

Dietary Practices and Nutrition Status of Adolescents Attending Day Secondary Schools in Kenya

Fridah K. Munene¹, Judith O. Kimiywe¹ and Peter M. Chege¹

Department of Food, Nutrition and Dietetics- Kenyatta University, Kenya.

*Correspondence:

Dr. Peter Chege, Department of Food, Nutrition and Dietetics, Kenyatta University, Kenya.

Received: 30 May 2019; Accepted: 25 June 2019

Citation: Fridah K. Munene, Judith O. Kimiywe, Peter M. Chege. Dietary Practices and Nutrition Status of Adolescents Attending Day Secondary Schools in Kenya. Food Sci Nutr Res. 2019; 2(2): 1-6.

ABSTRACT

Regular meal consumption, consistent physical activity habits and a diet characterized by a favourable nutrient profile all contribute to a healthy lifestyle. Regrettably, the eating behaviours of adolescents are characterized by high consumption of ready to eat foods, frequent snacking especially of food of low nutrition quality and unhealthy weight loss practices such as skipping meals, more so breakfast. The poor choices on what to eat and snack on, made by the adolescents, puts them at risk of being underweight, overweight and or obese. Under nutrition, overweight and obesity are issues of public health concern, as they world faces the double burden of malnutrition. The aim of the study was to determine the dietary habits and nutrition status of adolescents in mixed day public secondary schools. As such, the study adopted a cross-sectional analytical study design. The study population comprised of adolescents in mixed public day secondary schools in Thika, Kiambu County, Kenya where 212 adolescents responded to the study instruments. Data was collected using researcher administered structured questionnaires. Data on dietary intake was collected using 7-day food diary and a seven-day food frequency questionnaire. Anthropometric measures of Weight, height; which was used to calculate body mass index and waist circumference as well hip circumference to calculate waist-hip ratio were also taken to determine the nutrition status. Dietary intake data was analysed using nutri-survey, while WHO anthro-plus was used to calculate the nutrition status of the adolescents. Data analysis was conducted using SPSS (IBMTM) version 20. The results indicated that adolescent skip meals especially the breakfast meal, consume high sugar food, and carbonated drinks. The average energy intake per day was 2467.1±723.96 Kcal with only 21.1% of boy and 35.9% girls attained the RDA. Majority of the respondents 88.7% had z-scores of between < +1sd and >-2sd, 5.7% were at risk of metabolic disorders as assess using waist circumference while 4.7% had abdominal obesity when waist-hip ratio was determined.

Keywords

Adolescents, Dietary practice, Nutrition status, Secondary schools.

Introduction

Adolescence is a critical period of growth and development in a person's lifecycle. It is a stage of rapid mental, physical and emotional growth [1]. Nutrition needs for vitamins, minerals, protein and energy are very high at this period. Failure to attain these nutrients then can slow linear growth and sexual maturation thus affected adolescent do not attain their full potential. Regrettably, the eating behaviours of adolescents are characterized by high consumption of ready to eat foods, frequent snacking especially of food of low nutrition quality and unhealthy weight loss practices such as skipping meals, more so breakfast [2-4].

Adolescent stage is a phase where emotional, physical and emotional growth [1] and a stage where personal lifestyle choice are made, these choices including a healthy lifestyle and food consumption patterns. Research indicate that, habits adopted in adolescence are likely to be carried into adulthood for life [5]. Unfortunately, adolescents are more prone to unhealthy behaviours, nutritional compromises, poor dietary practices, physical inactivity and psychosocial stresses that shape their personalities and lifestyle patterns. The rapid physiological changes that adolescents undergo, affect their body's nutritional demands while other external factors such perceptions, lifestyles and beliefs about body size and shape influence their dietary choices and practices [6].

Pendergast et al. [7] conducted a systematic review and reported that meal skipping is rated between 4-57% for dinner, lunch

8-57% and 14-88% for breakfast. Britton [8] reported that 31% of adolescents in the United States skipped breakfast. In their study Onyiriuka and Umoru [9] found that 48.1% of the respondents reported skipping at least one meal, in Brazil, regular meal consumption among adolescents was reported at 47%, 78% and 52% for breakfast, lunch, and dinner respectively [10]. In addition, skipping meals was also associated with low consumption of fruits and vegetables [10].

Trends show an increase in the rates of malnutrition both in developing and developed countries, which is an issue of concern. More so, adolescence is a stage that requires the highest amounts of nutrients both micro and macro in the lifecycle. In addition, dietary habits have been linked to academic performance [11] while education status is a determinant of the economic status that translates to country's economy. More so, if adolescent stage offer a window of opportunity to correct childhood deficiencies and adopted behaviour on health lifestyle are carried into adulthood, then, understanding food habits of adolescents is critical. Addressing dietary habits of adolescents maybe key to reducing the cost of malnutrition which averages 3.1 billion dollars per annum globally. Despite of all this, little research has been carried out on dietary habits of adolescents in Kenya.

Materials and Methods

Study design

Cross-sectional analytical research design was used to collect data. Information on total nutrient intake was obtained from the 7-day food diary where an average intake was calculated. Nutrition status data was obtained from weight, height, waist and hip circumference. Weight and height were calculated as BMI-for-age and classified into four categories; wasted, normal, overweight and obese. While waist circumference was classified as health or at risk of, metabolic disorders while waist and hip circumference ratio data were classified as normal or obese (having abdominal obesity).

Dietary Assessment

Data on dietary consumption was obtained using a 7-day food diary. A food diary is a prospective method of dietary intake that does not rely on respondent memory as one records what they consume at the moment. Food diary is accurate on food intake and nutrients.

The participants were then trained on how to fill the 7-day food diary and how to quantify food using locally available household utensils such serving spoons, cups, tablespoons, and teaspoons. Visual aids and food models were also provided for the students to help in estimating food portions. Students were highly encouraged to record the meals as soon as they consume them and indicate the time food was consumed. The food diaries were collected from the adolescent the following day by the help of teacher and research assistants.

Measurement of nutrition status of adolescents

Nutrition status was assessed by anthropometric measurements

of weight, height waist circumference and Hip circumference as stipulated in the World Health Organization standard procedures. Each participant was asked to empty their pockets, remove shoes and heavy clothing during the measurements. Body weight and height were measured to the nearest 0.1 kg and 0.1 cm, respectively, using an electronic scale with attached standimeter (SECA 220, Germany). Waist and hip circumferences were measured to the nearest 0.1 cm with a measuring tape. Waist circumference was measured at the mid-point between the top of the iliac crest and the lower margin of the least palpable rib, while hip circumference was measured at the maximum circumference of the buttocks in a horizontal plane.

All the measurements were taken twice. However, if the measurements differed by more than 1.0 cm (height, circumferences) and 1.0 kg (weight), a third measurement was taken. The measurements recorded for each participant was the mean values of the two closest measurements. Weight and height measurements and age were used to calculate BMI-for-age of the adolescents. Waist and hip circumference measurements were used calculate the waist hip ratio.

Data analysis

Data was entered and cleaned using Census and Survey Processing System CsPro Software version 7.0. Statistical Package for Social Science (SPSS) version 20 was used to analyse the data from socio-demographic and economic questionnaire, the food diary, food frequency questionnaire and anthropometry. Nutrisurvey software was then be used to calculate dietary intake data from the food diary. Selected nutrients; carbohydrates, proteins, fibre, Vitamin A, folate, iron, calcium and zinc were analysed and referenced as recommended by Brown et al. [1]. Anthropometry measurements were analysed using the WHO-Anthroplus software version 3.2.2 program and computation of BMI-for-age was done. WHO [12] body mass index (BMI-Z) cut off points was used to categorize anthropometric data. Chi-square and Pearson correlations were used to test the relationship between the variables and a p-value of <0.05 at the confidence level of 95% was considered significant. Data is presented in the form of graphs and frequency tables.

Results

Socio- demographic characteristics

Out of the 228 targeted adolescents, 212 responded. Majority of the respondent were male representing 51.4% while 48.6% were females. The mean age of the study population was 15.7 ± 1.06 (sd) with majority (31.1%) being of 16-year-old. Majority of the adolescents, 64.6% lived with both parents (father and mother) with the mean household size was 4.93 ± 1.59 . The caregivers interviewed majority were female (82.5%) of average age of 40.85 ± 7.72 years whilst only 40.6% had completed secondary education (Table 1).

Meal frequency of adolescents

Meal skipping is a common practice among adolescent, in this study, a meal skipper was defined as skipping a meal three or more times in the 7 days that the dietary data was recorded. Breakfast

was the most frequently skipped meal with 14.6% while a low percentage skipped lunch at 4.6%. (Table 2).

Characteristics		n (212)	%
Gender of adolescent	Male		
	Female		
Age in years	14	32	15.1
	15	55	25.9
	16	66	31.1
	17	59	27.8
Adolescent caregivers	Both parents	137	64.6
	Father	5	2.4
	Mother	45	21.2
	Grand parents	4	1.9
	Elder brother/sister	7	3.3
	Aunt/uncle	14	6.6
Household size	2	13	6.1
	3	21	9.9
	4	52	24.5
	5	59	27.8
	6	38	17.9
	7	16	7.5
	>8.00	13	6.1
	Mean 4.93±1.59sd		
Gender of caregiver	Male	37	17.5
	Female	175	82.5
Age of caregiver	20-30 years	7	3.3
	31-40 years	118	55.6
	41-50 years	66	31.1
	51-60 years	19	8.9
	>60 years	2	1.1
Mean age 40.85±7.72			
Education of caregiver	No formal education	6	2.8
	Primary incomplete)	8	3.8
	Primary complete)	42	19.8
	Secondary incomplete)	33	15.6
	Secondary complete)	86	40.6
	Tertiary	37	17.5

Table 1: Socio-demographic characteristics of Adolescent attending mixed day public secondary schools in Kenya.

Meal	Skipped (%)	Consumed (%)
Breakfast	14.6	85.4
Lunch	4.2	95.8
Dinner	6.6	93.4

Table 2: Meal frequency of adolescents.

Nutrient intake

The mean average energy consumption for the study population was 2467.1±723.96 Kcal. The nutritional requirement during adolescent is the highest and varies across gender for girls and

boys. Table 3 shows nutrient intake of selected nutrients among the adolescents per gender. All adolescents attained RDA for protein and carbohydrate while no adolescent attained the RDA for calcium this is alarming bearing in mind that all calcium is obtained from the diet and calcium is vital for bone development.

All the males met the RDA for iron while only 76.7% of the female attained RDA yet female require more iron to cater for blood loss during menstruation. Vitamin A and zinc play a vital role in immune system yet less than 10% of the adolescent attained the RDA. In addition, to its role in immunity, zinc is vital sexual maturation, which is high during adolescence stage.

Nutrient	Gender	RDA	Mean intake	Attained RDA	
				N (212)	%
Kcal	Male	3152	2619.5 ± 697.03	23	21.1
	Female	2368	2327 ± 727.26	37	35.9
Carbohydrate g/d	Male	130	767.7 ± 232.64	109	100
	Female	130	642.5 ± 251	103	100
Proteins g/d	Male	52	101.9 ± 23.41	109	100
	Female	46	87.6 ± 29.83	103	100
Fiber g/d	Male	38	20.2 ± 7.37	3	2.8
	Female	26	20.0 ± 7.10	18	17.5
Vit A µg/d	Male	900	368.7 ± 371.32	3	2.8
	Female	700	455.9 ± 574.95	9	8.7
Folate µg/d	Male	400	214.6 ± 73.57	3	2.8
	Female	400	229.4 ± 97.09	9	8.7
Iron mg/d	Male	11	43.9 ± 23.15	109	100
	Female	15	31.8 ± 16.54	79	76.7
Calcium mg/d	Male	1300	511.8 ± 151.28	0	0
	Female	1300	470.8 ± 189.87	0	0
Zinc mg/d	Male	11	4.9 ± 2.25	3	2.8
	Female	9	5.2 ± 2.57	9	8.7

Table 3: Selected nutrient intake among the adolescents.

Food frequency data was analyzed the most commonly consumed foods in the food groups presented below (Figure 1). Consumption of carbohydrates was high at 96.9% and 96.7% for maize flour and maize grain, milk was the most commonly consumed protein. Notably, consumptions of sugar was very high at 96.7%, with slightly more than half 53.3% of the adolescent consuming carbonated drinks.

The frequent consumption of milk was mostly milk in tea, which was consumed along with sugar that is, tea with milk and sugar, in addition, porridge provided at school had sugar added to it. Rice was the commonly consumed food in the school menu and this was accompanied by a beans stew explaining possible reason for the high percentage of consumption. In addition to making stew for rice and ugali in the school menus, beans are mixed with maize (Githeri) which was also part of the school menu and in addition to food consumed at home. The median and mean consumption for the selected foods in the food groups is represented in the Table 4.

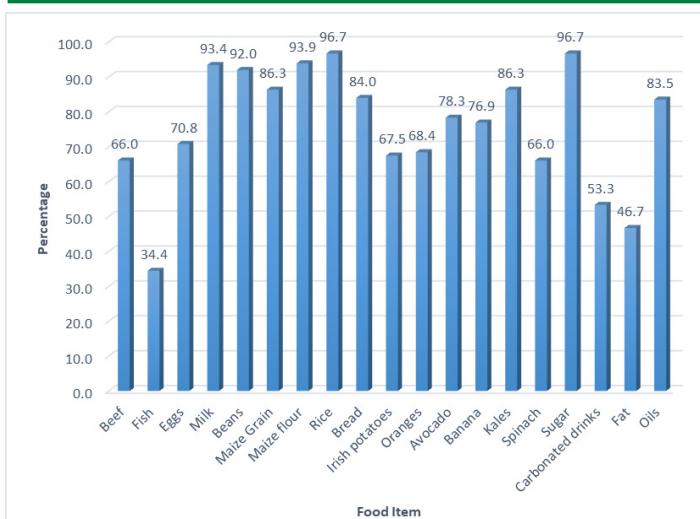


Figure 1: The 7-day food frequency data from adolescents.

Nutritional status of adolescents

Nutrition status of adolescent was accessed using anthropometric measurements weight, height, waist circumference and hip circumference. Weight and height were used to calculate Z-scores (BAZ) for the adolescents while waist and hip circumference calculated the waist-hip ratio. The data analyzed was interpreted and categorized as wasted, normal, overweight and obese from the Z-scores while waist-hip ratio data was classified the respondent as having abdominal obesity or not. Majority of the respondents 88.7% had z-scores of between $< +1sd$ and $> -2sd$ thus classified as normal nutrition status (WHO, 2008). In this study, 5.7% of the respondents were overweight while 3.8% were wasted.

Parameter		Gender	Number (n=212)	Percentage (100%)
Nutrition status by BAZ	Wasting		8	3.8
	Normal		181	85.4
	Overweight		19	9
	Obese		4	1.8
Waist circumference	Healthy	Male	109	100
		Female	91	88.3
	At risk	Male	0	0
		Female	12	11.7
Waist-Hip Ratio	Normal		202	95.3
	Obese		10	4.7

Table 4: Nutritional status of adolescents in mixed day public secondary school.

The mean waist circumference was $70.98 \text{ cm} \pm 8.58 \text{ sd}$, hip circumference was $89.48 \text{ cm} \pm 7.83 \text{ sd}$. Waist circumference is a tool for assessing the abdominal fat and health status and acts as a predictor for adolescent becoming overweight or obese [13]. A waist circumference of $>94 \text{ cm}$ in men and $>80 \text{ cm}$ in women, increases the risk of diseases such as coronary heart disease. In the study, 5.7% were at risk metabolic disorders as on Table 5. Notably, all the respondents that were at risk were all girls.

Variable		r	P value
Total Kcal against	BAZ	0.241	0.043*
	Waist Circumference	0.047	0.661
	Waist-Hip ratio	0.171	0.106

Table 5: Relationship between energy intake and nutrition status of the adolescents.

On the other hand, WHR is used as a measurement of obesity, which in turn is a possible indicator of other more serious health conditions. A waist hip ratio of less than 0.9 for boys and less than 0.85 for girls is considered normal [12] while anything above that is classified as abdominal obesity. Majority, 95.3% of the adolescent had normal waist-hip ratio while 4.7% had abdominal obesity.

A correlation of BMI-Z, waist circumference, and waist-hip ratio revealed a positive correlation ($r= 0.594$, $P < 0.001$) between BMI-Z and waist circumference meaning that as waist circumference increased, there was an increase in BMI-Z while there was not significant correlation between BMI-Z and waist-hip ratio. Bivariate correlation was ran to establish whether there was a relationship between total nutrient intake (Kcal) and the nutrition status of the adolescents indicated a statistical significance between total nutrient intake and BAZ ($P = 0.043$).

Discussion

Socio- demographic characteristics

The mean household size in this study was slightly higher than the mean size of a Kenyan household according to the Kenya Demographic and Health Survey [14]. Nationally, 55 percent of children 17 years and below live with both of their biological parents while 58.2% in central Kenya of the same population live with both parents this study found a slightly higher number possibly because the study focused on adolescents only and not all children below seventeen years.

A higher number of women were interviewed as caregivers compare to men in this study. This could be because traditionally it is the responsibility of men provide for the family thus they are away most of the day working while women take to the family and do household chores thus are more likely to be found at home during the day compared to men.

Meal frequency of adolescents

Meal skipping among adolescents has been reported to rate between 4-57% for dinner, lunch 8-57% and 14-88% for breakfast [7]. In the current study, breakfast was skipped by 14.5% of the adolescents, which was similar to studies on breakfast consumption [15]. In their study Onyiriuka and Umoru [9] found that 48.1% reported skipping at least one meal (skippers), while 51.9% were non-skippers. Similar to the current study, Onyiriuka and Umoru [9] reported breakfast as the most frequently skipped meal however contrary to this study; they found lunch to have been skipped more frequently than dinner. Probably because lunch was provided in the school, then adolescents eat lunch more than breakfast and dinner whose consumption could be determined and

affected by other factors. In their study Brown et al. [1] explained that the eating patterns of adolescent are influenced by peers, cost, convenience, personal and cultural believes, mass media and body image.

Energy and nutrient intake among adolescents

Adolescent stage requires a high amount of energy and failure to attain them can slow or stop growth [1]. Nonetheless, majority of the adolescent did not meet the RDA for energy intake. In their study among adolescent girls, Montazerifar et al. [16] found that the girls did not meet the RDA for calcium, zinc and Folate the findings correlate with the findings of this study where the mean intake for calcium, folate and zinc among the girls were below the RDA. Similarly, in the study, a high consumption of protein among the girls was reported [16] which is above the RDA. In Saudi Arabia by Washi et al. [17] also reported similar results among the adolescent girls.

Folate is an important micronutrient as it helps in the formation of DNA/RNA and in the formation of red blood cells [1] and failure could have an implication on the baby if such a woman got pregnant. In the present study, the adolescents did not meet the RDA for folate; the results were similar to the findings of folate intakes of adolescent Mozambican girls which were lower than recommended intake of 400 µg/day [18]. Vitolo et al. [19] also reported a low intake of folate among adolescent aged 14 to 19 years in Brazil. The present study present data that illustrate risk of folate insufficiency among the adolescent. The study among Brazillian adolescents [19] revealed the risk factors for folate insufficiency as irregular consumption of dark green vegetables and beans and having a waist circumference above the eightieth percentile. Thomas et al. [20] stated that low dietary intake is a major determinant of Folate deficiency. Anaemia is a common disorder among adolescents and studies have shown a higher prevalence of folate deficiency among anaemic patients than iron deficiency [20-22].

Unhealthy dietary patterns in adolescents can lead to diet-related chronic illness in the future. More than half of the respondents had consumed soft drinks (soda) in the past 7-days from the data gathered in the FFQ, the percentage was slightly lower than that of Iran where three-quarters of the respondent reported to consumed soft drinks [16]. Harnack et al. [23] showed that high consumption of soft drinks lessened consumption of zinc. This raises questions on whether the consumption of soft drinks in the current study could have be the probable cause of the low number of adolescents attain their RDA for zinc. The micronutrient current micronutrient data in Kenya suggest that 82.5% of children are Zinc deficient. It is of concern that less than ten percent of adolescent met their RDA for zinc yet Zinc is vital for immunity and sexual maturation, which is at its peak during adolescence.

Calcium deficiency is associated with preeclampsia, low birth weight; rickets and high post-menopausal bone loss. Consequentially, the intergenerational effects of extreme calcium deficiency may manifest through stunting related to subclinical

calcium deficiency, cephalopelvic disproportion or a spectrum of bone ailments [24]. Regular consumption of dairy products during adolescence was found to be related to lower levels of post-menopausal bone loss. In this study, the consumption of Ca²⁺ was too low compared to the RDA and no student attained the requirements for this micronutrient despite the reported consumption of milk in the food frequency. However, the milk consumption in the food frequency was consumed as tea. De Assumpc,ão [25] found the rate of calcium inadequate intake at 88.6% for the total population, with 85.1% of boys and 92.2% of girls not attaining the RDA for Calcium. Higher than the findings of this study, de Assumpc,ão [25] found the mean intake of calcium intake to be 540.7 mg in girls and 692.3 mg in boys. By virtue of increased physiological needs and poor dietary intake among adolescent, there is need for intervention to improve calcium intake among the adolescents.

Nutrition status of adolescents

A study among adolescents in Kuwait 50.55% of boys and 46.5% were overweight and obese [26]. This data is higher from the present study statistics where the prevalence of overweight and obesity was 7.6%. Among the adolescents in Benghazi, Libya 18.3% and 12.1% were overweight and obesity, respectively while, 4.9% were underweight [27]. In Nigeria, Akingbade and Sanusi [28] reported a prevalence of obesity, overweight and underweight to be at 4.9%, 8.7% and 11.7%, respectively. The data suggest the two forms of malnutrition among adolescent that some adolescent are underweight while others are overweight and obese.

According to the World Health Organization [12] Indicator Cut-off points for the Risk of metabolic complications for Waist circumference is >94 cm for male; and >80 cm for female. People with a Waist circumference >102 cm (men); >88 cm (women) have a substantially increased risk for metabolic complication while Waist-hip ratio ≥0.90 cm (male) ≥0.85 cm (female) substantially increases the risk of metabolic complication. In the current study, 5.7% had abdominal obesity from the waist circumference while 4.7% had an increased risk for metabolic disorder based on their waist-hip ratio.

Nutrient consumption had a significant statistical relationship with BAZ of the adolescents but not with the waist-hip ratio or the waist circumference. Possible explanation is that waist circumference and waist hip ratio are indicators of obesity yet majority of the adolescents had normal nutrition status.

Conclusion

Skipping meals was reported among the adolescent with breakfast being the most frequently skipped meal. Almost a third of the adolescent did not meet their RDA for energy meaning that their food consumption was not enough yet adolescent is the most nutritionally demanding stage in the lifecycle. The eating habits of adolescents were characterised by consumption of high sugar foods, carbonated drinks and fats that are unhealthy. Nonetheless, a vast majority (85.4%) of the adolescent had normal nutrition status with less than ten percent being reported to be both overweight and obese and a few (3.8%) exhibiting wasting despite a significant

number not attaining their RDA.

Acknowledgement

The authors thank Kenyatta University library for facilitating space and accessibility to online databases used to gather relevant material for manuscript preparation.

Ethical Statement

The study was conducted following ethical approval from Kenyatta University Ethical Review Committee (ERC). Informed consent was obtained from the parent/guardian of the adolescents prior to data collection while an assent was sought from the adolescents.

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