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Research Article

Pattern of Beverage Consumption and Body Mass Index Among Adolescents in Ogun State, Southwest Nigeria

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ABSTRACT
Consumption of sugar sweetened beverages has been on the increase among children and adolescents and has been implicated in the overweight and obesity. The study was designed to assess the relationship between beverage consumption and body mass index among adolescents. The study was a cross-sectional descriptive study conducted among 400 adolescents, 10-19 years. A structured questionnaire was used to collect information on the personal and socio-economic characteristics and nutrition knowledge of respondents. Beverage consumption pattern was assessed using a semi-quantitative food frequency questionnaire. Physical activity was measured using the WHO global-activity questionnaire. Descriptive statistics were used for analysis and Chi-square test and multi nominal logistic regression analysis were used for identifying factors associated with beverage consumption. The prevalence of underweight, overweight and obesity were 18.5%, 6.8% and 2.2% respectively. Carbonated and fruit juice with sugar drinks were the most frequently consumed beverage with an average intake of 500ml per portion among the consumers. However, milk consumption was rather low (28ml per portion). Only 4.3% had poor nutrition knowledge and 10% had low physical activity level. Respondents in senior classes had significantly higher nutrition knowledge than those in junior classes (p= 0.001). Also, the male adolescents were significantly more physically active than their female counterpart (p=0.012). In addition, consumption and quantity of carbonated drinks was significantly associated with BMI-for-age (p<0.05). The logistic regression analysis shows statistical significant difference (p=0.033) in the beverage consumption pattern of respondents in the junior and senior secondary class. The odds (OR = 1.529) of consumption of fruit juices with sugar increases from 125- 350mls (P=0.279, 95%CI:0.709 – 3.294). Despite higher nutrition knowledge among the respondents in the senior secondary class, beverage consumption was significantly higher among this group.

Keywords: *beverage consumption, adolescents, body mass index-for-age, physical activity, nutrition knowledge*

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INTRODUCTION

Overweight and obesity have reached epidemic proportions globally. It is a major contributor to the global burden of chronic diseases, disabilities (Australian Institute of Health and Welfare, 2017) and it is quickly becoming one of the most prominent conditions affecting children and adolescents (Sorre *et al*, 2017). Obesity in childhood and during adolescence is a major concern. Some of the associated risks include physical and psychosocial problems in the early stages of life (NIEHS, 2017), and it also tends to track throughout life.

Many adolescents do not meet their nutritional requirements despite the importance of healthy eating during adolescence. Studies have revealed that they tend to snack, miss meals, eat away from home, consume fast foods and follow a weight reduction diet more frequently (Sogari *et al*, 2018). Although studies that have examined snacking and body mass index have yielded mixed results (Mithra *et al*, 2018), snacking is generally believed to be associated with development of overweight and obesity (Sogari *et al*, 2018; Mithra, *et al*, 2018). Poor food choices have also been reported to be associated with snacking as adolescents tend to eat more of foods high in sugar, sodium, fat, relatively low in essential vitamins and minerals (Larson *et al*, 2016) and consequently poor dietary diversity.

Dietary behavior such as high frequency of sweets and high-calorie beverage intake, psycho-social factors, female gender, perceptions of needs to diet, potential social isolation, self-perceived health status, physical inactivity and sedentary lifestyles contribute to the prevalence of overweight and obesity. It has also been reported that overweight and obesity during childhood can track to adulthood with consequent cardiovascular disorders and metabolic problems (Robinson *et al*, 2017).

Scientific evidence have shown that high consumption of sugar-sweetened and alcoholic beverages promotes fat storage hence weight gain (Malik and Hu, 2019; Booranasuksakul, 2019). Sugar-Sweetened Beverages (SSB) are drinks with added sugar (Scharf and De Boer, 2016) which includes soft drinks (soda or pop), fruit drinks, sports drinks, tea and coffee drinks with sugar, energy drinks, sweetened milk or milk alternatives, and any beverage to which sugar has been added (typically high fructose corn syrup or table sugar). These are sources of energy, and excess consumption can lead to weight gain.

Studies have also shown that SSB consumption is increasing among children, adolescents and young adults (Muth *et al*, 2019). Moreover, it has been reported that high fructose corn-syrup is the sweetener used in some SSBs, and that it promotes weight gain because of its adverse effects on insulin secretion and leptin release and it also reduces the body's normal inhibitory effects on food intake. The fructose content of these beverages may promote the accumulation of visceral adiposity (Yoshida and Sinoes, 2018).

There are clear associations of soft drinks consumption with increased energy intake and body weight and soft drink intake has also been found to be associated with lower intake of milk which can lead to calcium and other nutrient deficiencies with increased risk of several medical problems (Releye *et al*, 2019). It has also been found that mean BMI is positively associated with the frequency of consumption of certain beverage (Abdul Halim, 2017).

In Nigeria, few studies have explored the pattern of beverage consumption among adolescents or its association with the BMI. This study therefore aims to investigate the pattern of beverage consumption, and its association with BMI of adolescents in Odeda Local Government Area, Ogun state, Nigeria.

MATERIALS AND METHODS

Study design: The study was cross-sectional and descriptive in design.

Study location and sampling: Eight (8) secondary schools in the semi-urban and rural communities of Odeda Local Government Area (ODLGA) were selected using a simple random sampling technique. There are 24 secondary schools in ODLGA (14 in the rural and 10 in the semi-urban). Four (4) were randomly selected from the rural and 4 were also randomly selected in the semi-urban. Four-hundred (400) schooling adolescents between the ages of 10 – 19 years (boys and girls) were randomly selected from these schools.

Data collection: Data was obtained by the administration of a structured and adapted questionnaire. The second author and some trained research assistants supervised the self-administration of the questionnaire to small groups of students in a classroom environment. The questionnaire consisted of the following sections:

Personal characteristics: (gender, age, tribe, religion, and class), occupation and educational level of parents.

Nutrition knowledge: This was assessed using an adapted questionnaire consisting of 11 questions under three domains (Kliemann *et al*, 2016). The first domain had four questions on nutrition related diseases. The second domain had four questions on food choices and the third domain had three questions on food group classification. Every correct answer was scored as 1 and incorrect answers were scored as 0. Individual total knowledge score was derived by summing all the scores. Individual score was divided by the maximum score (11) and multiplied by 100 to convert it to percentage. The percentage values were then categorized into Poor (0 – 40%), Moderate (41 – 69%) and Adequate (>70%) knowledge (Kigaru *et al*, 2016).

Physical activity level of the respondents was assessed using the adapted WHO Global Physical Activity Questionnaire. WHO global physical Analysis Guide was used to convert the number of days in a week, duration spent during each activity (which was divided into 3 Domains: At school, Transport and Recreation) and Metabolic equivalent value (MET-value) to Total physical activity Metabolic Equivalent (MET)-minutes/week. Respondents were categorized into Low level of physical activity if they do not meet WHO recommendations (<600 MET/minute/week), Moderate physical activity level if they achieve a minimum of 600 MET/minute/week and High physical activity level if they engage in vigorous-intensity activity at least 3 days, achieving a minimum of 1500 MET/minutes/week.

Types, frequency and portion sizes of commonly consumed food and beverages These were assessed using an adapted Block Semi-Quantitative Food Frequency Questionnaire (SQFFQ) for ages 8-17. To determine frequency of consumption, respondents were asked how many times they eat or drink a food or beverage either daily, 3 – 4 times weekly, once weekly, once monthly, rarely or never in the last one year. Responses were then summarized into number of times consumed in a week. Respondents were shown known measurements of household measures and food models and were asked to quantify the quantity consumed relative to the measures or models.

Anthropometric measurements: Anthropometric measurements were taken. Digital bathroom weighing scale (Health o meter: Model HDM560DQN-01) was used to take body weight to the nearest 0.1kg. Height was taken in centimeters (cm) using a Portable height tape (Scales 2000 Model 082 55 1192). Subjects were asked to remove their shoes and heavy items or clothing, such as berets, school jackets, keys and phones before taking their weights and heights.

Ethical Approval: Ethical approval was obtained from the Ogun State Ministry of Health (ref: HPRS/381/62). Permission to conduct study was also obtained from the School Management Board and School Principals. Signed informed consent was obtained from the parents of the respondents before being recruited for the study.

Data Analysis: WHO Anthro plus was used in calculating BMI for age. Classification of BMI-for-age was done using the Recommended BMI-for-age cut offs as proposed by the Centre for Disease Control (CDC, 2018). Respondents were classified as underweight, healthy weight, overweight and obese if their BMI falls into <5th percentile, 5th - < 85th percentile, 85th – 95th percentile and ≥ 95th percentiles of BMI-for-age and gender respectively.

All data collected was analyzed using the Statistical Package for Social Sciences (SPSS), version 20 (SPSS Inc., Chicago, USA). The results were summarized using descriptive statistics; percentages, frequencies mean and standard deviations (SD). Chi-square tests and multinomial logistics regression analysis were used to determine the factors associated with overweight and obesity, nutritional knowledge, physical activity and beverage consumption. P-value less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the personal characteristics of the respondents. Four hundred (400) secondary school students comprising 211 females (52.8%) and 189 males (47.2%) participated in the study.

Table 1:
Personal characteristics of the respondents

Variable		Frequency	Percentage
Age	10-14 years	196	49
	15-19 years	204	51
Gender	Boys	189	47.2
	Girls	211	52.8
Religion	Christianity	300	75
	Islam	97	24.3
	Traditional	1	0.2
	Others	2	0.5
Class	*JSS 1-3	224	56
	**SSS 1-3	176	44
Tribe	Yoruba	333	83.3
	Igbo	24	6.0
	Hausa	19	4.7
	Others	24	6.0
Mother's Occupation	Trader	206	51.5
	Artisan	28	7.0
	Farmer	30	7.5
	Civil servant	110	27.5
	Pensioner	14	3.5
	Others	12	3.0
Father's educational level	No formal edu	21	5.3
	Primary edu	28	7.0
	Secondary edu.	174	43.5
	Degree	99	24.8
	Postgraduate	78	19.4
Mother's educational level	No formal edu	22	5.5
	Primary edu	44	11.0
	Secondary edu.	172	43.0
	Degree	127	31.7
	Postgraduate	35	8.8
Father's occupation	Trader	71	17.7
	Artisan	61	15.3
	Farmer	62	15.5
	Civil servant	147	36.8
	Pensioner	30	7.5
	others	29	7.2

Junior Secondary School* * Senior Secondary School*

Their ages ranged from 10 – 19 years and more than half (56.0%) of the adolescents were in the junior secondary classes. Over two-third (83%) of the respondents were from the Yoruba ethnic group and about 75% were Christians. The educational level attained by most of the respondents' parents was secondary school education. About 5.3% of the fathers and 5.5% of the mothers had no formal education. More than one-third (36.8%) of the respondents' fathers were civil servants, while about half (51.5%) of the mothers were traders. Table 2 shows the body mass index for age (BMI-for-age) categorization of the respondents. The mean weight and height of the respondents are 46.39kg±9.65 and 156.92cm±9.21 respectively. The prevalence of overweight and obesity were 6.8% and 2.2% respectively. Nearly three-quarters (72.5%) of the respondents have a healthy weight and less than a quarter (18.5%) of the respondents are underweight. Age, class, religion and occupation of the respondents' mothers were factors that are significantly associated with BMI-for-age (P=0.021; P=0.035; P=0.005; P=0.025 respectively) as shown in table 3. Underweight, overweight and obesity were more prevalent among younger adolescents (10 – 14 years), those in the junior secondary classes and those whose mothers are traders. However, the gender, tribe, father's and mother's level of education and the father's occupation do not have a significant association with the BMI-for-age of the respondents (P=.0.348; P= 0.437; P= 0.061; P= 0.843; P= 0.154 respectively.

Figure 1 shows the nutritional knowledge of the respondents. The mean nutrition knowledge score was 7.39±1.74. Table 3 shows the association between nutritional knowledge and some variables. Nutritional knowledge between the boys and girls was not significantly different (P= 0.743). Also, there was no significant relationship between nutritional knowledge and BMI-for-age of respondents. Age of respondents, religion, tribe, educational level of both father and mother and occupation of both parents were also not significantly associated with the respondent's nutritional knowledge. However, the class level of the respondents was a factor that affected their nutritional knowledge (P= 0.001) as students in the senior secondary classes had better nutrition knowledge than those in the junior classes.

Table 4 shows the association between physical activity level, gender, class and BMI-for-age of the respondents. The mean MET/minute per week is 1294.70±585.13. The result shows that, one-third (33.8%) of the adolescents participated in high level of physical activity. More than half (56.2%) of the respondents were moderately active, while one-tenth (10.0%) engaged in low physical activities. A significant difference was observed in the physical activity level between the boys and girls (p = 0.012) as the boys engaged in high level of physical activities compared to the girls. More girls than boys had low physical activity level. However, there was no significant association between the physical activity level of the respondents and BMI-for-age (P = 0.390). Table 5 shows the pattern of beverage consumption (types and number of times in a week each beverage is consumed by the adolescents). The table also shows the median portion of each beverage consumed among the consumers.

Among the sugar-sweetened beverages, the most frequently consumed are: tea (with sugar), soft-drinks, cocoa beverages and ice-cream, with more than three-quarter of the respondents consuming each of these beverages. The median portion sizes of soft drink, energy drink, fruit juices with sugar, tea with sugar and coco beverage is 500ml/portion each. Although, the median portion sizes of yoghurt and a local probiotic drink – *kunuzaki* are the same (250ml/portion), the frequency of consumption of youghurt is higher than *kunuzaki*. Among the alcoholic beverages, palm wine and wine are more frequently consumed than others with a median portion of 500ml/portion each. Also, powdered milk and evaporated milk are more frequently consumed than fruit juice (without sugar). However, the median portion size of fruit juice consumed is about eight times more than evaporated milk.

Table 2:
Body Mass Index-for-Age and Personal characteristics of respondents

Variable		Underweight	Normal Weight	Overweight	Obesity	Chi-Square	P-value
Age	10-14	41 (20.9)	131 (66.8)	16 (8.2)	8 (4.1)	9.783	*0.021
	15-19	33 (16.2)	159 (77.9)	11 (5.4)	1 (0.5)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Gender	Male	42 (22.2)	131 (69.3)	12 (6.3)	4 (2.1)	3.299	0.348
	Female	32 (15.2)	159 (75.4)	15 (7.1)	5 (2.4)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Class	JSS	49 (21.9)	152 (67.9)	15 (55.6)	8 (3.6)	8.601	*0.035
	SSS	25 (14.2)	138 (78.4)	12 (6.8)	1 (0.6)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Religion	Christian	52 (17.3)	223 (74.3)	20 (6.7)	5 (1.7)	23.765	*0.005
	Islam	22 (22.7)	65 (67.0)	7 (7.2)	3 (3.1)		
	Traditional	0 (0)	1 (100)	0 (0)	0 (0)		
	Others	0 (0)	1 (50.0)	0 (0)	1 (50.0)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Mother's Education	No Formal	6 (27.3)	14 (63.6)	2 (9.1)	0 (0)	7.219	0.843
	Primary	8 (18.2)	34 (77.3)	2 (4.5)	0 (0)		
	Secondary	36 (20.9)	122 (70.9)	11 (6.4)	3 ((1.7)		
	Degree	19 (15.0)	94 (74.0)	9 (7.1)	5 (3.9)		
	Master/PhD	5 (14.3)	26 (74.3)	3 (8.6)	1 (2.9)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Mother's Occupation	Trader	42 (20.4)	147 (71.4)	12 (5.8)	5 (2.4)	27.465	*0.025
	Artisan	10 (35.7)	16 (57.1)	1 (3.6)	1 (3.6)		
	Farmer	5 (16.7)	24 (80.0)	1 (3.3)	0 (0)		
	Civil servant	14 (12.7)	85 (77.3)	9 (8.2)	2 (1.8)		
	Pensioner	2 (14.3)	11 (78.6)	0 (0)	1 (7.1)		
	Others	1 (8.3)	7 (58.3)	4 (33.3)	0 (0)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Tribe	Yoruba	61 (18.3)	242 (72.7)	21 (6.3)	9 (2.7)	8.475	0.487
	Igbo	6 (25.0)	16 (66.7)	2 (8.3)	0 (0)		
	Hausa	5 (26.3)	11 (57.9)	3 (15.8)	0 (0)		
	Others	2 (8.3)	21 (87.5)	1 (4.2)	0 (0)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Father's Education	No Formal	7 (33.3)	11 (52.4)	3 (14.3)	0 (0)	20.317	0.061
	Primary	2 (7.1)	26 (92.9)	0 (0)	0 (0)		
	Secondary	38 (21.8)	120 (69.0)	13 (7.5)	3 (1.7)		
	Degree	19 (19.2)	71 (71.7)	7 (7.1)	2 (2.0)		
	Master/PhD	8 (10.3)	62 (79.5)	4 (5.1)	4 (5.1)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
Father's Occupation	Trader	18 (25.4)	43 (60.6)	7 (9.9)	3 (4.2)	20.484	0.154
	Artisan	16 (26.2)	41 (67.2)	4 (6.6)	0 (0)		
	Farmer	11 (17.7)	50 (80.6)	1 (1.6)	0 (0)		
	Civil servant	23 (15.6)	111 (75.5)	10 (6.8)	3 (2.0)		
	Pensioner	2 (6.7)	24 (80)	2 (6.7)	2 (6.7)		
	Others	4 (13.8)	21 (72.4)	3 (10.3)	1 (3.4)		
	Total	74 (18.5)	290 (72.5)	27 (6.8)	9 (2.2)		
	Variable	**Minimum**	**Maximum**	**Mean±SD**			
	Weight	25.30	80.40	46.39±9.65			
	Height	132.00	185.00	156.92±9.21			
	BMI	13.20	29.50	18.7±2.9			

Table 3:
Association between Nutritional knowledge, Gender, Class and BMI-for-age

	Variables	Poor N (%)	Moderate N (%)	Adequate N (%)	Total	X^2	p-value
Gender	Girls	10 (4.7)	102 (48.3)	99 (47.0)	211 (52.8)	0.594	0.743
	Boys	7 (3.7)	87 (46.0)	95 (50.3)	189 (47.2)		
	Total	17 (4.3)	189 (47.2)	194 (48.5)	400 (100)		
Class	JSS 1 – 3	8 (3.6)	125 (55.8)	91 (40.6)	224 (56.0)	14.944	0.001
	SSS 1 - 3	9 (5.1)	64 (36.4)	103 (58.5)	176 (44.0)		
	Total	17 (4.3)	189 (47.2)	194 (48.5)	400 (100)		
BMI-for-age	Underweight	1 (1.3)	31 (41.9)	42 (56.8)	74 (18.5)	7.213	0.302
	Healthy weight	16 (5.5)	141 (48.6)	133 (45.9)	290 (72.5)		
	Overweight	0 (0.0)	14 (51.9)	13 (48.1)	27 (6.8)		
	Obese	0 (0.0)	3 (33.3)	6 (66.6)	9 (2.2)		
	Total	17 (4.3)	189 (47.2)	194 (48.5)	400 (100)		

Table 4:
Association between Physical Activity Level, Gender, Class and BMI-for-age

	Variables	Low Level N (%)	Moderate Level N (%)	High Level N (%)	Total N (%)	X^2	p-value
Gender	Female	26 (12.3)	127 (60.2)	58 (27.5)	211 (58.0)	8.829	0.012
	Male	14 (7.4)	98 (51.9)	77 (40.7)	189 (47.2)		
Class	JSS 1 – 3	19 (8.5)	125 (55.8)	80 (35.7)	224 (56.0)	1.773	0.412
	SSS 1 – 3	21 (12.0)	100 (56.8)	55 (31.2)	176 (44.0)		
BMI-for-age	Underweight	8 (10.8)	38 (51.4)	28 (37.8)	74 (18.5)	6.305	0.390
	Healthy weight	29 (10)	161 (55.5)	100 (34.5)	290 (72.5)		
	Overweight	3 (11.1)	20 (74.1)	4 (14.8)	27 (6.8)		
	Obese	0 (0.0)	6 (66.7)	3 (33.3)	9 (2.2)		
	Total	40 (10.0)	225 (56.2)	135 (33.8)	400 (100)		

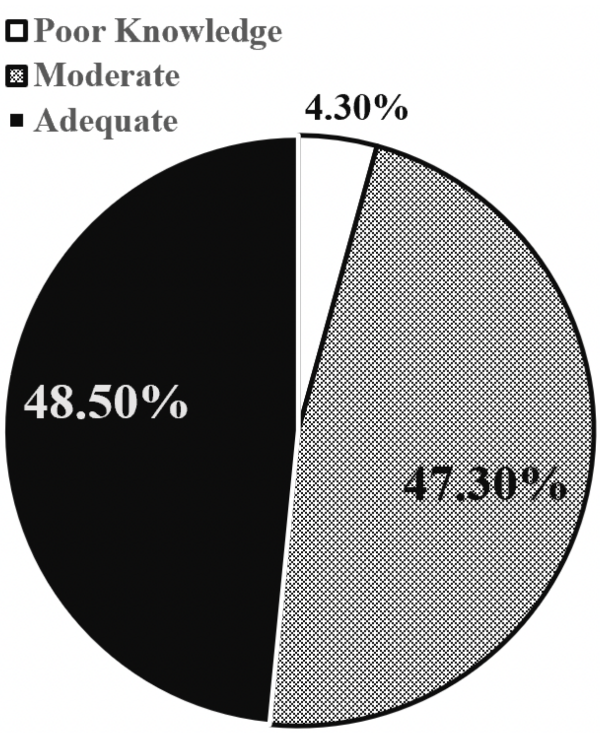

Figure 1:
Nutritional knowledge of the respondents

In Table 6, a significant association was observed between BMI-for-age and the quantity of soft drinks consumed (p= 0.001), as well as the quantity of fruit juice with sugar (p= 0.000).

Among the respondents that were underweight, 4.1% of them drank between 850 – 1750ml of soft drinks while 33.3% of obese respondents drank between 850 – 1750ml of soft drinks. Also, 88.9% of the obese respondents drank between 875- 1500ml of fruit juice with sugar.

Table 7 shows logistic Regression Model for Predictors of Beverage Consumption Pattern. In the table, the class variable shows a level of statistical significance (P=0.033). Also, the Odd Ratio (OR) increases along the physical activity category variable. However, there is a decrease along the knowledge category from moderate to adequate. Although, in the fruit juice (with sugar) there is an initial increase in the Odd Raito (OR) as the quantity increases from 125-350ml to 500-750ml whereas, as the quantity consume further increases, there is a decrease in the OR indicating a decrease in the consumption. Lastly, in the fruit juice (without sugar) there is an initial decrease in OR (0.9576-0.588) as the quantity consumed increases but the Odd Ratio decreases as the quantity keeps increasing.

Table 5:
Pattern of Beverage Consumption

	Beverages	No of consumers N	%	Consumption per week Frequency	%	Median Portion (ml)	Minimum	Maximum	Skewness
Sugar sweetened	Soft drinks	381	95.0	925	13.05	500	100	1750	0.53
	Malt drink	246	61.5	603.5	8.51	330	135	990	0.63
	Energy drink	291	72.8	707.3	9.98	500	125	1750	1.39
	Fruit juices (with sugar)	350	87.5	484.5	6.84	500	125	2500	1.67
	Coffee (with sugar)	250	62.5	743	10.48	250	83.3	625	0.07
	Tea (with sugar)	345	86.3	1387	19.57	500	125	750	0.24
	Cocoa beverages	299	74.8	847	11.95	500	125	875	0.38
	*Zobo	292	73	620.5	8.75	250	100	1500	0.89
	Ice cream	331	82.8	770.5	10.87	250	38	1250	1.80
	Total			7088.3	100				
Fermented Non-alcoholic	Yoghurt	326	81.5	985.5	62.57	250	75	750	0.47
	***Kunuzaki*	282	70.5	589.5	37.43	250	75	1500	1.23
	Total			1575	100				
Alcoholic	Palm wine	244	61	216	27.93	500	250	500	-1.91
	Wine	242	60.5	258.5	33.42	500	250	500	-1.05
	Spirits	138	34.5	155.5	20.11	250	125	500	1.36
	Beer	55	13.8	143.4	18.54	250	125	500	0.5
	Total			773.4	100				
Nutrient based	[1]Powdered milk	364	91	1343.3	44.16	15	5	125	3.18
	Evaporated milk	349	87.3	1070.5	35.19	30	7.5	90	0.95
	Fruit juice (without sugar)	275	68.3	628	20.65	250	75	1000	0.88
	Total			3041.8	100				

*zobo - *Hibiscus sabdariffa* leaves infused spiced with ginger, flavored and sweetened with sugar
** *Kunuzaki* – local probiotic drink made from cereal fermentation, spiced and sweetened with sugar
[1] powdered milk was measured in grams
N = number of respondents that consumed the drink

Table 6:
Association between Soft drink, fruit juice consumption and BMI-for age

Variable		Underweight N (%)	Healthy weight N (%)	Overweight N (%)	Obese N (%)	Total N (%)
Soft drinks	0	4 (5.4)	14 (4.8)	1 (3.7)	0	19 (4.7)
	100 – 350mls	18(24.3)	90 (31.0)	1 (3.7)	1(11.1)	110 (27.5)
	375 – 750mls	49 (66.2)	178 (61.4)	24 (88.9)	5(55.6)	256 (64)
	850 –1750mls	3 (4.1)	8 (2.8)	1 (3.7)	3(33.3)	15 (3.8)
	Total	74 (100)	290 (100)	27 (100)	9 (100)	400
						P-value = 0.001
Fruit-juice (with sugar)	0	14 (18.9)	36 (12.4)	0	0	50 (12.5)
	125 – 350mls	23 (31.1)	109 (37.6)	3 (11.1)	1(11.1)	136 (34)
	500 – 750mls	37 (50)	134 (46.2)	22(81.5)	0	193 (48.3)
	875 – 1500mls	0	10 (3.4)	2 (7.4)	8 (88.9)	20 (5)
	>1500mls	0	1 (0.3)	0	0	1 (0.2)
	Total	74 (100)	290 (100)	27 (100)	9 (100)	400
						p-value = 0.000

DISCUSSION

Findings have reported a higher prevalence of underweight than overweight and obesity among adolescents in Nigeria (Ayogu *et al,* 2018) and same was observed in this study. A study conducted in South Africa reported the prevalence of underweight to be 25% among children (Modjadji and Madiba, 2019). The prevalence of overweight and obesity in this study is similar to the values reported in Godor City, Ethiopia and Pondicherry, South India where 9.6%, 4.2% and 9.7%, 4.3% of adolescents were overweight and obese respectively(Prasad *et al*, 2016; Sorrie *et al*, 2017). In Nigeria, it was also reported that the prevalence of overweight and obesity among adolescents' students in public secondary school in Kwara State were 4.7% and 0.2% respectively (Lateef *et al*, 2016). It was however observed that the prevalence of overweight and obesity in this study was higher in the girls compared to boys but was not significantly different. Previous researches also reported similar results (Letlape *et al,* 2017; Ofakunrin *et al,* 2018).

Majority of the respondents in this study had moderate to adequate nutritional knowledge. Only very few (4.3%) had poor nutritional knowledge. However, a study conducted among students attending high school in Pretoria, South

Africa reported a low knowledge of diet, nutrition and physical activity among respondents (Azrin *et al,* 2018). The result of this study however reveals that respondents' nutritional knowledge is not a factor contributing to the BMI status of the respondents. Previous study had reported similar findings in showing no statistical differences between the nutritional knowledge of obese and non-obese individuals (Shahsanai *et al,* 2018).

Table 7:
Logistic Regression Model for Predictors of Beverage Consumption Pattern

Variables		Odds Ratio	P-value	95% CI (Odds Ratio)
Gender	Female[C]	0.745	0.216	0.468 - 1.187
	Male			
Class	JSS 1 – 3[C]	1.689*	0.033	1.043 - 2.735
	SSS 1 – 3			
Activity Category	Low[C]			
	Moderate	1.028	0.946	0.466 - 2.264
	High	1.205	0.662	0.522 - 2.779
Knowledge Category	Poor[C]			
	Moderate	0.201	0.127	0.026 - 1.582
	Adequate	0.135	0.057	0.017 - 1.062
Fruit Juice (With Sugar) 0[C]	125 – 350	1.529	0.279	0.709 - 3.294
	500 – 750	0.857	0.670	0.422 - 1.741
	875 – 2500	0.508	0.221	0.172 - 1.504
Fruit Juice (Without Sugar) 0[C]	75 – 175	0.957	0.939	0.310 - 2.953
	215 – 375	0.588	0.074	0.329 - 1.052
	500 – 1000	0.717	0.288	0.389 - 1.323
	Constant	17.579*	0.014	

*__Statistical Significant__

About 90% of the respondents were engaged in moderate to high physical activity levels, while only 10% were involved in low physical activities. A study among rural adolescents in Nigeria reported that 27.9% engaged in low physical activity level, about 36.5% were moderately active, while 35.6% of the respondents are involved in high physical activity levels (Odunaiya *et al,* 2018). In another study to assess the anthropometric correlates of adolescents' physical activity pattern in the University of Ilorin Teaching Hospital (UITH), Ilorin, Kwara State Nigeria, it was reported that 63.2% of the respondents were involved in moderate to vigorous physical activities (Usman *et al,* 2018). Existing research has shown that males are consistently more active (DeWolfe *et al,* 2019). Physical inactivity and sedentary lifestyles are known to predispose to overweight and obesity. However, no significant association was observed between physical activity and BMI. Other factors such as diet may be a contributing factor to the prevalence of overweight and obesity among the respondents. It has been shown that increasing beverage portion size consumption from 350ml to 530ml significantly increases body weight regardless of the type of beverage consumed (Hetterington and Blundell-Birtill, 2018). This study shows that consumption of sugar-sweetened beverages such as soft drinks and fruit juices (with sugar) were of equal amounts (500ml/portion each) and had a significant association with BMI-for-age (p=0.001 and p=0.000 respectively). In this study, consumption of larger quantities of soft drinks and fruit juice was observed among overweight and obese adolescents. Recent evidence suggests that sugar-sweetened beverages is positively associated with or has an effect on body weight (Luger *et al,* 2017). Likewise, in a meta-analysis, authors found a positive association between soft drink consumption and overall energy intake and body weight in five longitudinal studies (Abdul Halim *et al.* 2017). A study has also examined the effect of fruit juice on weight in children and adolescents and has shown a positive relationship between fruit juice consumption and BMI (Wall *et al,* 2018). Another study however found no statistical significance between soft drinks, fruit juice consumption and weight status in any of their models (Nicklas *et al*, 2015). Also, in a 2017 meta-analysis review, no consistent association was found between consumption of 100% fruit juice consumption and overweight/obesity in children and adolescents (Auerbach *et al*, 2017).

Portion sizes consumed for evaporated milk (30ml/portion) was rather low compared to other beverages. Low milk intake has been reported among adolescents in Southwest, Nigeria (Folasire and Akinrinde, 2017). Also, low milk intake by respondents in this study is similar with existing report which states that at this age, high soft drink consumption in adolescents contribute to low calcium intake because of the likelihood of soda being substituted for milk (Tahmassebi and BaniHani, 2019). The powdered milk commonly consumed among the respondents is the sachet milk normally packed in 12g, 13g, 40g or 45g depending on the brand. These sachet milk powders are often licked and sometimes taken with tea or cocoa drinks.

Senior students were more likely to consume more beverages than junior students. Similar pattern has been recorded in studies in more advanced countries and developing countries alike (Alexandre *et al,* 2016; Miller *et al*, 2017). The odds of consuming fruit juice reduce with respondents having adequate nutrition knowledge than those with just moderate knowledge validating the report that knowledge about the adverse effects of sugar sweetened beverage is significantly associated with its consumption (Sohyun *et al,* 2014). Increased odds of beverage consumption has been reported among students with high physical activity owing to the fact that physical activity increases cell metabolism; it causes an increase in body temperature thereby leading to sweats especially in hot climates which in turn increases the needs of the body water to keep adequate thermoregulation functioning (Maria *et al*, 2016).

In conclusion, female adolescents had the highest prevalence of overweight and obesity compared to the males and they were also less physically active. Public health officials should consider incorporating appropriate strategies for preventing overweight and obesity and promoting physical activity particularly among female adolescents. Overweight and obesity was higher among adolescents whose beverage consumption is predominantly from sugar-sweetened beverages. Respondents consume less of milk in terms of quantity compared to other beverages. There is need to address adolescents' awareness on portion sizes of sugar-sweetened beverages in order to improve their food choices and future health outcomes. Nutritional Education programs should discuss how to prioritize the intake of healthier beverages.

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