liberal amounts of fat/oil, it is a satiety and fullness inducing food. Fat gives flavor to foods and high fat in the chapatti makes it a favorite Kenyan food generally. The least consumed meals were ugali + beans/green grams at 5.3% and 3.2% by male and female students, respectively. Ugali is the favorite Kenyan staple cereal food and it is cheap. It is a food that makes one feel satisfied

for long. So a student wishing to get full and remain satiated for a good part of the day running from one lecture to another would preferably buy a meal with Ugali as part of it. Meals consisting of red meat were hardly consumed due to the cost and also its low availability. It is rarely cooked as the sales can be low in a situation where students try to keep expenditure on food as low as possible. The least consumed food commodity by both genders was animal protein. Animal protein foods were not consumed daily due to the high cost of the commodities. However, female students consumed more milk and dairy products as well as fruits than male students. Hence they would potentially be healthier than the male students-their diets would probably contain higher protein content with a good supply of the essential amino acids and

minerals including calcium from animal foods such as eggs and dairy products.

Most students also consumed considerable amount of plant foods, which are low in saturated fatty acids, but high in fibre and phytates (these included beans, green grams, and green leafy vegetables)-these are generally regarded as healthy foods. Cooking probably reduced the effect of phytates and fibrous food components to bind dietary minerals and therefore the bioavailability of minerals would not be affected much despite the students consuming predominantly plant-based meals (Castillo, 2007).

Food	Quantity	% Male			Quantity	% Female		
		Breakfast	Lunch	Dinner		Breakfast	Lunch	Dinner
¹ Chapatti + sweet tea (beverage)	2 pieces (74.2 g each) + 1 cup (250 mL)	26.6	---	---	2 pieces (74.2 g each) + 1 cup (250 mL)	31.9	---	---
¹ Mandazis + sweet tea (beverage)	4 pieces (41.1 g each) + 1 cup	73.4	---	---	4 pieces (41.1 g each) + 1 cup	68.1	---	---
¹ Chapatti + beans/green grams in broth	(74.2 g each for chapatti and 125 g for green grams/beans)	---	24.5	26.6	(74.2 g each for chapatti and 125 g for green grams/beans)	---	24.5	27.7
² Chapatti + red meat in broth	(74.2 g for each chapatti and 50 g for meat)	---	3.2	3.2	(74.2 g for each chapatti and 50 g for meat)	---	6.4	3.2
² Ugali + cabbage/kales In broth	(203.4 g for ugali and 125 g for cabbage /kale)	---	10.6	19.1	(203.4 g for ugali and 125 g for cabbage /kale)	---	5.3	7.4
² Ugali + red meat in broth +cabbage/kale	(203.4g for ugali, 50 g for meat) and 125 g for cabbage /kale)	---	6.4	4.3	(203.4 g for ugali, 50 g for meat) and 125 g for cabbage /kale)	---	10.6	6.4
² Ugali + red meat in broth	(203.4 g for ugali and 50 g for meat)	---	8.5	3.2	(203.4 g for ugali and 50 g for meat)	---	9.6	10.6
² Ugali + beans/green grams in broth	(203.4 g for ugali and 125 g for green grams/beans)	---	5.3	10.6	(203.4 g for ugali and 125 g for green grams/beans)	---	3.2	2.1
² Rice + red meat in broth+ cabbage/kale	(257 g for rice, 50 g for meat and 125 g for cabbage /kale)	---	5.3	2.1	(257 g for rice, 50 g for meat and 125 g for cabbage /kale)	---	5.3	4.3
² Rice + red meat in broth	(257 g for rice and 50 g for meat)	---	8.5	1.1	(257 g for rice and 50 g for meat)	---	9.6	3.2
² Rice + beans/green grams + cabbage/kale	(257 g for rice, 125 g for green grams/beans and 125 g for cabbage /kale)	---	12.8	12.8	(257 g for rice, 125 g for green grams/beans and 125 g for cabbage /kale)	---	10.6	21.3
² Rice + beans/green grams	(257 g for rice and 125 g for green grams/beans)	---	14.9	17.0	(257 g for rice and 125 g for green grams/beans)	---	14.9	13.8

Table 2: Common daily meal combinations

Legend: ¹Breakfast meal; ²Lunch and dinner meal; chapatti: a pan-baked flat bread; ugali: a stiff cooked maize meal; Mandazi: a deep-fried bread from self-raising flour (deep-brown in colour).

Table 3 shows the meals by food group skipped by students in an effort to minimize expenditure on food.

Type of food	Number of students (%), male	Number of students (%), female
Carbohydrates i.e. (ugali, chapatti and rice)	3.2	13.9

Animal Proteins	52.1	47.9
Plant Proteins (legumes i.e. red beans)	13.8	10.6
Vegetables (cooked)	6.4	13.8
Fruits	8.5	5.3
Milk and Dairy products	16.0	8.5

Table 3: Percentage of students who skipped certain food groups in a day

N.B: Oils and fats are consumed through fried and cooked foods (so it is not included in the table as a food group).

Table 3 above shows the percentage of students who skipped various food groups in a day as a way of coping with the lack of adequate money for the purchase of food. Animal protein was the most skipped food, especially by the male students. The percentage that skipped taking animal proteins in a day was 52.1% and 47.9% for male and female students, respectively (Table 3). The quality of the protein available from the plant-based meals may therefore be low for young growing persons of University age group (18-25 years).

The most consumed meal was chapatti + beans/green grams at 26.6% and 27.7% for male and female students, respectively. The least consumed meal was ugali + beans/green grams at 5.3% and 3.2% for male and female students, respectively. Meals consisting of red meat were hardly consumed due to the high sales price. The least consumed food commodity by both genders was animal protein as indicated by the high skipping of flesh in meals (Table 3). This led to its exclusion from the meal plans by both genders (Table 5).

Daily Energy intake

1 gram of protein and carbohydrate each provide 4 kilocalories (K cal), while 1 gramme of fat provides 9 K cal (WHO, 2018). It should also be noted that the National Academy of Sciences (NAS, 2020) recommends 1900-2200 K cal/day for active females and 2300-2900 K cal/day for active males. The indicative energy intakes for the two genders are thus compared and discussed below.

Breakfast meals and energy intake

For male students-going by a typical daily student meal, male students who consumed chapatti and tea as breakfast as shown in Table 5, consumed a total of 573.28 K cal at breakfast. Male students who consumed 4 mandazi and tea at breakfast consumed a total of 613.58 K cal.

For Females-Female students who consumed 3 mandazis, one boiled egg and tea as breakfast consumed for a total of 573.6 K cal during breakfast. When they consumed chapatti, one boiled egg and tea as breakfast as shown in Table 5, the energy intake comes to 620.18 K cal.

Lunch and dinner for both genders

During lunch meal, both male and female students often took the same meal (2 chapattis + 125 g of green grams or beans as shown in Table 5). They consumed a total of 1077.62 K cal during dinner. Both genders also frequently consumed the same meal for dinner. The calorie intake from dinner, for 257 g rice + 125 g of green grams or beans was a total of 975.82 K cal.

Therefore, female students consumed approximately a total of 2627.04 K cal/day while male students consumed a total of 2666.02 k cal/day. The recommended calorie intake is 1900-2200 k cal/day for females, while the male daily caloric intake was within the normal range as the recommended intake is 2300-2900 K cal/day (NAS, 2020). The over-consumption of calories by female students can lead to weight gain, and is not recommended for a healthy lifestyle. School girls in Kenya have been reported to suffer from overweight and a tendency to obesity than the boys (Adamo et al., 2010), though the cohorts in this study were primary school children of 3-13 years of age, who may not, however, compare in many respects with the University students in the current study (18-25 years of age). In other studies, Muhihi et al. (2013) found the rates of obesity and overweight in girls among children in private primary schools in Dar es Salaam were higher than that of boys (6.3% for girls and 3.8% for boys), but again these were younger children than the University students in the current study, who may have better knowledge of the benefits of physical activity for a healthy body weight. In Cameroon, Choukem et al. (2018), found the overweight /obesity rates to be 13.2% for girls compared to 11.9% for boys of similar age (3-13 years) as the Kenyan case by Adamo et al. (2010).

The recommended daily allowance for dietary protein is 0.8-1.0 g/kg body weight/day for adults, (Daniel, 2015). According to Table 5, male students consumed 67.6 g of protein/day, whereas female students consumed 78.6 g of protein/day. The daily percentage of calories from protein should be 10-15% of total calories (WHO, 2018).

The percentage range of protein that the students should take as calculated using the 10-15% of total calories recommendation should be 65.7 g/day to 98.5 g/day and 66.7 g/day to 100 g/day for female and male students, respectively. Female students frequently added 1 boiled egg to their breakfast meal as compared to male students. This was healthy for them since the highly bioavailable heme iron from the egg aids in obviating iron loss during menstruation. Both student genders met the daily protein recommended allowance as well as the recommended daily calorie intake for their age and occupation.

SAMPLE	% PROTEIN (g/100g)	%CHO (g/100g)	% FAT (g/100g)
1 – rice	2.38	82.14	0.3
2 – rice and beans (composite)	12.47	79.76	1.2
3 – chapatti and beans(composite)	8.61	85.91	—

Table 4: Proximate Composition of Frequently Consumed Foods.

Meal	Male	Female
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	Breakfast	Lunch	Fruit/snack	Dinner	Breakfast	Lunch	Fruits/snack	Dinner
Price (KES)	30	40	10	40	40	40	10	30
Cooked food item	Tea (250 mL) + 4 mandazi/2 chapatti	2 chapattis (each 74.2 g) + 125 g of green grams or beans	1 piece of mango, banana or watermelon/ or 2 apple size cakes	257 g rice + 125 g of green grams or beans	Tea (250 mL) + one boiled egg + 3 mandazi/2 chapatti	2 chapattis (each 74.2 g) + 125 g of green grams or beans	2 pieces of mango, banana or watermelon/2 apple size cakes	257 g rice + 125 g of green grams or beans
Protein content, g/100 g food	8.0	23.5	————	36.1	19	23.5	————	36.1

Table 5: Typical Student Daily Meal Plan and Expenditure

N.B: Meals in each column are sold at the same price shown at the top row; KES-Kenya Shilling

Dimension of food security not achieved by students

The dimension of food security that was not achieved by students was food affordability. The male student population skipped more meals than the female students. Students rely on the Kenyan Government Higher Education Loans Board (HELB) funding for fees and upkeep. *HELB loan disbursements were the same for male and female*, ignoring the observation that *female* students' expenditure patterns necessitate higher allocations (Stephen, 2007). Students from the School of Nursing and School of Agriculture and Biotechnology paid more school fees due to the nature of their programmes. These students were therefore potentially left with a lower amount of money for upkeep and for food for the semester. They would be at a higher risk of not meeting the daily recommended dietary allowances (RDA) for nutrients. However, the survey did not estimate the number of students from the two schools due to the random selection of respondents. Animal protein consumption was low due to the high cost of these food commodities. For example, fried meat + Ugali costs KES 60, fried eggs + Ugali costs KES 50. Of those who could afford, the percentage that consumed animal protein in a day was 21.3% males and 26.6% females, respectively. Of those who consumed animal protein food, beef or chicken was the choice and was consumed once a week. At the University of Witwatersrand in South Africa, food security coping strategies used by students included avoiding expensive fast-food places, food pooling, shared meal preparation schedules, eating fewer meals and going home to get food (Rudolph, 2018). Similar to the South African students, Karatina University students ate fewer meals as a coping strategy for food insecurity. Students of Karatina University are not permitted to cook in the hostels and therefore feed on readily prepared meals bought from the University Cafeteria and food kiosks close to the halls of residence. At the University of Witwatersrand, the major dimension of food insecurity that was not met was affordability as evidenced by the purchase of cheaper foods, sharing meal preparation and eating fewer meals (Rudolph et al., 2018). This was the same case with Karatina University students who live on cheap foods, skip some meals and avoided animal food products such as beef, chicken and eggs for a better part of the semester.

Approximately 32.08% of male students' and 23.62% of female students' skipped meals due to not having enough money to buy the next meal, implying that male students skip more meals than female students. Skipping meals has a negative implication for health because the body has inbuilt biological adaptive mechanism as it stores nutrients especially the carbohydrates that are converted to fat and stored in body organs to be used during starvation. The body will therefore tend to store more

nutrients when food is taken so as to provide energy to the body during starvation (Kissler, 2020). The skipping of meals may therefore not be beneficial from a biological point of view. Male students on average spent at Kenya Shillings 120 (USD 1.20) per day for food whereas female students on average spent a little more, about Kenya shillings 130 (USD 1.30) (Table 5). Typically, student's expenditure on the 3 meals in a day is about 120 KES. Both genders therefore spent about the same amount of money on food. The students' meal plan and expenditure is shown in Table 5.

Limitations of the study: Due to the short time available for the study, a comprehensive proximate composition of the foods consumed by students was not done. Limited finance also constrained the scope and depth of the study.

Conclusions

Female students consumed more diverse foods (including more eggs, milk and dairy products) than male students. Male students consumed lower amounts of animal proteins and fruits than the females, though both genders consumed less animal protein foods than recommended for their stage of life. The students lived mainly on plant-based foods.

A majority of the students who took part in the survey were food insecure due to an apparent shortage of money to buy food with. The most used strategy to stretch the money available, in an effort to try to meet the daily food needs, was borrowing food from friends and neighbors, sticking to simple, low-priced food items, skipping some meals sometimes daily, but definitely once or twice every week of the month. The major cause of food insecurity among the students was food affordability.

Recommendations

The study recommends:

- The University establishes food/cash-for-work programme for needy students
- The university management sets up a support system for food insecure students to enable them acquire adequate and good quality food, which is likely to enhance health, a positive factor for academic success
- That University management starts an awareness campaign and offer a range of training programmes to educate and inform students on the negative impacts of hunger and poor nutrition on general health and learning outcomes
- Further studies be done on income level of students, parents and guardians who support students financially

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Conduct and Funding of the Study

Michael Lokuruka provided the funding for the study and advised on the procedures to follow in the course of the study. Daniel Sewe developed the questionnaire and conducted the study.

Conflict of interest

The authors declare there was no conflict of interest that needed declaration or avoidance.

Nature of study

This was a B.Sc. Honours in Food Science and Nutrition student project of Karatina University.

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