Dietary Patterns, Nutritional Knowledge and Status of Adolescents in Lagos, Nigeria.

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Abstract

Background Adolescents in low- and middle-income countries, such as Nigeria, are at increased risk of under-nutrition and overnutrition. This study assessed this risk by examining the dietary patterns, nutritional knowledge and status of adolescents in Lagos state of Nigeria.

Methods A descriptive cross-sectional study in which six hundred and eighty-two (682) adolescents were selected from their communities using multistage sampling technique. Nutritional knowledge and dietary patterns were ascertained using structured, self-administered questionnaires and anthropometric measurements were taken to determine nutritional status. Data was analyzed using Epi-Info version 7.2.3.1 computer software. Chi-square was used to test for association between categorical variables and p-values ≤ 0.05 were considered statistically significant. WHO Anthro-Plus was used to evaluate nutritional status.

Results The mean age of the adolescents was 13.6 ± 2.3 years. Only 12.0% of them had good level of nutritional knowledge with the males having significantly higher levels. Dietary pattern and diversity were poor with the majority consuming refined cereals (73.5%), salty snacks/high fat foods (69.6%) and carbonated soft drinks (46.8%) while only 9.7% took adequate amount of fruits and vegetables daily. Prevalence of undernutrition was 5.4% while that of overweight and obesity were 10.7% and 5.3% respectively. More females were obese compared with the males. Sex, age, educational status, source of information, daily consumption of snacks, infrequent intake of fruits and vegetables, nutritional knowledge, food habits and dietary diversity were statistically significantly associated with nutritional status of adolescents in the positive direction ($p \leq 0.05$).

Conclusions Nutritional knowledge and dietary patterns were poor while overweight and obesity are higher than previously reported in the region; especially among the females. Adolescent nutrition intervention programmes addressing weight control especially among females is needed in Lagos.

Background

The co-existence of two different forms of malnutrition creates a double burden of nutrition-related ill health in specific populations. Adolescents in low-and middle-income countries, such as Nigeria, are at increased risk of under-nutrition (because of inadequate food intake, irregular meals consumption especially skipping breakfast) and overnutrition because of overconsumption of foods that are high in calorie and fats but poor in nutrients.^{1,2}

Social pressures to achieve a distorted body image is creating under nutrition among some groups of adolescents.³ On the other hand, overweight and obesity continue to increase due to nutrition transition to energy and lipid-rich diets and decrease in physical activity, especially among urban adolescents.³ Common eating behaviours include snacking, skipping meals, eating out, and consuming foods that are high in fats and carbohydrates.^{3,4}

Irregular meal patterns are associated with obesity and overeating is linked with breakfast skipping.^{5,6}

The global prevalence of underweight (thinness) among adolescents is 8.4% for girls and 12.4% in boys. According to the Global School-Based Student Health Survey, about 4% of girls aged 13–15 years of age are underweight, although > 10% of surveyed girls are underweight in countries like Mauritius, Sudan, Bangladesh, Maldives, Cambodia and Vietnam. (8) In 2016, the mean BMI estimates for youths aged 10–19 in South Asia, South East Asia, East Africa, West Africa and Central Africa were < 20 kg/m² for both male and female adolescents.⁷

The percentage of overweight adolescents has more than tripled since 1980, with 17% of adolescents between ages 12–19 being considered overweight. Globally, the prevalence of obesity (BMI > 2SD BMI for age Z score) has risen from < 1% in 1975 to > 5% in girls and nearly 8% in boys age 5–19 in 2016.^{7,9} Malnutrition increases health care costs, decreases productivity and slows economic growth, which can perpetuate a cycle of poverty and ill health.^{10,11} Long-drawn undernutrition leads to energy and protein deficiency, which might result in an inhibition of physical and intellectual development, cognitive functions impairment, disorders in immune system and poor obstetrics outcome.¹² It could also affect social and psychological development. Moreover, overweight increases the risk of Non-Communicable Chronic Diseases such as cardiovascular diseases, different kinds of disabilities and mortality, later in life.^{13,14}

Adolescence offers the last opportunity to intervene and recover growth that faltered in childhood and support growth spurt.¹⁵ Adolescents have high nutritional needs but usually engage in risky habits such as unhealthy eating which affect their immediate health and have significant impact on their health in adulthood. About 40% of adult deaths in developing countries and 70–80% of deaths in industrialized countries are linked to attitudes and behaviours adopted during adolescence.^{1,9} Research suggests that adequate level of nutritional knowledge is related to optimal nutritional behaviours while dietary habits affect nutritional status.¹⁶ Dietary habit is one of the modifiable risk factors for obesity in childhood and adolescence.¹⁷ In Nigeria, the prevalence of underweight among adolescents range from 13.5–37.1%¹⁸, while that of overweight and obesity range from 7.4 to 13.2% and 2.6 to 4.4% respectively.^{10,19} Over the years, the presumption that adolescents are less susceptible to disease and suffer relatively fewer life-threatening conditions has limited research interest in this group, while more attention has been given to children. Hence, there is a paucity of data on adolescent nutrition in Nigeria.²⁰ Adolescents however constitute a significant population (almost one fifth of Nigerian population) that represent a huge potential workforce whose health affect the nation socially and economically. Adolescents can learn and adopt healthy habits to create a strong foundation for healthy lifestyles to improve quality of their lives in adulthood. Some studies have reported low level of nutritional knowledge, poor dietary patterns and nutritional status of adolescents in other parts of Nigeria but there is limited information about these parameters among adolescents in Lagos State.^{18,19,21} Although Lagos, in terms of land mass, is the smallest State in Africa's most populous country, its cosmopolitan nature, economic productivity and high population density make it an effective window into the lived experiences of Sub-Saharan African

populations, particularly in terms of how the nutritional status of adolescents predicts future health and healthcare burdens. This study therefore determined the nutritional knowledge, dietary patterns, nutritional status and associated factors among adolescents in Lagos state.

Methods

A descriptive cross-sectional study was conducted among adolescents in Lagos Metropolitan area. Male and female adolescents between 10-19 years were included in the study. The sample size determined using Cochran's formula was 400 but 682 adolescents were recruited into the study.

Sampling technique: A multi-stage sampling technique was used to determine the sample. Using simple random sampling technique, two local government areas (Somolu and Lagos Mainland) were selected from the twenty LGAs, four wards were selected from each LGA to obtain eight wards and three streets were selected from the list of streets in each ward to obtain twenty-four streets. All the eligible houses on each street were included in the study but only one adolescent was selected from each household using balloting method.

Data was collected using structured interviewer-administered questionnaire. A standard questionnaire was adapted for assessment of nutrition knowledge.²² Some non-local foods in the standard questionnaire were replaced with local foods with similar nutrient profiles. Food frequency questionnaire was used to determine dietary habits. Nutrient intake was assessed by using non-quantifiable 24- hour diet recall. Anthropometric measurements were taken and analyzed according to WHO standard to determine the Body Mass Index.²³

Six research assistants were trained successfully for data collection. The questionnaire was pretested in Oshodi-Isolo LGA and the results were used to adjust the questionnaire before data collection.

Data analysis: Data was analyzed using EPI INFO epidemiological software package (version 7.2.3.1). The socio-demographic characteristics were analyzed using descriptive statistics. Relevant summary statistics were generated for the variables. The chi-square test was used to determine association between categorical variables, and p values of ≤ 0.05 were considered as statistically significant.

Malnutrition was determined based on the WHO classification/ BMI cut offs as follows: ≥ 17.0 to < 18.5 = Grade 1 thinness / mild malnutrition; ≥ 16.0 to < 17.0 = Grade 2 thinness / moderate malnutrition; < 16.0 = Grade 3 thinness / severe malnutrition, ≥ 18.5 to < 25.0 = Normal nutrition; ≥ 25.0 - < 30 = overweight; ≥ 30 = obesity.²⁴

BMI Z scores were calculated for each adolescent based on their age in months, BMI and gender. Z score expresses the anthropometric value (BMI in this case) as a few standard deviations below or above the reference mean/ median value, and is classified as: $< -3SD$ – Severe thinness; $-3SD$ to $< -2SD$ – Thinness; $-2SD$ to $1SD$ – Normal; $1SD$ to $2SD$ = Overweight; $> 2SD$ – Obese.²⁴

The scores of nutritional knowledge ranged from 0-15. Those who scored 0-5 were classified as having poor knowledge, 6-10 as having fair knowledge while those who scored 11-15 were regarded as having good level of knowledge.

The dietary patterns were analyzed using frequency tables. The non-quantifiable 24-hour dietary recall was analyzed based on the dietary diversity. Participants who consume four (4) out of the seven (7) classes of food were classified as having adequate dietary diversity, while those who consumed below four (4) classes of food were classified as having inadequate dietary diversity.

Results

Socio-demographics characteristics of the adolescents

Most of the respondents were early adolescents (63.9%) and the mean age of the participants was 13.6 ± 2.3 years. Most of them (94.9%) lived with their parents at the time of the study. **(Table 1)**

Respondents' nutritional knowledge

Majority of the adolescents, 69.8% (CIs 64.5-74.7%) knew the six classes of food but only 17.2% (CIs 33.1-43.9%) knew that balanced diets must contain all the nutrients in adequate amount. Few adolescents, 15.8% (CIs 5.6-11.8%) knew that food could either cause disease or improve health. The most prominent source of nutritional information for the participants was other family members (54.1%). Only 12.0% (CIs 17.1-26.3%) of the adolescents had overall good nutritional knowledge about food groups, healthy food choices and diet related diseases. **(Table 2)**

Dietary Patterns

Processed cereal including white rice was the commonest cereal consumed by the adolescents daily (73.5%). Fruits and vegetables (15.7%), roots and tubers (12.4%), legumes (13.4%) were rarely eaten whereas 46.8% drank carbonated drinks daily. Only 9.7% took adequate amount of fruits and vegetables (F&V) which is 400g or five servings per day. **(Figure 1)**

Nutritional Status of the adolescents

Prevalence of overweight and obesity were 10.7% and 5.3% respectively while underweight was 5.4%. **(Figure 2)**

Factors associated with nutritional knowledge

Age, sex, educational level and source of information were significantly associated with the nutritional knowledge of the adolescents; male, younger adolescents, senior secondary school adolescents and those who obtained information from their families had better nutritional knowledge ($p \leq 0.05$). **(Table 3)**

Factors associated with the nutritional status

Sex, age, living with parents were significantly associated with the nutritional status of the adolescents ($p \leq 0.05$). Prevalence of overweight and obesity were higher among the girls compared with the boys. Prevalence of underweight, overweight and obesity were higher among the older adolescents (24(9.8%), 27(11.0%) and 21(8.5%) respectively compared to the younger ones.

The overall level of nutritional knowledge was significantly associated with the nutritional status of the adolescents, ($P \leq 0.05$). Most of the adolescents who had good nutritional knowledge were within the normal BMI range. Poor level of nutritional knowledge was associated with higher prevalence of underweight, 28(20.4%), overweight 22(16.1%) and obesity, 16(11.7%).

Infrequent intake of fruits and skipping meals to control weight were positively associated with higher prevalence of overweight and obesity while dieting to control weight was positively associated with underweight. However, there was no statistically significant association between the number of main meals eaten per day and nutritional status of the participants. **(Table 4)**

Discussion

Most of the respondents' parents had at least secondary education (78.5%). This is consistent with the findings of a similar study in Ibadan, Nigeria where 89.2% and 94.6% of the mothers and fathers had at least secondary education.²⁵

Less than one third (31.0%) of the adolescents had good knowledge of balanced diet but the majority (76.1%) knew the common food sources of energy and protein. This agrees with a similar study in Abuja municipal area, wherein 34.8% of the adolescents had good knowledge of balanced diet.²⁶ It is possible that the adolescents had learnt about common food sources in school through subjects like physical and health education, home economics as well as food and nutrition. In contrast, less than half of the adolescent girls in rural Bangladesh, knew common food sources of energy and protein.¹⁵ The higher knowledge among adolescents in Lagos could be because Lagos is an urban area where adolescents are probably more exposed to media adverts, television and internet compared to 'rural Bangladesh'.

Overall nutritional knowledge was poor; only 12.0% of the adolescents had good level of overall nutritional knowledge. This is consistent with the report of a similar study in Sokoto, Nigeria where only 29% of adolescents had good level of nutritional knowledge.²⁷ This implies that Nigerian adolescents don't have substantial knowledge and understanding of healthy food choices, energy and nutritive values of foods and dietary related diseases. Detailed explanation of healthy food choices, energy and nutritive values of foods and dietary related diseases maybe absent from the school curriculum. On the contrary, a Tehranian study reported good nutritional knowledge among 82% of the girls and 75% of the boys.²⁸ This could be because adolescents in Asia are more exposed than those in Nigeria. Good nutritional knowledge is important because it usually has a positive influence on healthy food choices and health.²⁹ This was demonstrated in this study because the level of knowledge was significantly associated with the nutritional status of the adolescents. Most of the adolescents who had good nutritional knowledge

were within the normal range of Body Mass Index. This finding similar to that of another study in India where nutritional knowledge had great impact on the health status of adolescents.³⁰

According to this current study, sex and age were positively associated ($p < 0.05$) with level of nutritional knowledge. The males and younger adolescents exhibited better nutritional knowledge than the females and older adolescents. This is similar to the findings from another study in rural Bangladesh¹⁵ where age, and other socio-demographic characteristics were positively associated with nutritional knowledge. It however contrasts with the report from a similar study in Sokoto state, Nigeria²⁸ where the females had better overall nutritional knowledge than males. This current research shows that females do not always have better nutritional knowledge.

Various forms of malnutrition have been associated with adolescents' dietary patterns which make them predisposed to obesity and non-communicable diseases. Majority (84.9%) of adolescents in this study had 3–4 main meals per day. This could be because they lived with their parents who monitor their feeding. This finding is corroborated by another report from urban Baroda, India, where 55% of the adolescents took regular meals 3 times a day, (4) but contrasts with the report from adolescent girls in Saudi-Arabia³¹ where 44.7% of the adolescents had 2–3 main meals in a day and

Skipping of breakfast was reported among 33.0% of the adolescents and done five times more often compared with dinner (5:1). This is consistent with another report from Saudi-Arabia where 40.0% skipped breakfast and other Nigerian studies where the rate of breakfast skipping is higher than lunch and dinner.^{31,32} However, in India 55% of adolescents have a good habit of taking regular meals thrice a day and did not skip a single meal in a week.⁴ Adolescents generally have poor habits of breakfast skipping irrespective of their geographical location. Some reasons for missing meals as explored by other studies include little time for meal preparation, ill health, lack of appetite, or disliking the food served.²⁷

Adolescents' concern about body image has been linked with breakfast skipping and social pressures to achieve a distorted body image, is creating malnutrition among some groups of adolescents.¹⁷ About 45% of rural adolescents in India suffer from under-nutrition with Body Mass Index (BMI) < -2SD.³³ Irregular meal patterns and breakfast skipping are associated with obesity.^{5,6} The consequences of poor dietary habits such as skipping breakfast, include poor academic performance on standardized tests, absenteeism and tiredness.³⁴

Daily consumption of snacks (69.6%) and carbonated drinks (46.8%) were common among the adolescents. These findings are similar to reports from Sokoto where 82.1% of the students reported daily consumption of snacks though a lower prevalence was obtained in Osun state (33.2%).^{20,29} This finding agrees with a Ghana study where majority of adolescents were reported to have Sweet Tooth Patterns (STPs).³⁵ Adolescents commonly indulge in unhealthy dietary practices. When adolescents skip meals, they often make poor decisions such as consuming less fruits and vegetables, buying fast foods or unhealthy snacks which lead to weight gain and ultimately diabetes and heart disease later in life.³

The WHO survey among Oman adolescents reported that some foods that were used for snacks included carbonated drinks (33.4%) and fast foods (10%), which mostly are purchased outside the home. This practice of snacks use is becoming more common in societies due to westernization and especially among those who spend long hours outside home.³⁶

Dietary intake of adolescents in developing countries like Nigeria and Ghana is a major concern, because traditional diets (predominantly cereal and tuber based, fresh fruits and vegetables and foods low in fat) are gradually giving way to more westernized diets which lack diversity and are high in calorie. The reason for increased consumption of snacks can be because the adolescents have some amount of money available to them for daily spending, and that these unhealthy snacks and soft drinks are relatively affordable and comfortably fits in their budget.

Consumption of high-sugar, fat and salty snacks was high among the adolescents because of ready availability and affordability of the snacks. Consistent with previous studies, the choice of fast food among adolescents was influenced by taste, convenience and cost. Most fast foods with the qualities of good taste, convenience and low cost, usually have a high fat and sugar content but low fiber content which promotes obesity.³⁶ Consumption of snacks is a general issue among adolescents irrespective of their countries or localities. Although snacking is not completely bad, the quality of snacks chosen is very important. Carbonated soft drinks are energy dense and have a high glycemic index.³⁶ Some studies have linked high soft drink consumption rate to poor intake of calcium, vitamin C and increased risk of bone fractures because of its acidity.³⁶

Cereals especially rice (73.5%) and pastries (69.6%) were the most commonly consumed group of foods. This finding correlates with other studies from South-western Nigeria (76.5%), Ethiopia (99.6%) (97.6%) and India (50%) where rice and pastries were commonly consumed by adolescents compared with other foods.^{4, 37, 38} Refined cereals like processed rice and pastries have little or no fiber and contribute to the prevalence of obesity. They contribute significantly to the higher intakes of Advanced Glycation End-products (AGEs) which is associated with marginally greater weight gain. The top six food groups contributing to AGEs intake are cereals/cereal products, meat/processed meat, cakes/biscuits, dairy, sugar and confectionary and fish/shellfish.³⁹

A higher proportion of older adolescents were underweight, overweight and obese compared with younger adolescents. This may be because many of the older ones engaged in dieting and skipping of meals compared with the younger adolescents. This finding is a contrast to the results obtained from similar studies in India and Ibadan, Nigeria where higher proportion of the younger adolescents were underweight ($p < 0.001$).^{4, 20}

Females had higher prevalence of overweight (13.9) and obesity (8.4%) compared with males (6.6% and 4.3%) similar to the reports from Sokoto and Ethiopia studies.^{27, 37} The higher prevalence of obesity among the girls may be related to weight gain that results from developmental changes and hormonal influences which necessitates beginning of menarche in females. In addition to the hormonal influences,

gender roles particularly those requiring higher physical exertion can also affect weight. Boys participate more in physical activities which necessitate energy utilization compared with girls, thereby aiding expenditure of consumed calories, and reduction of fat accumulation. However, some other studies have reported contrasting reports wherein more boys had higher prevalence of overweight than girls (19.4 vs 13.2%; $p < 0.05$).⁴

Infrequent intake of fruits (456, 66.9%) and skipping meals to control weight (254, 38.7%) were positively associated with higher prevalence of overweight and obesity while dieting to control weight (365, 53.5%) was positively associated with underweight. However, there was no statistically significant association between the number of main meals eaten per day and nutritional status of the participants ($p = 0.0508$).

Only 9.7% of the adolescents consumed adequate fruits and vegetables (F&V) (400 g or 5 servings) daily. This is not surprising since only 27.0% of the adults in Lagos consumed an adequate amount of F&V daily. Consumption of F&V is usually lower among adolescents due to inadequate knowledge about their benefits, family practice of irregular fruits intake, dislike of the taste of some fruits and others. In this study, low consumption of fruits and vegetables was associated with overweight and obesity. This correlates with the report from a similar study in Benin City, where low consumption of fruits and vegetables was associated with overweight.³²

Only 30.4% of the respondents had high dietary diversity, similar to the report among Zimbabwe and Tehranian adolescents where less than 50% of adolescents had high dietary diversity.⁴⁰ Based on the nine item FAO Dietary Diversity Score (WDDS); dietary diversity is regarded as high and more likely to meet micronutrient needs if four or more food groups are consumed per day whereas dietary diversity is poor if three or less food groups are consumed per day.⁴¹ In this study, good dietary diversity was associated with normal body mass index and decreased prevalence of underweight, overweight and obesity ($p < 0.001$). This correlates with the fact that adequate dietary diversity indicates that significantly higher intakes of most key nutrients are consumed and available for the body to maintain a normal nutritional status.⁴²

Number of meals consumed per day was not associated with the nutritional status of the adolescents. This agrees with some other studies which have demonstrated that no of meals does not affect weight status but contrasts the findings in a similar study in Saudi-Arabia where 13.0% of those who consumed more than four meals per day were overweight and obese.³¹

Few adolescents, 5.4% were undernourished, 78.6% were of normal weight, while 10.7% and 5.3% were overweight and obese respectively. The prevalence of obesity among Lagos adolescents is quite higher than the rate in other parts of Nigeria such as Ibadan (0.8%), Ondo (0.96%) and Port Harcourt (1.8%).^{10, 19, 43} Nutritional status of adolescents is very important, because they are highly susceptible to malnutrition which can have impact on their offspring in the future.⁴⁴

Conclusions

Levels of nutritional knowledge and dietary patterns of adolescents in Lagos were poor while the prevalence of overweight and obesity are rising compared with past studies. Poor nutritional knowledge and dietary patterns as well as obesity favour increased risk of non-communicable diseases later in adult life.

Limitations Of The Study

Only chi-square test was employed in statistical analysis and this might not have been sensitive enough since many confounders could likely change the result of the association.

Declarations

Ethics approval and consent to participate: The study was conducted according to the guidelines laid down in the Declaration of Helsinki. Ethics approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital (Ref No: ADM/DCST/HREC/APP/3074) before commencing the study. Child assent was obtained from the participants while informed written consent was obtained from their parents before the study. Confidentiality was assured and maintained throughout the period of the study.

Consent for publication: “Not applicable”

Availability of data and material: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: FO, PO and EA conceptualized and designed the study. PO, EA and FO acquired and interpreted the data. FO, PO, EA, OI and KN drafted the manuscript and critically revised it for important intellectual content. All authors read and approved the final manuscript.

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Tables

Table I: Socio-demographics characteristics of adolescents in the study population

Variable	Frequency(n=682)	Percentage (%)
Age in years		
10 -14	436	63.9
15 -19	246	36.1
Sex		
Female	287	42.1
Male	395	57.9
Education level		
Junior secondary school	349	51.2
Senior secondary school	333	48.8
Religion		
Christianity	453	66.4
Islam	229	33.6
Currently living with		
Parents	647	94.9
Other than parents	35	5.1
Family Setting		
Monogamous	550	80.7
Polygamous	132	19.3
Ethnic Group		
Yoruba	440	64.5
Igbo	168	24.6
Hausa	8	1.2
Others (Benin, Efik and so on)	66	9.7
Father's Occupation		
Civil Servant	138	20.2
Highly Skilled Professional	188	27.6
Business	305	44.7
Petty Trading	38	5.6
Academics	13	1.9
Mother's Occupation		
Housewife	17	2.5
Civil Servant	87	12.8
Highly Skilled Professional	130	19.1
Business	247	36.2
Petty Trading	24	25.9
Academics	17	3.5
Father's Education Level		
No Formal Education	83	12.2
Primary	44	6.5
Secondary	199	29.1
Tertiary	356	52.2
Mother's Education Level		
No Formal Education	95	13.9
Primary	52	7.6
Secondary	214	31.4
Tertiary	321	47.1
Total	682	100

Table II: Respondents' nutritional knowledge

Nutrition knowledge	Frequency (n=682)	Percentage (%)
There are six (6) classes of food	476	69.8
Knowledge of balanced diet		
Contains essential nutrients	477	69.9
Contains essential nutrients in proper quantities	117	17.2
Important for good health	88	12.9
Definition of nutrient	535	78.5
Foods rich in protein	519	76.1
Foods rich in carbohydrate	558	81.8
Foods rich in fiber	167	24.5
Foods rich in calcium	456	66.9
Fruits and vegetables are rich in fibre& vitamins	357	52.4
Iodine fortified food item	546	80.1
Knowledge of foods that lead to overweight or obesity		
Drinking a lot of soft drinks	252	37
Drinking alcohol	91	13.3
Eating too much meat	339	49.7
Food can either cause disease or improve health	108	15.8
Unit of measurement of food on label is Calorie (C)	198	29
Causes of kwashiorkor	346	50.7
Cause of rickets	216	31.7
Sources of nutrition information		
Family members	369	54.1
Friends and peers	129	18.9
Online sources	298	43.7
Traditional media	269	39.4
Overall level of knowledge		
Good	82	12
Fair	463	68
Poor	137	20
TOTAL	682	100

Table III: Factors associated with nutritional knowledge

Variable	Frequency (n=682)				
	Poor knowledge (%)	Fair knowledge (%)	Good knowledge (%)	Total (%)	p-value
Age					
10-14	53(12.2)	338(77.5)	45(10.3)	436(100)	<0.001*
15-19	84(34.2)	125(50.8)	37(15.0)	246(100)	
Sex					
Male	17(4.3)	340(86.1)	38(9.6)	395(100)	<0.001*
Female	120(41.8)	123(42.9)	44(15.3)	287(100)	
Educational level					
Junior secondary					<0.001*
Senior secondary	7(2.0)	312(89.4)	30(8.6)	349(100)	
	130(39.0)	151(45.4)	52(15.6)	333(100)	
Source of nutrition information					
Family (n=369)					<0.001*
Online (n=298)					
Peers (n=129)	120(32.5)	232(62.9)	17(4.6)	369(100)	
Traditional media (n=269)	120(40.2)	161(54.0)	17(5.7)	298(100)	
	120(93.0)	0(0.0)	9(7.0)	129(100)	
	120(44.6)	132(49.1)	17(6.3)	269(100)	

* Statistically significant

Table IV: Factors associated with the nutritional status of the adolescents

Variable	Frequency (n=682)						
	Under-weight	Normal weight	Over-weight	Obesity	Total	X2	P-value
Sex							
Male	5(1.3)	340(86.1)	33(8.4)	17(4.3)	395(100)	43.15	<0.001
Female	32(11.2)	196(68.3)	40(13.9)	19(6.6)	287(100)		
Age (years)							
10-14	13(3.0)	362(83.0)	46(10.6)	15(3.5)	436(100)	23.97	<0.001
15-19	24(9.8)	174(70.7)	27(11.0)	21(8.5)	246(100)		
Currently living with							
Parents	37(5.7)	501(77.4)	73(11.3)	36(5.6)	647(100)	10.05	0.0182*
Others	0(0.0)	35(100)	0(0.0)	0(0.0)	35(100)		
Level of knowledge							
Poor	28(20.4)	71(51.8)	22(16.1)	16(11.7)	137(100)	110.9	<0.001*
Fair	7(1.5)	403(87.1)	38(8.2)	15(3.2)	463(100)		
Good	2(2.4)	62(75.6)	13(15.9)	5(6.1)	82(100)		
Daily intake of							
Fruits & Vegetables							
No	0(0.0)	223(41.6)	71(15.6)	35(7.7)	329(100)	81.44	<0.001*
Yes	37(8.1)	313(68.6)	2(2.7)	1(2.8)	353(100)		
Number of main meals eaten daily							
<3	2(3.1)	51(78.5)	7(10.8)	5(7.7)	65(100)		
03-4	35(6.0)	447(77.2)	66(11.4)	31(5.4)	579(100)	22.38	0.0508*
>4	0(0.0)	38(100)	0(0.0)	0(0.0)	38(100)		
Take soft drinks daily							
No	9(2.5)	280(77.1)	51(14.1)	23(6.3)	363(100)		
Yes	28(8.8)	256(80.3)	22(6.9)	13(4.1)	319(100)	22.38	0.0001
Skip breakfast							
No	37(8.1)	317(69.4)	68(14.9)	35(7.7)	457(100)		
Yes	0(0.0)	219(97.3)	5(2.2)	1(0.4)	225(100)	70.65	<0.001*
Skip lunch							
No	37(9.8)	249(67.1)	63(17.0)	22(5.9)	371(100)	75.26	<0.001*
Yes	0(0.0)	287(92.3)	10(3.2)	14(4.5)	311(100)		
Skip dinner							
No	37(5.8)	492(77.4)	71(11.2)	36(5.7)	636(100)	8.97	0.0297*
Yes	0(0.0)	44(95.7)	2(4.4)	0(0.0)	46(100)		
Control weight with dieting							
Yes	28(7.7)	315(86.3)	12(3.3)	10(2.7)	365(100)	63.18	<0.001
No	9(2.8)	221(69.7)	61(19.2)	26(8.2)	317(100)		

If yes, method used (n=363)

Skipping meals	8(3.0)	193(73.1)	44(16.7)	19(7.2)	264(100)		
Laxatives/vomiting/diuretics	1(2.6)	28(71.8)	5(12.8)	5(12.8)	39(100)	206.44	<0.001*
Diet pills	8(25.0)	0(0.0)	2(6.3)	2(6.3)	32(100)		
Avoiding high calorie meals	20(71.4)	8(28.6)	0(0.0)	0(0.0)	28(100)		
Dietary diversity							
Low	36(7.6)	336(70.7)	68(14.3)	35(7.4)	475(100)	57.69	<0.001*
High	1(0.5)	200(96.6)	5(2.4)	1(0.5)	207(100)		

*=Fisher's exact values, Row % in bracket, Significant values ($p \leq 0.05$) highlighted.

Figures

Figure 1

Respondents' food consumption pattern

Figure 2

Nutritional Status of the adolescents