



Dietary Intake, Physical Activity and Nutritional Status of Adolescent Girls in Secondary Schools in Peri-Urban Nairobi, Kenya

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ABSTRACT

Adolescence is a significant period in life as it is a time of intense physical, psychosocial, and cognitive development. Across sectional and comparative study was conducted to assess dietary intake, physical activity and nutritional status of 402 randomly selected adolescent girls aged 13-18 years in boarding and day secondary schools in peri-urban Kenya. Semi structured pretested questionnaire was used to collect data on dietary intake of energy iron, vitamin A and zinc using food frequency and individualized 24 hour dietary recall and analyzed using Nutria-survey and Kenya food composition table 2018. Physical activity was computed using the global physical activity questionnaire with metabolic equivalent in task values of 8 for high and 4 for moderate. Nutritional status was measured using BMI z-score for age. Girls from boarding who met their RDA for energy, iron, vitamin A and zinc were 51.9%, 11%, 18.5% and 29.6% respectively and while those from day school were 66.7%, 7%, 44.4% and 44.4% respectively. At 95% CI the results showed a positive association between school type and intake of energy at $p=0.037$ and vitamin A at $p=0.042$ and no association for iron and zinc intake There was no significant relation of physical activity between girls in boarding and day school at $p=0.073$. Nutritional status measured as BMI for age -5-19 years (z-score) showed a positive association of energy intake and nutritional status at $p=0.021$ but there was no association at $p=0.296$ between nutritional status and type of school.

Keywords: Dietary intake; RDA; Physical activity; nutritional status; BMI; boarding; day

INTRODUCTION

Adolescence is an important period in life as it is a time of intense physical, psychosocial, and cognitive development. During this period of growth there is an average gain of up to 50% of weight, more than 20% of adult height, and 50% of adult skeletal mass (WHO, 2018). During peak growth periods of adolescents there is increase in dietary needs for nutrients like iron, vitamin A, calcium, zinc and vitamin D but about 60% to 80% of adolescents suffer from micro-nutrient deficiencies. In Kenya the prevalence of severely thin and mildly thin among adolescents aged 15-19 years is 5.4% and 11.2% respectively with the ones in Nairobi have prevalence of severely thin at 0.2% and 2.6% are mildly thin. Adolescents in urban and peri-urban areas are exposed to urbanization, sedentary lifestyles, unhealthy foods and snacks which affect their dietary habits and physical activity. Common physical activities practised by adolescents in

secondary schools are running, walking, and sports indoor and outdoor games. Schools are identified as great environments for promoting physical activity among adolescents therefore, in line with sustainable development goal 3 and the Kenyan vision 2030 it's advocated for adolescents in Kenya to practice healthy lifestyles which include adequate physical activity and consumption of healthy foods. Kenyan secondary schools have predetermined menus for a week which is repeated throughout the year Girls from boarding schools eat all their meals and snacks from the school while the ones in day school eat from school, environment and home. The study aimed at investigating the dietary intake, physical activity and the nutritional status of adolescent secondary school girls in boarding and day school in peri-urban Nairobi Kenya. The study findings can be used by ministry of Education and ministry of Health to make policies geared towards ensuring proper dietary intake and adequate physical activity among adolescents in schools.

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METHODS AND MATERIALS

The study was a cross sectional comparative study involving adolescent girls in three boarding and three day secondary public schools from Embakasi, Makadara and Kasarani (Njiru) sub counties of Nairobi City County which were proportionally selected. Schools that participated in the study were. Ruai girls, Embakasi girls, St Ann girls, Makongeni secondary, Dandora secondary and Drumvale secondary. Sampling was done using purposive, proportional and simple random sampling method to select the adolescents for the study. Study population included adolescent girls aged 13 to 18 years who were in public secondary school at the study time; Sample size of 402 was determined using Fischer’s, (1991) formula for comparative studies and 95% confidence level was used in the study. The schools involved in the study had a student population of 326, 460 and 455 (173 boarders) for Embakasi st Anns and Ruai secondary girl’s schools respectively. For the mixed day schools it was Dandora 450 (Girls-213, Boys-237). Makongeni 385 (Girls-175 Boys-210) and Drumvale 350 (Girls162 Boys 188) students. Simple random sampling was done using the class list to acquire the total population of 402 for the study. To ensure quality control the study was approved by the Kenyatta National Hospital/University of Nairobi Ethics and Research Commission and National Commission for Science Technology and Innovation (NACOSTI).A consent form was discussed with the respondents before the interview and permission granted by the respondents through signing the form. A coded questionnaire was used to collect data in order to ensure anonymity. The study contracted three research assistance trained for three days prio to data collection. Practical season were done on collection of data on 24 hour dietary recall, food frequency and measurements of weight and height for BMI computation. A food frequency questionnaire was used to collect data on the frequent intakes of foods rich in micronutrients and 24 hour dietary recall was used to collect data on intake of energy and micronutrients focusing on iron, vitamin A and zinc. The meals included in the 24 hour dietary recall were breakfast, 10.0 o’clock snack, lunch, evening snack and supper. Collected data was checked entered, and analyzed in descriptive and analytical ways using statistical package for social science SPSS (20.0).at 95% CI. This included use of frequency, means, odds ratio, t- test.

RESULTS

Socio demographic characteristics of adolescent school girls

Table 3.1 shows socio demographic characteristics which included adolescents’ age, household head and family size.

Table1: Socio Demographic characteristics of adolescent school girls.

Socio Demographic characteristics	boarding (n=201)	Day (n=201)
	Percentage	Percentage

Adolescent (years)		
Middle adolescents(13-16 years)	70.1	56.2
Older adolescents (17-18 years)	29.9	43.8
Household head		
Father	84.1	75.1
Mother	14,9	21.9
Others	1	3
Number of Children per family		
1-3	45.3	39.3
4-6	43.8	56.2
7-9	8.9	4
10-12	2	0.5

Socio-economic characteristics

Table 3.2 socio economic characteristics which included fathers occupation mothers occupation, pocket money, amount of pocket spend.

Table2: Socio-Economic characteristic.

Socio Economic characteristics	Boarding (n=201)	Day (n=201)
	Percentage	Percentage
Father’s occupation		
Employed	40..3	36.8
Farmer	6.5	7.0
Business	30.3	28.3
Casual work	1.5	5.5
Unemployed	3.5	5.0
Others	8.5	3.0
N/A	9.4	14.4
Mother’s occupation		
Formal employment	46.3	29.8
Farmer	7.0	10.4

Business	22.4	28.9
Casual work	3.5	7.0
Unemployed	9.9	13.4
Others	8.4	4.0
N/A	2,5	6.5
Pocket money		
Low	28.3	63.7
Middle	60.2	33.8
High	9	1.5
Very high	2.5	1
Spending Pocket Money		
Stationary	13,4	13.4
Snacks	35.8	22.9
Personal items	47.8	58.7
Others	3	5
Average family size	6	6

Dietary intake of Energy, Iron, Vit A and Zinc and type of school

A 24 hour recall questionnaire was used to assess the intake of energy and nutrients such as vitamin A iron and zinc. Table 3.3 shows the percentage of adolescents who met the recommended dietary allowances.

Table3: Adequacy of dietary intake of energy, iron and zinc with type of school.

Nutrient Intake	RDA for nutrient	Range of RDA Measured	% of RDAs measured	% of sample meeting RDA	P-value
Energy					
Boarding	2200 kcal	1280 - 2775	58.2 - 126	51.9	0.037*
Day	2200 kcal	1566 - 3262	71.2 - 148.3	66.7	
Iron					
Boarding	15 mg	4.4 - 15.2	29 - 101	11.1	.0801
Day	15 mg	9.3 - 17.1	62 - 114	7	

Vit A						
Boarding	800	178 - 1736	22.3 - 217	18.5	.042*	
Day	800	403 - 1349	50.4 - 168.6	44.4		
Zinc						
Boarding	12 mg	2.5 - 16.9	20.8 - 140.8	29.6	0.264	
Day	12 mg	6.1 - 19.8	50.8 - 165	44.4		

*Significant at < 0.05

Frequency consumption of foods rich in iron, vitamin A and zinc by the adolescent secondary school girls

Table 3.4 Shows food intake as assessed by the food frequency questionnaire which assessed some dietary practices by the adolescent girls.

Table4: Frequency consumption of foods rich in iron, vitamin A and zinc by the adolescent secondary school girls.

Foods rich in nutrients	Frequency of intake (%)				
	3-6 times per week	1-2 times per week	1-3 times per month	less than once per month	Rarely or Never
Iron Rich foods	0	44.8	49.2	6.0	0
Boarding n=201					
Day n=201	16.4	59.7	20.9	3	0
Vitamin A rich foods	0	36.4	52.2	11.4	0
Boarding n=201					
Day n=201	14.9	55.7	25.9	3.5	0
Zinc rich foods	11.9	43.8	38.3	5.5	0.5
Boarding n=201					
Day n=201	12.9	48.8	33.3	4.5	0.5

Day
n=2001

Association between frequency of consuming foods rich in iron, vitamin A and zinc and type of school

The frequency of taking diverse foods rich in micronutrients was assessed in relation to school type and the results are shown in Table 3.5.

Table5: Association between frequency of consuming foods rich in iron, vitamin A and zinc and type of school

Predictor	B	Wald	Sig	Exp (B)
Iron rich foods	1.152	44.856	0.00x	3.163
Vit A rich foods	1.113	47.818	0.00x	3.044
Zinc rich foods	0.132	1.050	0.306	1.141

^xSignificance level <0.05

B - Regression coefficient

Wald - Wald statistics

Sig - significance level

Exp (B) - odds ratio

Association between physical activity and school type

Physical activity levels were categorized using global physical activity questionnaire (GPAQ v2.0) with metabolic equivalent in task (MET) values of 8 for high and 4 for moderate physical activity levels. Figure 3.1 Shows frequency of physical activity and type of school.

MET values, High =8, Moderate =4

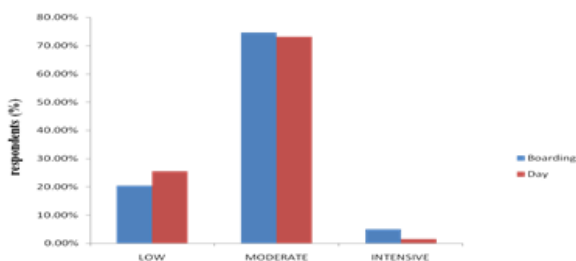


Figure1: Physical activity and type of school.

Association between intensity of physical activity and type of school

Table 3.6 shows the association of the various physical activity levels and type of school.

Table6: Association between physical activity and school type.

Predictor	B	Wald	Sig	Exp (B)
Low	1.240	3.466	0.063	3.455
Moderate	0.51	0.051	0.821	1.053
Intensive	0.283	1.405	0.236	0.754

^xSignificance level <0.05

B - Regression coefficient

Wald - Wald statistics

Exp (B) - odds ratio

Nutritional status measured as BMI for age - 5-19 years (z-score) and type of school

The nutritional status for all adolescent girls in the study was analysed through frequency. The results are shown in Table 3.7.

Table7: Nutritional status measured as BMI for age - 5-19 years (z-score) and type of school.

Nutritional status	BMI (z-score)	Percentages			P value
		Both schools N=402	Boarding n=201	Day n=201	
Severe thinness	< -3	0	0	0	0.296
Thinness	> -3 < -2	1.5	2.5	0.5	
Normal	> -2 < 1	71.2	72.1	70.1	
Overweight	> 1 < 2	26.1	23.9	28.4	
Obesity	> 2	1.2	1.5	1	

*Significant at < 0.05

Association between dietary intake of energy, iron, vitamin A, zinc and nutritional status

There was a positive association for energy and type of school while iron, vitamin A and zinc had a negative association

Table8: Association between dietary intake of energy, iron, vitamin A, zinc and nutritional status.

Nutrient	B	R	r ²	Sig	LB (B)	Upper CI (B)
Energy	.000	.314	.081	.021*	.001	.000
Iron	.043	.060	.004	.230	.027	.113
Vit A	.000	.133	.018	.338	.001	.000
Zinc	.012	.019	.000	.706	.051	.076

*Significance level <0.05

B – Regression coefficient

R – Correlation coefficient

Sig – significance level

DISCUSSION

During the peak periods of adolescents' physical growth their needs for macro and micro nutrients such as iron, zinc, calcium, vitamin A and vitamin D increases in order to meet the bodies demands. According to FAO/WHO (2001), rapid growth in stature, muscle mass and fat mass during adolescents results in greater daily requirement for iron and vitamin A than among persons of other age groups. The food choices and dietary intake of adolescent girls can be influenced according to the context they are in. Adolescent girls in boarding and day schools may thus have varied eating experiences and diet challenges due to the environment, peer, socio economic characteristics, commercial advertisements, culture and beliefs. In boarding schools' adolescents' dietary intake revolves around the school meals and canteen while for day school it's from varied sources which include home meals, school meals, school environment and the community. This leads to increased dietary diversity among adolescents in day school compared to the ones in boarding thus putting adolescents in boarding school at the risk of nutrient deficiency if the school does not offer variety of foods.

Studies have shown that most adolescents do not meet their recommended daily allowances (RDA) of micronutrient like iron, vitamin A and zinc. According to other studies by, and adolescents girls did not meet their RDA for iron, vitamin A and zinc respectively. This could be related to lack of diet diversity in vegetables and fruits in secondary school menus with boarding schools most affected. Although most adolescents had normal nutritional status as computed using the BMI for age 5-19 z-score, majority did not meet their RDA for micronutrients. Most adolescent girls consume foods rich in carbohydrates and snack on foods high in sugars and fats this enables them take in adequate kilocalories. There was a positive association of the intake of iron, vitamin A and type of school. Physical activity is important in adolescence as it helps control overweight and obesity which are linked to non-communicable diseases. It is recommended that adolescents achieve 60 minutes of physical activity daily. Adolescents in urban and peri urban are affected by urbanization thus most use motorized means of transport and have more screen time due to digital

transformation leading to a more sedentary lifestyle. In the study adolescents in both boarding and day school were moderately active and common physical activities practiced were walking, running, sports and games (volleyball, netball, football).

CONCLUSION AND RECOMMENDATION

From the study majority of adolescent girls in secondary schools met their RDA for energy but not for micro-nutrients such as iron, Vit A and zinc and girls in boarding school were more likely to have deficiency in micro-nutrients. Although most of the girls had normal nutritional status this may not be necessarily a reflection of adequate micro-nutrient intake as it requires an in-depth analysis to assess micro-nutrient status. Secondary schools have fixed menus lacking in variety of vegetables and fruits rich in micro nutrients and canteens in most schools mainly sell processed non nutritious foods. Nutrition education for schools on the importance of good nutrition for the growth and development of adolescent girls be conducted to encourage schools to feed adolescent girls on nutritious healthy foods through including them in the school menu and canteen.

Adolescent girls in school should be educated on the importance of nutritious healthy meals and snacks so that they may adopt healthy eating patterns. Ministry of education and other stakeholders to develop or enforce existing policies and structures in place to enable adolescent girls in secondary school be able to have nutritious healthy foods that will supply the important nutrients needed at this stage in life through to adulthood and motherhood.

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