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COMPARATIVE ASSESSMENT OF OBESITY AMONG PRIMARY SCHOOL CHILDREN IN URBAN AND RURAL AREAS OF ANAMBRA STATE

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ABSTRACT

***Objectives**; This study was carried out to assess and compare the prevalence and factors influencing obesity among Primary School Children in Urban and Rural areas of Anambra State. **Methodology**; A cross sectional study of 606 children between 4-16 years of age, selected using a multi-stage sampling method was conducted. BMI- weight status category (obesity) was determined using anthropometric measurements. Obesity was defined according to Center for Disease Control (CDC) cutoff points. Associated factors were examined using Chi-square tests. **Results**; Out of 606 children from urban and rural areas combined, the overall prevalence of normal weight, underweight, overweight and obesity were 81.5%, 10.2%, 4.6% and 3.6% respectively. Higher proportion of obesed subjects were from the urban areas. Factors such as socio-demographic variables of the child-(age and sex), parents-(mother´s level of education, mother´s occupation and father´s occupation), dietary patterns-(times eaten daily, frequent consumption of meat pie, biscuits, sweets, other pastries) and physical activities- In-door games; frequent watching of television, Surfing internet (browsing), out-door games; occasional (playing of games, sport or exercises- athletics e.g. running, jumping etc.), means of transportation to school were significantly associated to BMI weight status (obesity). **Conclusion**; There is high prevalence of obesity among primary school children in Anambra state. There were higher proportions of subjects with obesity in the urban than in the rural areas. Factors such as socio-demographic variables of the child-(age and sex), parents-(mother´s level of education, mother´s occupation and father´s occupation), dietary patterns-(times eaten daily, frequent consumption of meat pie, biscuits, sweets, other pastries) and physical activities- In-door games; frequent watching of television, Surfing internet (browsing), out-door games; occasional (playing of games, sport or exercises- athletics e.g. running, jumping etc.), means of transportation to school all influence the occurrence of obesity among primary school children in urban and rural areas of Anambra state.*

Keywords; Obesity, Primary school children, Urban and Rural, Anambra state

INTRODUCTION

Obesity has been recognized for thousands of years as seen in Stone Age statues that depicted the excessive roundness of the female human form. Hippocrates first pointed out the possible negative health effects of obesity when he observed high cases of sudden death among the obesed individuals (Christopoulou-Aletra, and Papavramidou, 2004). For a big part of human history extra weight was considered as an indication of good health- (the heavier a child, the healthier he was, in order words "the bigger the better"), as well as wealth and prosperity. This attitude began to change by the late 19th century and has continued to the present time with increasing recognition of the associated health risks of overweight and obesity (Allison *et al.*, 2001). There is a global increase in the prevalence of overweight and obesity. The worldwide prevalence of obesity more than doubled between 1980 and 2014. In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. Overall, about 13% of the world's adult populations (11% of men and 15% of women) were obese in 2014. In 2014, 39% of adults aged 18 years and over (38% of men and 40% of women) were overweight (WHO, 2015a). In 2013, about 42 million children < 5 years were overweight and obese; the prevalence was 30% higher in developing countries than in developed countries (WHO, 2015a).

The children who are overweight and obese face the twin burden of diseases in childhood as well as increased morbidity and mortality in adulthood. In childhood, they often have breathing difficulties, increased risk of fractures, hypertension and psychological problems while in adulthood they have a higher risk of premature deaths, disability and obesity (WHO, 2015b). The problem of overweight and obesity in children is significant because of the associated health burden on the child and its implication on the health of the future adult population (Singh *et al.*, 2008).

Also, childhood obesity is increasingly being observed with the changing lifestyle of families with increased purchasing power, increasing hours of inactivity due to addiction to television, video games and computer, which have replaced outdoor games and other social activities (Singh, and Sharma, 2005). Overall overweight and obesity entail health risks with potential effects in social and economic well being of an individual and community at large. The poor health condition resulting from obesity among children may act as a barrier to the development of good mind and thus pave way to poor learning behaviour and outcomes.

This research work assesses and compares the prevalence and factors influencing obesity among primary school children in urban and rural areas of Anambra State, Nigeria.

METHODOLOGY

3.1 Study Area

This study was done in primary schools in urban and rural areas of Anambra state. Anambra state is located in the South-East, Nigeria. Old Anambra State was created in 1976 from part of East Central State, and its capital was Enugu. In 1991 a re-organization divided Anambra into two states, Anambra and Enugu. The capital of Anambra is Awka. The State covers an area of 4,416sq km, it is situated on rolling flat land on the eastern plains of the River Niger, the State has a population of 4,177,828 people, according to the 2006 census. The state is the eight most populated states in Nigeria and the second most densely populated state in Nigeria after Lagos (Orabueze 2009). It shares boundaries with Delta State to the West, Imo State to the South, Enugu State to the East and Kogi State to the North. The major occupation of the people is trading and handworks. The indigenous ethnic groups in Anambra state are the

Igbos (98% of population) and a small population of Igala (2% of the population) who live in the North Western part of the state.

Anambra state is made up of three (3) Senatorial Districts namely; Anambra North, Anambra Central and Anambra South. There are a total of 21 LGAs, seven (7) of which are Urban and fourteen (14) Rural (Nwabueze *et al.*, 2015). The Urban LGAs are Nnewi North, Awka-South, Onitsha North, Ihiala, Idemili-North, Aguata, Orumba-South. The Rural LGAs are Awka-North, Anambra-East, Anambra West, Anaocha, Oyi, Ayamelum, Dunukofia, Ekwusigo, Idemili South, Njikoka, Nnewi-South, Ogbaru, Onitsha-South and Orumba-North.

The state has a total of 2,255 primary schools; made up of 1,065 public and 1,190 private (Planning, Research and Statistics Department (PRSD), ASUBEB 2020).

3.2 Study Design

The study was a cross-sectional descriptive study, among primary school children in urban and rural areas of Anambra state.

3.3. Study Population

The study population consisted of primary school pupils (public and private) in the urban and rural areas of Anambra state.

3.3.1. Inclusion Criteria

Children or sample persons who can stand unassisted on the weighing scale, no obvious skeletal deformity such as paraplegia, quadriplegia, no known chronic medical conditions such as chronic renal failure and heart disease, and such a pupil was willing to participate.

3.3.2. Exclusion Criteria

Children or sample persons who are amputees, obvious skeletal deformity such as paraplegia, quadriplegia, and those with known chronic medical conditions such as chronic renal failure and heart disease were excluded.

3.4. Sample Size Determination

The sample size was calculated using the formula for calculation of sample size in a comparative study (Araoye, 2008).

$$\mathbf{n=} \frac{2z^2pq}{d^2} \text{ (Araoye, 2008).}$$

n = The desired sample size

z = The normal standard deviate at 95% confidence interval = 1.96.

P= The proportion in the target population estimated to have a particular characteristic. Using the estimated prevalence of obesity of 11.1% (Opara *et al*., 2010).

Therefore, P = 0.111

q =1.0-P = 0.889

d = Degree of accuracy desired, set at 5% for comparative study.

Therefore, the sample size:

$$n = \frac{2\times1.96^2\times0.111\times(1-0.111)}{0.05^2} = 303$$

The calculated sample size was 303. With 10% attrition rate =337 samples

This is approximated to 344 in each arm of the study (urban and rural), for even distribution of subjects to the various schools selected for the study. Therefore a total of 688 subjects will be enrolled in the study.

3.5. Sampling Techniques

A multi-stage sampling method was carried out to select 688 pupils in the state.

First stage; Three (3) LGAs were selected (1urban and 2 rural) from the state on the basis of their urban/rural status using the urban/rural proportion of LGAs in the state. The selected urban LGA was Awka South while the two (2) rural LGAs were Anaocha and Nnewi South.

Second stage; In each selected LGA, 2 public and 2 private schools were selected by simple random sampling consisting of 6 public and 6 private schools giving a total of 12 schools.

Third stage; Realizing the fact that urban LGA- (Awka South) have higher population densities than the rural LGAs,-(Anaocha and Nnewi South) (AC Nweke, 2019)**.** Each of the urban schools was allotted 86 subjects while each of the rural schools was allotted 43 making it 4 urban and 8 rural schools from a total of 12 schools.

Fourth stage; Based on the different class levels (primary 1-6), number of pupils and male/female proportion of pupils per class level in each selected school, stratified random sampling was used to select the pupils in order to give even representation- sex and class level for the school. For urban, the number of pupils selected ranges from 12 -16 pupils per class and 6-8 pupils per class for rural areas giving a total of 344 pupils from the 4 urban schools and 344 pupils from the 8 rural schools.

3.6. Data Collection and Instrument Used

Prior permission was taken from the school head teachers of the concerned schools. The tool for data collection was an interviewer- administered pre-tested structured questionnaire, the questionnaire also contained details of the physical examination of the children including their Weights, Heights, BMI using a Mechanical Bathroom Scale (Brand-Hana, Model-BR, Capacity-120kg, Made in China- Reg No. SON/MPR/000346). Research assistants comprised of community health and extension workers (CHEWs), who were trained on how to obtain information using the questionnaire and carry out anthropometric measurements. This was done in order to ensure reliability of the information and the measurements obtained. Samples were selected on the basis of inclusion and exclusion criteria.

3.6.1. Anthropometric Measurement

Weight: Was measured using the Mechanical Bathroom Scale (Brand-Hana, Model-BR, Capacity-120kg, Made in China- Reg No. SON/MPR/000346). Weights of the children were measured with their normal school uniform only. They were asked to empty their pockets, pull off sweaters or vests, belts and wrist watches before having their weights taken. The scale was adjusted to zero reading before each measurement. The weighing scale was

standardized using a known standard weight after every 10 users. The recordings were in kilogram, measured to the nearest 0.01kg (CDC, 2007).

Height: Was measured using a rigid, non-collapsible two metre rule. Each participant was asked to stand against the metre rule on a flat wall, with the heel, buttock and occiput touching the wall, knees together, arms hanging loosely at the sides and the subject focusing horizontally on a distant object. A transparent ruler (Brand--Horse, Brand NO. 2002, Made in China) was held firmly to crown of the subject's head with its end touching the long meter rule behind the head to indicate the subject's height which was then read and recorded. Measured in centimeter to the nearest 0.1cm CDC, (2007).

Body mass index: This was calculated from weight and height in kg/m² as follows. BMI = weight (kg) / height (m²).

BMI was interpreted as healthy weight when BMI is between 5th and 84th percentile, overweight as BMI of 85th percentile to 95th percentile and obese as BMI of greater than 95th percentile. The criteria for weight status categorization in children and adolescent is based on the United States Center for Disease Control and prevention (CDC) BMI- for-age growth chart cut-off reference standard (CDC: Published May; 2000). The BMI number is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Normally the measurement for only one child is plotted on a growth chart. This indicates the relative position of the child's BMI number among children of the same sex and age. The growth charts show the weight status categories used with children and adolescent (underweight, normal weight, overweight and obesity), as shown in the BMI-for-age weight status categories annexed (CDC: Published May; 2000). The BMI for children is calculated the same way as for adults. However, it is interpreted differently. For adults, BMI classifications do not depend on age or sex. For children and adolescents between 2 and 20 years old, BMI is interpreted relative to a child's age and sex, because the amount of body fat changes with age and varies by sex (NCHS, 2000).

3.7. Data Analysis

The age, as well as the weight and the height of the subjects, were entered into IBM-SPSS version 25.0 (International Business Machine-Statistical Package for Social Sciences) from where it was imported to BMI --for--age scores calculator (WHO Anthro Plus software version- V.1.0.4.). BMI – for – age Z scores were converted to the corresponding values in percentile in line with (CDC) BMI- for-age growth chart cut-off reference standard and exported back to IBM-SPSS. Tables were used to report descriptive statistics. Mean and standard deviation was provided as appropriate. Discrete variables were compared using the Chi-square test. The level of significance was established at P-value of < 0.05.

3.8. Ethical Consideration.

Ethics committee clearance and approval for this study was obtained from Nnamdi Azikiwe University Teaching Hospital Institutional Research Ethics Review Committee (Reference No: NAUTH/CS/66/VOL.13/19/2019/105), before the commencement of the study. Further approval to carry out this study was obtained from the Education Secretaries (ES) in Local Education Authority (LEA) of the selected L.G.A. Permission was also obtained from the school head teachers and class teachers during field work. In addition, written informed consent was obtained from the participants. The participants were properly enlightened on the aims, objectives, benefits and protocols of the study and the need for voluntary participation

and withdrawal at any given time. All data obtained were treated with utmost confidentiality and only for the purpose of this research.

3.9. Limitation of the Study

1. This study is based on self reports and is subject to recall bias, social desirability bias due to the sensitive nature of some of the questions or both.

RESULTS

Completed data for a total of six hundred and six (606) children in age group 4-16 years were returned for analysis. This gives a response rate of 88% (606/688).

These were subsequently analyzed and result presented below.

Table1: Socio-demographic variables of the Children.

Variables	Frequency	Percentage (%)
Ages(yrs)		
4-6	58	9.6
7-9	240	39.6
10-12	265	43.7
13-15	39	6.4
16-18	4	0.7
Pupil´s Sex		
female	305	50.3
male	301	49.7
Class present in School		
primary 1	101	16.7
primary 2	101	16.7
primary 3	101	16.7
primary 4	101	16.7
primary 5	101	16.7
primary 6	101	16.7
School type		
public	303	50
private	303	50
Area of residents		
urban	303	50
rural	303	50
Mother´s level of education		
none	30	5
primary	91	15
secondary	202	33.3
tertiary	283	46.7
Mother´s occupation		
civil servant	115	19
trader/business	363	59.9
farmer	45	7.4
clergy	22	3.6
artisan	36	5.9
not working	25	4.1
Father´s level of education		
none	19	3.1
primary	102	16.8
secondary	175	28.9
tertiary	310	51.2
Father´s occupation		
civil servant	170	28.1
trader/business	311	51.3
farmer	62	10.2
clergy	23	3.8
artisan	34	5.6
not working	6	1

Table 1 shows the socio-demographic variables of the children. The age range of the children is between 4 to 16 years. The bulk of the children fall within 10 to 12 years age range (43.7%) while the mean age is 9.47± 2.14.

There are 305(50.3%) females and 301(49.7%) males giving a total of 606 subjects.

Table 2: **BMI for Age-Weight Status Categories of the Children**

Weight Status Categories	Frequency	Percentage (%)
normal weight	494	81.5
overweight	28	4.6
obesity	22	3.6
underweight	62	10.2

Out of 606 children in both urban and rural areas combined, 494(81.5%) had normal weight, 62(10.2%) were under weight while 28(4.6%) and 22(3.6%) had over weight and obesity respectively.

Table 3: Distribution of the BMI for Age-weight status categories between Urban and Rural Areas.

Weight Status Categories	Urban N=303n=(%)	Rural N=303n=(%)	Total N=606n=(%)	X^2	df	p-value
normal weight	250(82.5%)	244(80.5%)	494(81.5%)	8.221	3	0.042
overweight	17(5.6%)	11(3.6%)	28(4.6%)			
obesity	14(4.6%)	8(2.6%)	22(3.6%)			
underweight	22(7.3%)	40(13.2%)	62(10.2%)			
Total	303(100%)	303(100%)	606(100%)			

The above distribution of BMI for age weight status categories between urban and rural areas shows that, in a total of 303 children from the urban area, 250(82.5%) had normal weight, 17(5.6%) over weight, 14(4.6%) obesity and 22(7.3%) under weight. While in a total of 303 children from the rural area, 244(80.5%) had normal weight, 11(3.6%) over weight, 8(2.6%) obesity and 40(13.2%) under weight.

The differences in the distribution of BMI for age weight status categories between urban and rural areas was statistically significant (X^2=8.221, df=3, p=0.042).

Table 4: **BMI Distribution between the Sexes and between Urban and Rural areas**

Weight status Categories	Urban		Rural		X^2	df	p-value
	Male (No. %)	Female (No. %)	Male (No. %)	Female (No. %)	17.206	3	0.001
Underweight	9 (6.0%)	13 (8.6%)	17 (11.3%)	23 (15.1%)			
Normal weight	134 (89.3%)	116 (75.8%)	129 (85.4%)	115 (75.7%)			
Overweight	5 (3.3%)	12 (7.8%)	2 (1.3%)	9 (5.9%)			
Obesity	2 (1.4%)	12 (7.8%)	3 (2%)	5 (3.3%)			
Total	150 (100%)	153 (100%)	151 (100%)	152 (100%)			

The above cross-tabulation shows BMI for age weight status categories distribution between the Sexes and between Urban and Rural areas. There was a statistically significant association between socio-demographic variable of the child-(sex) and the weight status categories among primary school children in urban and rural areas. Sex (X^2=17.206, df=3, p=0.001).

The BMI weight status-(obesity) of the children presented is higher among the Females than the Males and in the urban areas than in the rural areas- (Urban; males 1.4%, females 7.8%. Rural; males 2%, females 3.3%).

Table 5: BMI Distribution between the Ages and between Urban and Rural areas.

Weight status Categories	Urban					Rural					X^2	df	p-value
	Ages (years)					Ages (years)							
	4-6	7-9	10-12	13-15	16-18	4-6	7-9	10-12	13-15	16-18			
Underweight	1(5.3%)	5(15.2%)	1(0.8%)	2(12.8%)	0(0.0%)	3(20.2%)	5(11.3%)	4(8.4%)	1(20%)	_	69.82	36	0.001
Normal weight	6(94.7%)	29(77.1%)	42(88.5%)	5(75.4%)	4((100%)	9(68.7%)	36(82.3%)	34(85%)	3(80%)	_			
Overweight	0(0.0%)	1(3.0%)	4(6.4%)	1(6.7%)	0(0.0%)	1(11.1%)	3(5.6%)	1(1.4%)	0(0.0%)	_			
Obesity	0(0.0%)	2(4.6%)	2(4.3%)	1(5.1%)	0(0.0%)	0(0.0%)	1(0.8%)	2(5.2%)	0(0.0%)	_			
Total	7(100%)	37(100%)	49(100%)	9(100%)	4(100%)	13(100%)	45(100%)	41(100%)	4(100%)	_			

The BMI for age weight status categories distribution indicated above is between the Ages and between Urban and Rural areas. There was a statistically significant association between socio-demographic variable of the child-(Age) and the weight status categories among primary school children in urban and rural areas. Age (X^2=69.82, df=36, p=0.001).

The BMI weight status- (obesity) of the children presented varies with ages. However, bulk of the children between age bracket (7-9, 10-12 and 13-15 years) presented higher BMI weight status- (obesity). Urban areas also presented higher BMI weight status- (obesity) than the rural areas.- (Urban; (7-9 years: 4.6%, 10-12 years : 4.3%, and 13-15 years: 5.1%). Rural; (7-9 years: 0.8%, and 10-12 years: 5.2%, and 13-15 years 0.0%).

Table 6: Cross-tabulation between Socio-demographic Variables of the Parents- Mother (education, occupation) and weight status categories by Area of Residence.

Variables	Categories	Frequency (%)				Total(n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
Mother's level of education	**None**						18.591	9	0.029
	urban	12(80.0%)	0(0.0%)	1(6.7%)	2(13.3%)	15(100%)			
	rural	13(86.7%)	0(0.0%)	0(0.0%)	2(13.3%)	15(100%)			
	Total	25(83.3%)	0(0.0%)	1(3.3%)	4(13.3%)	30(100%)			
	Primary								
	urban	43(81.1%)	0(0.0%)	1(1.9%)	9(17.0%)	53(100%)			
	rural	24(63.2%)	2(5.3%)	2(5.3%)	10(26.3%)	38(100%)			
	Total	67(74%)	2(2.3%)	3(3.3%)	19(21%)	91(100%)			
	Secondary								
	urban	71(80.7%)	11(12.5%)	5(5.7%)	1(1.1%)	88(100%)			
	rural	94(82.5%)	3(2.6%)	2(1.8%)	15(13.2%)	114(100%)			
	Total	165(81.7%)	14(6.9%)	7(3.7%)	16(7.9%)	202(100%)			
	Tertiary								
	urban	124(84.4%)	6(4.1%)	7(4.8%)	10(6.8%)	147(100%)			
	rural	113(83.1%)	6(4.4%)	4(2.9%)	13(9.6%)	136(100%)			
	Total	237(83.7%)	12(4.2%)	11(3.9%)	23(8.1%)	283(100%)			
Mother's occupation	**Civil servant**						34.624	15	0.003
	urban	38(86.4%)	0(0.0%)	3(6.8%)	3(6.8%)	44(100%)			
	rural	56(78.9%)	5(7.0%)	0(0.0%)	10(14.1%)	71(100%)			
	Total	94(81.7%)	5(4.3%)	3(2.6%)	13(11.3%)	115(100%)			
	Trader/business								
	urban	153(84.5%)	6(3.3%)	8(4.4%)	14(7.7%)	181(100%)			
	rural	152(83.5%)	5(2.7%)	6(3.3%)	19(10.4%)	182(100%)			
	Total	305(84.0%)	11(3%)	14(3.9%)	33(9.1%)	363(100%)			
	Farmer								
	urban	18(66.7%)	6(22.2%)	0(0.0%)	3(11.1%)	27(100%)			
	rural	15(83.3%)	0(0.0%)	0(0.0%)	3(16.7%)	18(100%)			
	Total	33(73.3%)	6(13.3%)	0(0.0%)	6(13.3%)	45(100%)			
	Clergy								
	urban	8(72.7%)	3(27.3%)	0(0.0%)	0(0.0%)	11(100%)			
	rural	5(45.5%)	1(9.1%)	2(18.2%)	3(27.3%)	11(100%)			
	Total	13(59.1%)	4(18.2%)	2(9.1%)	3(13.6%)	22(100%)			
	Artisan								
	urban	25(100%)	0(0.0%)	0(0.0%)	0(0.0%)	25(100%)			
	rural	6(54.5%)	0(0.0%)	0(0.0%)	5(45.5%)	11(100%)			
	Total	31(86.1%)	0(0.0%)	0(0.0%)	5(13.9%)	36(100%)			
	Not working								
	urban	8(53.3%)	2(13.3%)	3(20.0%)	2(13.3%)	15(100%)			
	rural	10(100%)	0(0.0%)	0(0.0%)	0(0.0%)	10(100%)			
	Total	18(72%)	2(8%)	3(12%)	2(8%)	25(100%)			

Table 6 shows cross-tabulation between socio-demographic variables of the Parents- Mother (education, occupation) and weight status categories by area of residence. There was a statistically significant association between socio-demographic variables of the Parents-

Mother and weight status categories among primary school children in urban and rural areas.- Mother's level of education (X^2=18.591, df=9, p=0.029), Mother's occupation (X^2=34.624, df=15, p=0.003).

For Mother´s level of education, Weight status categories vary with level of education. Obesity was high among those with tertiary level (3.9%) than those with primary level (3.3%). Underweight was high among those with primary level (21%) than those with tertiary level (8.1%). There are more mothers with tertiary and primary levels of education in the urban than in the rural areas

Obesity was higher among pupils whose mothers were clergy (9.1%), followed by traders/business (3.9%) and lower among pupils whose mothers were civil servant (2.6%). Underweight was higher among pupils whose mothers were artisans (13.9%) and lowest among trader/business (9.1%). There are more mothers who were civil servants in rural than in the urban and more mothers who were artisans and farmers in the urban than in the rural.

Table 7: Cross-tabulation between Socio-demographic Variables of the Parents- Father (education, occupation) and weight status categories by Area of Residence.

Variables	Categories	Frequency (%)				Total(n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
Father's level of education	**None**						14.63	9	0.102
	urban	6(66.6%)	0(0.0%)	0(0.0%)	3(33.3%)	9(100%)			
	rural	8(80.0%)	0(0.0%)	0(0.0%)	2(20.0%)	10(100%)			
	Total	14(73.7%)	0(0.0%)	0(0.0%)	5(26.3%)	19(100%)			
	Primary								
	urban	40(80.0%)	2(4.0%)	6(12.0%)	2(4.0%)	50(100%)			
	rural	38(73.1%)	3(5.8%)	0(0.0%)	11(21.2%)	52(100%)			
	Total	78(76.5%)	5(4.9%)	6(5.9%)	13(12.7%)	102(100%)			
	Secondary								
	urban	51(77.3%)	11(16.7%)	2(3.0%)	2(4.0%)	66(100%)			
	rural	89(81.7%)	2(1.8%)	3(2.8%)	15(13.8%)	109(100%)			
	Total	140(80%)	13(7.4%)	5(2.9%)	17(9.7%)	175(100%)			
	Tertiary								
	urban	153(86.0%)	4(2.2%)	6(3.4%)	15(8.4%)	178(100%)			
	rural	109(82.6%)	6(4.5%)	5(3.8%)	12(9.1%)	132(100%)			
	Total	262(84.5%)	10(3.2%)	11(3.5%)	27(8.7%)	310(100%)			
Father's occupation	**Civil servant**						53.764	15	0.000
	urban	83(86.5%)	2(2.1%)	2(2.1%)	9(9.4%)	96(100%)			
	rural	56(75.7%)	5(6.8%)	0(0.0%)	13(17.6%)	74(100%)			
	Total	139(81.8%)	7(4.1%)	2(1.2%)	22(12.9%)	170(100%)			
	Trader/business								
	urban	123(86.0%)	8(5.6%)	4(2.8%)	8(5.6%)	143(100%)			
	rural	142(84.5%)	5(3.0%)	7(4.2%)	14(8.3%)	168(100%)			
	Total	265(85.2%)	13(4.2%)	11(3.5%)	22(7.1%)	311(100%)			
	Farmer								
	urban	16(76.2%)	2(9.5%)	0(0.0%)	3(14.3%)	21(100%)			
	rural	32(78.0%)	1(2.4%)	1(2.4%)	7(17.1%)	41(100%)			
	Total	48(77.4%)	3(4.8%)	1(1.6%)	10(16.1%)	62(100%)			
	Clergy								
	urban	8(57.1%)	3(21.4%)	3(21.4%)	0(0.0%)	14(100%)			
	rural	6(66.7%)	0(0.0%)	0(0.0%)	3(33.3%)	9(100%)			
	Total	14(60.9%)	3(13.0%)	3(13.0%)	3(13.0%)	23(100%)			
	Artisan								
	urban	20(80.0%)	0(0.0%)	3(12.0%)	2(8.0%)	25(100%)			
	rural	6(66.7%)	0(0.0%)	0(0.0%)	3(33.3%)	9(100%)			
	Total	26(76.5%)	0(0.0%)	3(3.0%)	5(14.7%)	34(100%)			
	Not working								
	urban	0(0.0%)	2(50.0%)	2(50.0%)	0(0.0%)	4(100.0%)			
	rural	2(100%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)			
	Total	2(33.3%)	2(33.3%)	2(33.3%)	0(0.0%)	6(100%)			

Table 7 shows cross-tabulation between socio-demographic variables of the Parents-Father (education, occupation) and weight status categories by area of residence. There was a statistically significant association between socio-demographic variables of the Parents-Father's occupation and weight status categories among primary school children in urban and rural areas.- Father's occupation (X^2=53.764, df=15, p=0.000). Father's level of education was not statistically significant (X^2=14.63, df=9, p=0.102).

For Father´s level of education, Weight status categories vary with level of education. Obesity was high among those with primary level (5.9%) than those with tertiary level (3.5%). Underweight was high among those with primary level (21%) than those with tertiary level (8.1%). There are more fathers with tertiary levels of education in the urban than in the rural areas and more fathers with primary level of education in rural than urban areas.

Obesity was higher among pupils whose fathers were clergy (13.0%), followed by traders/business (3.5%) and lower among pupils whose fathers were civil servant (1.2%). Under weight was higher among pupils whose fathers were farmers (16.1%), artisans (14.7%) and lowest among trader/business (7.1%). There are more fathers who were civil servants,

artisans and clergy in urban than in the rural and more fathers who were traders/business and farmers in the rural than in the urban.

Table 8: Cross tabulation between Dietary patterns and weight status categories by Area of Residence

Variables	Categories	Frequency(%)				Total (n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
Times eaten daily	urban						271.858	9	0.000
	once	5(33.3%)	0(0.0%)	0(0.0%)	10(66.7%)	15(100%)			
	twice	35(67.3%)	6(11.5%)	1(1.9%)	10(19.2%)	52(100%)			
	thrice	168(90.8%)	8(4.3%)	7(3.8%)	2(1.1%)	185(100%)			
	more	42(82.4%)	3(5.9%)	6(11.8%)	0(0.0%)	51(100%)			
	rural								
	once	4(15.40%)	0(0.0%)	0(0.0%)	22(84.6%)	26(100%)			
	twice	45(78.9%)	1(1.8%)	0(0.0%)	11(19.3%)	57(100%)			
	thrice	174(89.2%)	10(5.1%)	4(2.1%)	7(3.6%)	195(100%)			
	more	21(84.0%)	0(0.0%)	4(16.0%)	0(4.3%)	25(100%)			
Restaurant, vendors/fast food consumption							3.431	3	0.33
	occasionally								
	urban	63(80.80%)	2(2.60%)	10(12.80%)	3(3.80%)	78(100%)			
	rural	66(82.50%)	3(3.80%)	3(3.80%)	8(10.00%)	80(100%)			
	frequently								
	urban	14(100%)	0(0.0%)	0(0.0%)	0(0.0%)	14(100%)			
	rural	14(63.60%)	2(9.1%)	1(4.50%)	5(22.7%)	22(100%)			
Soft drink consumption	occasionally						9.168	3	0.027
	urban	150(83.30%)	7(3.90%)	7(3.90%)	16(8.9%)	180(100%)			
	rural	192(79.00%)	9(3.70%)	6(2.50%)	36(14.80%)	243(100%)			
	frequently								
	urban	100(81.30%)	10(8.10%)	7(5.70%)	6(4.90%)	123(100%)			
	rural	48(85.70%)	2(3.60%)	2(3.60%)	4(7.10%)	56(100.%)			

Table 8: Cntd.

Variables	Categories	Frequency(%)				Total (n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
Meat pie consumption	occasionally						8.189	3	0.042
	urban	157(82.2%)	9(4.70%)	8(4.20%)	17(8.90%)	191(100%)			
	rural	175(82.90%)	5(2.40%)	3(1.40%)	28(13.30%)	211(100%)			
	frequently								
	urban	85(81.7%)	8(7.70%)	6(5.8%)	5(4.80%)	104(100%)			
	rural	58(73.40%)	5(6.30%)	5(6.30%)	11(13.90%)	79(100%)			
Biscuit consumption	occasionally						7.94	3	0.047
	urban	123(86.60%)	4(2.80%)	5(3.50%)	10(7.00%)	142(100%)			
	rural	125(81.20%)	6(3.90%)	1(0.6%)	22(14.30%)	154(100%)			
	frequently								
	urban	123(80.40%)	13(8.50%)	9(5.90%)	8(5.20%)	153(100%)			
	rural	114(79.70%)	5(3.50%)	7(4.90%)	17(11.905)	143(100%)			
Bread consumption	occasionally						7.951	3	0.047
	urban	136(82.40%)	8(4.8%)	6(3.6%)	15(9.10%)	165(100%)			
	rural	169(83.7%)	3(1.50%)	4(2.00%)	26(12.90%)	202(100%)			
	frequently								
	urban	106(81.5%)	9(6.90%)	8(6.20%)	7(5.40%)	130(100%)			
	rural	70(75.3%)	6(6.50%)	4(4.30%)	13(14.00%)	93(100%)			
Sweet consumption	occasionally						8.778	3	0.032
	urban	155(84.7%)	9(4.90%)	6(3.30%)	13(7.10%)	183(100%)			
	rural	169(81.3%)	8(3.8%)	3(1.40%)	28(13.50%)	208(100%)			
	frequently								
	urban	89(78.1%)	8(7.00%)	8(7.00%)	9(7.90%)	114(100%)			
	rural	52(75.4%)	3(4.30%)	5(7.20%)	9(13.00%)	69(100%)			

Table 8 shows cross tabulation between dietary pattern and weight status categories by area of residence. There was a statistically significant association between dietary patterns- Times eaten daily and weight status categories among primary school children in urban and rural areas (X^2=271.858, df=9, p=0.000), Soft drink consumption (X^2=9.168, df=3, p=0.027), Meat pie consumption (X^2=10.241, df=3, p=0.017), Biscuit consumption (X^2=7.94, df=3, p=0.047, Bread consumption (X^2= 7.951, df=3, p=0.047), and Sweet consumption (X^2= 8.778,df=3,

p=0.032). Restaurant, vendors/fast food consumption (X^2=3.431, df=3, p=0.33), was statistically not significant.

Table 9: Cross tabulation between Dietary patterns- other pastries and weight status categories by Area of residence

Variables	Categories	Frequency(%)				Total (n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
Other pastries	**Akara**						77.86	51	0.009
	urban	2(100%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)			
	rural	-	-	-	-	-			
	Buns								
	urban	2(100%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)			
	rural	5(100%)	0(0.0%)	0(0.0%)	0(0.0%)	5(100%)			
	Cake								
	urban	103(78.0%)	11(8.3%)	5(3.8%)	13(9.8%)	132(100%)			
	rural	107(74.8%)	6(4.2%)	3(2.1%)	27(18.9%)	143(100%)			
	Cheese ball								
	urban	2(100%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)			
	rural	4(100%)	0(0.0%)	0(0.0%)	0(0.0%)	4(100%)			
	Chin-chin								
	urban	84(90.3%)	6(6.5%)	2(2.2%)	1(1.1%)	93(100%)			
	rural	43(84.3%)	3(5.9%)	1(2.0%)	4(7.8%)	51(100%)			
	Doughnut								
	urban	13(100%)	0(0.0%)	0(0.0%)	0(0.0%)	13(100%)			
	rural	5(100%)	0(0.0%)	0(0.0%)	0(0.0%)	5(100%)			
	Gala								
	urban	8(100%)	0(0.0%)	0(0.0%)	0(0.0%)	8(100%)			
	rural	8(88.9%)	0(0.0%)	1(11.1%)	0(0.0%)	9(100%)			
	Peanut								
	urban	6(75.0%)	0(0.0%)	0(0.0%)	2(25.0%)	8(100%)			
	rural	-	-	-	-	-			
	Pop-corn								
	urban	30(69.8%)	0(0.0%)	7(16.3%)	6(14.0%)	43(100%)			
	rural	28(80.0%)	2(5.7%)	1(2.9%)	4(11.4%)	35(100%)			
	Coco- pop								
	urban	-	-	-	-	-			
	rural	1(100%)	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)			
	Egg roll								
	urban	-	-	-	-	-			
	rural	1(50%)	0(0.0%)	0(0.0%)	1(50%)	2(100%)			
	Fish pie								
	urban	-	-	-	-	-			
	rural	1(50%)	0(0.0%)	0(0.0%)	1(50%)	2(100%)			
	Fish roll								
	urban	-	-	-	-	-			
	rural	2(50%)	0(0.0%)	2(50%)	0(0.0%)	4(100%)			
	Groundnut								
	urban	-	-	-	-	-			
	rural	3(100%)	0(0.0%)	0(0.0%)	0(0.0%)	3(100%)			
	Moi-moi								
	urban	-	-	-	-	-			
	rural	1(100%)	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)			
	Mr. fruits								
	urban	-	-	-	-	-			
	rural	2(100%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)			
	Pan-cake								
	urban	-	-	-	-	-			
	rural	1(100%)	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)			
	Nil								
	urban	-	-	-	-	-			
	rural	32(91.4%)	0(0.0%)	0(0.0%)	3(8.6%)	35(100%)			

Above is the cross tabulation between dietary pattern -other pastries and weight status categories by area of residence. There was a statistically significant association between other pastries and weight status categories among primary school children in urban and rural areas- Akara, Buns, Cake, Cheese ball, Chin-chin, Doughnut, Gala, Peanut, Pop-corn**,** Coco-pop, Egg roll, Fish pie, Fish roll, Groundnut, Moi-moi, Mr. Fruits, Pan-cake (X^2=77.86, df=51, p=0.009).

Table 10: Cross tabulation between Dietary patterns and Obesity by Area of Residence

Variables	Categories	Frequencies(%) obesity (n= 22)	Total (n=606)	X^2	df	p-value
Times eaten daily	**urban**			24.144	3	0.000
	once	0(0.0%)	15(100%)			
	twice	1(1.9%)	52(100%)			
	thrice	7(3.8%)	185(100%)			
	more	6(11.8%)	51(100%)			
	rural					
	once	0(0.0%)	26(100%)			
	twice	0(0.0%)	57(100%)			
	thrice	4(2.1%)	195(100%)			
	more	4(16.0%)	25(100%)			
Restaurant, vendors/fast food consumption				1.301	1	0.254
	occasionally					
	urban	10(12.80%)	78(100%)			
	rural	3(3.80%)	80(100%)			
	frequently					
	urban	0(0.0%)	14(100%)			
	rural	1(4.50%)	22(100%)			
Soft drink consumption	**occasionally**			1.365	1	0.243
	urban	7(3.90%)	180(100%)			
	rural	6(2.50%)	243(100%)			
	frequently					
	urban	7(5.70%)	123(100%)			
	rural	2(3.60%)	56(100.%)			
Meat pie consumption	**occasionally**			3.726	1	0.054
	urban	8(4.20%)	191(100.%)			
	rural	3(1.40%)	211(100%)			
	frequently					
	urban	6(5.8%)	104(100%)			
	rural	5(6.30%)	79(100%)			
Biscuit consumption	**occasionally**			4.721	1	0.030
	urban	5(3.50%)	142(100%)			
	rural	1(0.6%)	154(100%)			
	frequently					
	urban	9(5.90%)	153(100%)			
	rural	7(4.90%)	143(100%)			
Bread consumption	**occasionally**			2.727	1	0.099
	urban	6(3.6%)	165(100%)			
	rural	4(2.00%)	202(100%)			
	frequently					
	urban	8(6.20%)	130(100%)			
	rural	4(4.30%)	93(100%)			
Sweet consumption	**occasionally**			7.799	1	0.005
	urban	6(3.30%)	183(100%)			
	rural	3(1.40%)	208(100%)			
	frequently					
	urban	8(7.00%)	114(100%)			
	rural	5(7.20%)	69(100%)			

Table 10 shows cross tabulation between dietary patterns and obesity by area of residence. There was a statistically significant association between dietary patterns- Times eaten daily and obesity among primary school children in urban and rural areas (X^2=24.144 df=3, p=0.000), Meat pie consumption (X^2=3.726, df=1, p=0.054), Biscuit consumption (X^2=4.721, df=1, p=0.030), and Sweet consumption (X^2= 7.799, df=1, p=0.005). Restaurant, vendors/fast food consumption (X^2=1.301, df=1, p=0.254), Soft drink consumption (X^2=1.365, df=1, p=0.243) and Bread consumption (X^2=2.727, df=1, p=0.099) were statistically not significant.

Table 11: Cross tabulation between Dietary patterns-other pastries and Obesity by Area of Residence

Variables	Categories	Frequencies (%)	Total (n=606)	X^2	df	p-value
		obesity (n= 22)				
Other pastries	**Akara**			39.327	17	0.002
	urban	0(0.0%)	2(100%)			
	rural	-	-			
	Buns					
	urban	0(0.0%)	2(100%)			
	rural	0(0.0%)	5(100%)			
	Cake					
	urban	5(3.8%)	132(100%)			
	rural	3(2.1%)	143(100%)			
	Cheese ball					
	urban	0(0.0%)	2(100%)			
	rural	0(0.0%)	4(100%)			
	Chin-chin					
	urban	2(2.2%)	93(100%)			
	rural	1(2.0%)	51(100%)			
	Doughnut					
	urban	0(0.0%)	13(100%)			
	rural	0(0.0%)	5(100%)			
	Gala					
	urban	0(0.0%)	8(100%)			
	rural	1(11.1%)	9(100%)			
	Peanut					
	urban	0(0.0%)	8(100%)			
	rural	-	-			
	Pop-corn					
	urban	7(16.3%)	43(100%)			
	rural	1(2.9%)	35(100%)			
	Coco- pop					
	urban	-	-			
	rural	0(0.0%)	1(100%)			
	Egg roll					
	urban	-	-			
	rural	0(0.0%)	2(100%)			
	Fish pie					
	urban	-	-			
	rural	0(0.0%)	2(100%)			
	Fish roll					
	urban	-	-			
	rural	2(50%)	4(100%)			
	Groundnut					
	urban	-	-			
	rural	0(0.0%)	3(100%)			
	Moi-moi					
	urban	-	-			
	rural	0(0.0%)	1(100%)			
	Mr. fruits					
	urban	-	-			
	rural	0(0.0%)	2(100%)			
	Pan-cake					
	urban	-	-			
	rural	0(0.0%)	1(100%)			
	Nil					
	urban	-	-			
	rural	0(0.0%)	35(100%)			

Table 11 shows cross tabulation between dietary pattern- other pastries and obesity by area of residence. There was a statistically significant association between other pastries and obesity among primary school children in urban and rural areas- Akara, Buns, Cake, Cheese ball,

Chin-chin, Doughnut, Gala, Peanut, Pop-corn**,** Coco-pop, Egg roll, Fish pie, Fish roll, Groundnut, Moi-moi, Mr. Fruits, Pan-cake (X^2=39.327, df=17, p=0.002).

Table 12: **Cross tabulation between Physical activities and weight status categories by Area of Residence**

Variables	Categories	Frequency(%)				Total (n=606)	X^2	df	p-value
		normal weight (n=494)	overweight (n=28)	obesity (n= 22)	underweight (n=62)				
(In-door games)									
Playing of Video games	**occasionally**						9.187	3	0.027
	urban	142(87.1%)	5(3.1%)	7(4.3%)	9(5.5%)	163(100%)			
	rural	145(82.4%)	5(2.8%)	3(1.7%)	23(13.1%)	176(100%)			
	frequently								
	urban	84(77.1%)	8(7.3%)	5(4.6%)	12(11.0%)	109(100%)			
	rural	47(75.8%)	6(9.7%)	4(6.5%)	5(8.1%))	62(100%)			
Watching of Television	**occasionally**						9.796	3	0.020
	urban	124(84.9%)	10(6.8%)	5(3.4%)	7(4.8%)	146(100%)			
	rural	165(84.6%)	3(1.5%)	1(0.5%)	26(13.3%)	195(100%)			
	frequently								
	urban	124(81.0%)	5(3.3%)	9(5.9%)	15(9.8%)	153(100%)			
	rural	75(72.1%)	8(7.7%)	7(6.7%)	14(13.5%)	104(100%)			
Use of Computer	**occasionally**						8.441	3	0.038
	urban	65(86.7%)	2(2.7%)	2(2.7%)	6(8.0%)	75(100%)			
	rural	61(70.9%)	3(3.5%)	2(2.3%)	20(23.3%)	86(100%)			
	frequently								
	urban	18(75.0%)	2(8.3%)	2(8.3%)	2(8.3%)	24(100%)			
	rural	14(82.4%)	2(11.8%)	1(5.9%)	0(0.0%)	17(100%)			
Surfing internet (browsing)	**occasionally**						10.241	3	0.017
	urban	37(90.2%)		2(4.9%)	2(4.9%)	41(100%)			
	rural	45(80.4%)	1(1.8%)	1(1.8%)	9(16.1%)	56(100%)			
	frequently								
	urban	10(55.6%)		5(27.8%)	3(16.7%)	18(100%)			
	rural	11(78.6%)	1(7.1%)	1(7.1%)	1(7.1%)	14(100%)			
(Out-door games)									
Playing of games,sports or exercise	**occasionally**						8.545	3	0.036
	urban	139(78.1%)	14(7.9%)	11(6.2%)	14(7.9%)	178(100%)			
	rural	179(79.2%)	9(4.0%)	8(3.5%)	30(13.3%)	226(100%)			
	frequently								
	urban	111(88.8%)	3(2.4%)	3(2.4%)	8(6.4%)	125(100%)			
	rural	65(84.4%)	2(2.6%)	0(0.0%)	10(13.0%)	77(100%)			
Means of Transportation to School	**trekking**						18.467	9	0.030
	urban	182(83.1%)	11(5.0%)	7(3.2%)	19(8.7%)	219(100%)			
	rural	150(82.0%)	4(2.2%)	3(1.6%)	26(14.2%)	183(100%)			
	bicycle								
	urban	20(83.3%)	4(16.7%)	0(0.0%)	0(0.0%)	24(100%)			
	rural	12(70.6%)	0(0.0%)	0(0.0%)	5(29.4%)	17(100%)			
	vehicle								
	urban	40(76.9%)	2(3.8%)	7(13.5%)	3(5.8%)	52(100%)			
	rural	82(81.2%)	7(6.9%)	5(5.0%)	7(6.9%)	101(100%)			
	others								
	urban	8(100%)	0(0.0%)	0(0.0%)	0(0.0%)	8(100%)			
	rural	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)	2(100%)			

Table12 shows cross-tabulation between physical activities and weight status categories by area of residence. There was a statistically significant association between physical activities and weight status categories among primary school children in urban and rural areas. Indoor games- (Playing of video games (X^2=9.187, df=3, p=0.027), Watching of Television

(X^2=9.796, df=3, p=0.020), Use of Computer (X^2=8.441, df=3, p=0.038), Surfing internet (browsing) (X^2=10.241, df=3, p=0.017)), Outdoor games-(Playing of games, sports or exercise- athletics (X^2=8.545, df=3, p=0.036)) and Means of Transportation to School (X^2=18.467, df =9, p=0.030).

Indoor games or games with less physical activities- (playing playing of video games, watching of television, use of computer and surfing of internet (browsing)) on frequent basis tends to increase weight status categories while on occasional basis tends to decrease weight status categories in the urban and rural areas.

Outdoor games or physically active games- (playing of games, sport or exercises- athletics e.g running, jumping etc.) on frequent basis tends to decrease weight status categories while occasional engagement increases it in the urban and rural areas.

Means of transportation- such as trekking, bicycle and others- (skating, motor cycle etc.) tends to decrease weight status categories while vehicles increases weight status categories in the urban and in the rural areas.

Table 13: Cross tabulation between Physical activities and Obesity by Area of Residence

Variables	Categories	Frequencies (%) obesity (n= 22)	Total (n=606)	X^2	df	p-value
In-door games						
Playing of Video games	**occasionally**			1.696	1	0.193
	urban	7(4.3%)	163(100%)			
	rural	3(1.7%)	176(100%)			
	frequently					
	urban	5(4.6%)	109(100%)			
	rural	4(6.5%)	62(100%)			
Watching of Television	**occasionally**			8.249	1	0.004
	urban	5(3.4%)	146(100%)			
	rural	1(0.5%)	195(100%)			
	frequently					
	urban	9(5.9%)	153(100%)			
	rural	7(6.7%)	104(100%)			
Use of Computer	**occasionally**			2.281	1	0.131
	urban	2(2.7%)	75(100%)			
	rural	2(2.3%)	86(100%)			
	frequently					
	urban	2(8.3%)	24(100%)			
	rural	1(5.9%)	17(100%)			
Surfing internet (browsing)	**occasionally**			9.089	1	0.003
	urban	2(4.9%)	41(100%)			
	rural	1(1.8%)	56(100%)			
	frequently					
	urban	5(27.8%)	18(100%)			
	rural	1(7.1%)	14(100%)			
Out-door games						
Playing of games,sports or exercise	**occasionally**			3.986	1	0.046
	urban	11(6.2%)	178(100%)			
	rural	8(3.5%)	226(100%)			
	frequently					
	urban	3(2.4%)	125(100%)			
	rural	0(0.0%)	77(100%)			
Means of Transportation to School	**trekking**			11.183	3	0.011
	urban	7(3.2%)	219(100%)			
	rural	3(1.6%)	183(100%)			
	bicycle					
	urban	0(0.0%)	24(100%)			
	rural	0(0.0%)	17(100%)			
	vehicle					
	urban	7(13.5%)	52(100%)			
	rural	5(5.0%)	101(100%)			
	others					
	urban	0(0.0%)	8(100%)			
	rural	0(0.0%)	2(100%)			

Table 13 shows cross-tabulation between physical activities and obesity by **area of residence**. There was a statistically significant association between physical activities and obesity among primary school children in urban and rural areas-Indoor games- (Watching of Television (X^2=8.249, df=1, p=0.004), Surfing internet (browsing) (X^2=9.089, df=1,

p=0.003)), Outdoor games-(Playing of games, sports or exercise-(athletics e.g running, jumping etc.) (X^2=3.986, df=1, p=0.046), and Means of Transportation to School (X^2=11.183, df =3, p=0.011). Playing of video games (X^2=1.696, df=1, p=0.193) and Use of Computer (X^2=2.281, df=1, p=0.131) were statistically not significant.

In-door games such as watching of television and surfing of internet frequently tends to increase obesity while an occasional involvement in similar activities decreases obesity in the urban and rural areas.

Out-door games or physically active games- (playing of games, sport or exercises- athletics e.g running, jumping etc.) frequently tends to decrease obesity while occasionally increases obesity in the urban and rural areas.

Means of transportation-such as trekking, bicycle and others-(skating, motor cycle etc.) tends to decrease weight status categories while vehicles increases weight status categories in the urban and in the rural areas.

DISCUSSION

A total of six hundred and six (606) children in age group 4-16 years were studied and analyzed. Out of 606 children in both urban and rural areas combined, 494(81.5%) had normal weight, 62(10.2%) were under weight while 28(4.6%) and 22(3.6%) had over weight and obesity respectively.

In a total of 303 children from the urban area, 250(82.5%) had normal weight, 17(5.6%) over weight, 14(4.6%) obesity and 22(7.3%) under weight. While in a total of 303 children from the rural area, 244(80.5%) had normal weight, 11(3.6%) over weight, 8(2.6%) obesity and 40(13.2%) under weight. There were higher proportion of subjects with normal BMI in Urban than rural (82.5% vs 80.5%; urban also had higher proportions of overweight /obesity than rural areas while the rural areas had higher proportions of underweight subjects. The differences in the distribution of BMI for age weight status categories between urban and rural areas were statistically significant (X^2=8.221, df=3, p=0.042).

This fairly compares with reported findings in some countries and regions of the world and was lower than the prevalence of obesity of 8.2% for children from Kuwait Canning *et al*., (2004), prevalence of overweight or obesity of 25.6% for children from Canada (WHO, 1996) and prevalence of obesity of 32% for the same age group of children from USA (WHO, 2000). A study among 898 adolescent girls in the United Arab Emirates revealed that 14 percent of subjects were overweight and 9 percent were obese, according to the CDC criteria (Al-Hourani *et al*., 2003). This was also higher than that reported in this study. In a study of secular trends in childhood obesity among adolescents aged 11- 17 years in Greece, the prevalence of overweight and obesity were 19.0 percent and 2.6 percent respectively (Krassas *et al*., 2001). This was higher than the prevalence of overweight but lower than the prevalence of obesity in this study.

In the developing countries, like Iran, the prevalence of overweight among youths aged 6 - 18 years doubled from 4.2 percent to 8.3 percent between 1993 and 1999 (Kelishadi, *et al.,* 2001).In a recent report from Sri Lanka, the prevalence of overweight in adolescents aged 10 - 15 years was reported to be 2.2 percent (Jayatissa and Ranbanda, 2006). The former was higher than over weight prevalence in this study whereas the latter was lower.

In another study in Coimbatore district among a total of 890 children aged 5-15 years, prevalence of overweight was 8.32% and obesity 4.72 %. This was higher than both over weight and obesity prevalence found in this study (Karthikeyan *et al*., 2016).

In Africa, Sobngwi *et al.*, (2002) observed that 22% of the urban population and 1.8% of rural population in Cameroon were overweight and obese among children of age > or= 15 years. This was higher than obesity prevalence in the urban areas but lower than obesity prevalence reported in this study, in the rural areas.

In Nigeria; South-West - A study done to determine the prevalence of overweight and obesity using data on 720 children aged 6-18 years in Ile-Ife showed that 2.8% and 0.8% were overweight and obese respectively. Females were more likely than males to be obese (Adegoke *et al.*, 2009 Unpublished report).

This was lower than the prevalence of overweight and obesity in this study. Also, Owa and Adejuyigbe (1997) recorded obesity prevalence of 18% among school age children in his study conducted using the multistage cluster sampling technique in Ifewara, a rural community in Osun State, Nigeria; identified the prevalence of overweight and obesity in this rural community among the preschool age children to be 13.7 and 5.2%, respectively. It was higher than that reported in this study.

In the South-South - Studies also showed obesity prevalence of 5.7% in Port Harcourt and 11.1% in Uyo respectively (Okoh *et al*., 2012; Opara *et al.*, 2010). There were higher than the prevalence reported in this study. Similar findings were obtained in another study conducted in Calabar, among 1,005 children and adolescents aged 6-18 years resident within the state. The results showed that the prevalence of obesity was 2.3% in the children aged 6-12 years (Ansa *et al*., 2001). This was lower than that reported in this study.

In the South-East, reported prevalence of obesity was 6.7% in Abia (Odenigbo *et al*., 2010), and over weight of 4.1% in Anambra (Nwabueze *et al.*, 2015).This was higher than obesity prevalence in this study but lower than over weight prevalence.

A cross-sectional study of 1,599 children and adolescents 5 to 18 years of age was also conducted in four urban towns (Lagos, Port Harcourt, Nsukka, and Aba) in southern Nigeria. It showed a prevalence rate of 11.4% and 2.8% for overweight, obesity respectively (Ene-Obong *et al*., 2012). All were lower in obesity prevalence as compared to this study.

In the North Central- a related study was done in the three senatorial districts in Benue State to assess the demographic variation in the prevalence of overweight and obesity using 3240 children aged 9 to 16 years. The results showed that 88.5% had normal weights, 9.7% were overweight and 1.8% were obese. Females (20.3%) were more likely to be overweight than boys (16.2%) (Musa *et al.*, 2012).This was lower than obesity prevalence in this study.

In the North West- The prevalence of overweight was 3.3%, and that of obesity was 1.4%. according to a study conducted among three hundred and sixty (360) apparently healthy students aged 10-18years, drawn from the secondary schools within Sokoto metropolis (state capital) (Ahmad *et al*., 2013).

In the North East- The prevalence of overweight was 3.7%, and that of obesity was 2.8%. According to a study conducted among 450 apparently healthy students aged 11 and 18years,

of children and adolescents in both public and private schools from primary to secondary levels within Gombe state (Alkali *et al*., 2015).

These findings suggest that, despite the harsh economic situation in Nigeria, further deepened by poverty in the wake of the Corona Virus Disease 2019 (COVID-19) pandemic and its economic fallout, the prevalence of obesity among primary school children in urban and rural areas of Anambra state perhaps Nigeria in general is high, in line with the global trend (WHO, 2015). This is probably, as a result of an increased intake of energy-dense foods that are high in fat and sugars; and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization (WHO, 2005).

Also, childhood obesity is increasingly being observed with the changing lifestyle of families with increased purchasing power, increasing hours of inactivity, sedentary lifestyles-(modern day smoking) due to addiction to television, video games and computer, which have replaced outdoor games and other social activities (Singh and Sharma, 2005).

The seeming differences between the prevalence of overweight and obesity in this study and other regions in the same country or in different countries of the world, may be due to both genetic susceptibility (Deshmukh-Taskar *et al*., 2006) and lifestyle differences-(dietary patterns and physical activities) between these children. Also, different cultural background could have an influence according to a study among high School students in Pattani province of Thailand (Manosh *et al*., 2006). It reported that the process of development of childhood obesity could vary in populations with different cultural backgrounds. It would therefore be a useful study to examine the cultural factors influencing the development of childhood overweight and obesity. However, these differences in the prevalence of overweight and obesity could also be due to the definitions used, age group and sex taken for the study, uniformity of selection of the sample, the methodology used for the survey and the use of different BMI cutoff reference standards. The results of this study and others presented above demonstrate clearly that the prevalence of overweight and obesity among primary school children in urban and rural areas of Anambra state perhaps Nigeria in general are still far lower than what is obtainable in the developed countries of the world. However since obesity is associated with increasing socioeconomic development, improvement in the standard of living of the people without corresponding preventive and control measures, Nigeria may eventually result in a similar rise in the prevalence of overweight and obesity among the children in foreseeable future, with consequent increase in morbidity and mortality or its implication on the health of the future adult population if not checked (Singh *et al.,* 2008).

In this study, the BMI weight status- (obesity) of the children presented varied with ages. However, bulk of the children between age bracket (7-9 years, 10-12 years and 13-15 years) presented higher BMI weight status- (obesity). Urban areas also presented higher BMI weight status- (obesity) than the rural areas.- (Urban; (7-9 years: 4.6%, 10-12 years : 4.3%, and 13-15 years: 5.1%). Rural; (7-9 years: 0.8%, and 10-12 years: 5.2%, and 13-15 years 0.0%)) p= 0.001.

This study also found that, The BMI weight status-(obesity) of the children was higher among the Females than the Males, and in the urban areas than in the rural areas- (Urban; males 1.4%, females 7.8%. Rural; males 2%, females 3.3%) p= 0.001.

There was a statistically significant association between socio-demographic variables of the child-(age, sex) in the occurrence of obesity among primary school children in urban and rural areas.

In a study in Saudi Arabia (Mohsen *et al*., 2002),the overall prevalence of childhood overweight was 10.7 percent and 12.7 percent in boys and girls, respectively, and the prevalence of obesity was 6.0 percent and 6.7 percent in boys and girls, respectively.

In a nationwide study of Brazilian adolescents aged 10 - 19 years the prevalence of overweight and obesity according to the CDC cutoff values was 7.7 percent, reaching 10.6 percent within the female group and 4.8 percent within the male group (Neutzling *et al*., 2000).

A related study was done in the three senatorial districts in Benue State to assess the demographic variation in the prevalence of overweight and obesity using 3240 children aged 9 to 16 years. The results showed that 88.5% had normal weights, 9.7% were overweight and 1.8% were obese. Females (20.3%) were more likely to be overweight than boys (16.2%) (Musa *et al.*, 2012).

A related study done to determine the prevalence of overweight and obesity using data on 720 children aged 6-18 years in Ile-Ife, Nigeria. The results showed that 2.8% and 0.8% were overweight and obese respectively. Females were more likely than males to be obese (Adegoke *et al*., 2009 Unpublished report). Similar findings were obtained in another study conducted in Calabar, Nigeria, among 1,005 children and adolescents aged 6- 18 years resident within the state. The results showed that the prevalence of obesity was 2.3% in the children aged 6-12 years. The BMI was higher in females than in the males. The researchers speculated that this gender difference may be attributed to various factors, which include the onset of puberty, a period when females acquire more body fat than males, who gain more amounts of muscle and bone in addition to becoming more physically active (Ansa *et al*., 2001).

A related study to assess feeding practices and determinants of the nutritional status of pupils in a public primary school in Aladinma Owerri, also showed statistically significant associations between Body Mass Index for age (Under weight, Normal and Overweight cum Obese) and sex (p=0.0121) (Nnebue *et al.,* 2016).

Contrary to the findings of this study and most of other studies, overall prevalence of obesity was higher in males than in females. For instance, a study in Greek school-aged children and adolescents, values obtained using Center for Disease Control (CDC) growth charts were 8.1 percent of girls and 18.8 percent of boys for overweight and 1.7 percent of girls and 5.8 percent of boys for obesity (Karayiannis *et al.*, 2003).

In 2000, a study performed among adolescents aged 10-14 years in Kuwait revealed very high prevalence of overweight (31.8 percent of girls and 30.0 percent of boys) and obesity (13.1 percent of girls and 14.7 percent of boys) (Al-Isa, 2004).

In China, a study of children aged 9 - 16 years in Dalian, 22.9 percent of boys and 10.4 percent of girls were overweight, which was a higher prevalence than that indicated in Chinese national surveys in 2006 (Zhou *et al.,* 2006).

In a recent population-based study in Qatar, based on the IOTF cutoffs, the prevalence of overweight and obesity were 28.6 percent and 7.9 percent, respectively, among adolescent boys and 18.9 percent and 4.7 percent, respectively, among girls. The prevalence of obesity

was highest at 12 years of age among boys (11.7 percent) and at 13 years among girls (6.4 percent) (Bener, 2006). This was attributed to the differences in lifestyles between boys and girls. However, besides differences in lifestyles between boys and girls, it is likely that adolescent girls at this age might be more concerned with their physical appearance and would probably desire a slim body than boys (Swami *et al*., 2007).

In this study, Obesity was more among pupils whose mothers have more education and Underweight was more among pupils whose mothers have less education. There were more educated mothers in the urban than in the rural areas. This study agrees with the findings in a study to assess feeding practices and determinants of the nutritional status of pupils in a public primary school in Aladinma Owerri, The result showed that there was a statistically significant associations between Body Mass Index for age (Under weight, Normal and Overweight cum Obese) and mothers' educational status (p=0.001) (Nnebue *et al.*, 2016).

Chaparro and Koupil, (2014) through their study on three generations of Swedish men and women; to investigate the impact of parental educational trajectories on their adult offspring's overweight/obesity status; concluded that " Socio-economic inequalities can have long-term consequences and impact the health of future generations. For overweight/obesity in their concurrent young cohorts, this inequality was not fully offset by an upward educational trajectory in their parent's generation" .

This study showed that, Obesity was higher among pupils whose mothers were clergy, followed by traders/business and lower among pupils whose mothers were civil servant. Under weight was higher among pupils whose mothers were artisans and lowest among trader/business. There are more mothers who were civil servants in rural than in the urban and more mothers who were artisans and farmers in the urban than in the rural. The association between mother´s occupation and weight status categories was statistically significant.

This study also showed that, Obesity was higher among pupils whose fathers were clergy, followed by traders/business and lower among pupils whose fathers were civil servant. Under weight was higher among pupils whose fathers were farmers, artisans and lowest among trader/business. There are more fathers who were civil servants, artisans and clergy in urban than in the rural and more fathers who were traders/business and farmers in the rural than in the urban. The association between father´s occupation and weight status categories was statistically significant.

These findings aligned with the presumption that parental and familial characteristics like occupation are presumed to have an impact on offspring's obesity status not only through shared genes but also through shared environments that determine nutrition and physical activity patterns early in life, as well as through the interaction of both (Martin, 2008). The variations in mothers' occupation and weight status categories may have been influenced by total lockdown on the economy of Nigeria- (Anambra state inclusive) following an outbreak of COVID-19 pandemic, protracted industrial action without pay e.g Academic Staff Union of the University (ASUU) Strike. Other economic challenges were End- Special Anti-Robbery Squad (EndSARS) riot, drop in oil prices in the international market (IMF, 2020a), hike in electricity tariff and pump price of petrol, shutting down of Nigeria land borders (PTF, 2020), security challenges, massive retrenchment of workers in the private sectors due to inability to pay salaries (IMF, 2020b), hoarding of COVID-19 relief materials by the elites in the political class and monarchs etc., in 2020 where this study was conducted.

In this study, Obesity was more among pupils whose fathers have less education and Under-weight was more among pupils whose fathers still have less education. There were fathers with more education in the urban than in the rural areas. However, there was no statistically significant association between weight status categories and fathers´ level of education. This was contrary to the study which showed that father's level of education had a statistically significant association with the weight for age of the pupils and underweight was commoner among the pupils whose fathers have lower educational level (Must et al., 1992). This may be due to a total lockdown on the economy of Nigeria- (Anambra state inclusive) following an outbreak of Corona Virus Disease 2019 (COVID-19) pandemic in 2020 which lasted for over 6months- (almost first three quarters of 2020) (FGN, 2020). The lockdown, however, prevented many Nigerians working in informal sectors - (non essential workers) in which more than 80 percent of Nigerians work, including a wide range of occupations, from street traders, taxi drivers, tradesmen, and artisans to food vendors and hairdressers from traveling to work or conducting their business. " Millions of Nigerians observing the COVID-19 lockdown lacked the food and income that their families need to survive, (said Anietie Ewang, Nigeria researcher at Human Rights Watch). Also people in the formal sectors were not left behind as some ministries, department and agencies could not pay salaries, some states sliced their workers' salaries to cut down the cost of governance (IMF, 2020b), others were on protracted industrial action without pay e.g Academic Staff Union of the University (ASUU) Strike. Other economic challenges were EndSARS riot, drop in oil prices in the international market (IMF, 2020a), hike in electricity tariff and pump price of petrol, shutting down of Nigeria land borders (PTF, 2020), security challenges, massive retrenchment of workers in the private sectors due to inability to pay salaries (IMF, 2020b), hoarding of Corona Virus Disease 2019 (COVID-19) relief materials by the elites in the political class and monarchs etc. Leaving thousand and one families to their fate where a lot of families go to bed on empty stomach and some targeted credit facility " to support their households as well as their micro, small and medium enterprises affected by the COVID-19 pandemic." However, most families scrambled for survival irrespective of their level of education (For instance, a father who is also a lecturer in Alex Ekwueme Federal University Ndufu Alike Ịkwo (AE-FUNAI) in Ebonyi State, Kyrian Nwoke resorted to taxi driving to make an earns meet but was suddenly waylaid and killed by unknown gunmen while dropping off a passenger-punch newspaper Jan 13, 2021), many graduates especially the young fathers couldn´t secure a job but engage themselves in whatever that put food on their table not minding their educational status, while some were still standing strong despite the harsh economy. With all these economic misfortunes (IMF, 2020b) in 2020 where this study was conducted, these brought about a slight different in what was obtainable in the past studies and the presumption that parental and familial characteristics like literacy level are presumed to have an impact on offspring's obesity status not only through shared genes but also through shared environments that determine nutrition and physical activity patterns early in life, as well as through the interaction of both Martin, (2008).

This study found a statistically significant association between dietary patterns-Times eaten daily and obesity among primary school children in urban and rural areas (p=0.000), children who eat thrice or more daily were more obese. This is consistent with a study to assess feeding practices and determinants of the nutritional status of pupils in a public primary school in Aladinma Owerri, which found that, out of 300 subjects studied, two hundred and sixty five (88.3%) of them fed at least thrice daily, 92(30.7%) skipped breakfast regularly, while 215(71.7%) had school meals during break period. There were statistically significant associations between Body Mass Index for age (Under weight, Normal and Overweight cum Obese) and number of meals per day (p=0.005) (Nnebue *et al.,* 2016).

Kafyulilo and Mafumiko, (2010) reported that the quality of nutritious food consumed by children at their homes was found to be another important determinant of overweight and obesity among school children. It was found that majority of children in rural areas were getting one or two meals per day. More than 20% of the rural school children reported to stay the whole day without anything to eat. They said, their residences were located far from school. Thus they faced difficulties to go home for lunch. They used to get only dinner or leftovers in the morning if they happened to be available. These hardships were hardly experienced by urban school children, who reported to get three to four meals per day. In addition to the number of meals, urban children were getting meals with plenty of fats or oils such as fried meat, canned foods and other junk foods. On the other hand, rural children were getting low quality food contents (Kafyulilo and Mafumiko, 2010).It was further revealed that about 96% of urban school children were having something to eat at school out of the normal eating routine. For example, urban children were buying ice-cream, chew gums, chocolates and fruits at school a pattern that was not observed among rural children. Urban children were in addition eating food with a lot of oils added in, blue band, and other fatty components for increasing flavour (Kafyulilo and Mafumiko, 2010).

This study found a statistically significant associations between dietary patterns-Meat pie consumption and obesity among primary school children in urban and rural areas (p=0.054) and Children who consumed meat pie frequently were more obesed. This agrees with Park, (2005) which stated that eating habits such as preference to sweets, refined foods and fats are established very early in life, and that the periodicity with which they are eaten are relevant to the aetiology of obesity. Meat pies are known to often contain a lot of hidden fat from the mode of their preparation during baking.

This study found a statistically significant associations between dietary patterns-Biscuit consumption and obesity among primary school children in urban and rural areas (p=0.030) and Children who consumed biscuit frequently were more obesed. This appears similar to Park, (2005); Biscuit, like meat pie also contains excess carbohydrates and hidden fat which cause obesity. Researchers have discovered that carbohydrate over feeding produced 75-85% excess energy being stored as body fat, and fat overfeeding produced 90-95% storage of excess energy as body fat (Kafyulilo, 2006 Unpublished B.Ed (PESC)).

This study found a statistically significant association between dietary patterns-Sweet consumption and obesity among primary school children in urban and rural areas (p=0.005) and Children who consumed sweet frequently were more obesed. This agrees with Te Morenga et al., (2013). Dietary sugars and body weight: systematic review and meta-analyses of randomized controlled trials and cohort studies: The result of the meta-analysis suggests that intake of sugars is a determinant of body weight in free living people consuming ad libitum diets. The data suggest that the change in body fat that occurs with modifying intake of sugars results from an alteration in energy balance rather than a physiological or metabolic consequence of monosaccharides or disaccharides (Manosh *et al*., 2006). The evidence is solid that caloric sweetened beverages (CSBs) are associated with excess weight gain, as reviewed in a meta-analysis of 30 studies published in 2006 (Malik *et al*., 2006). CSBs may act by several mechanisms, including by increasing fructose. In children, the largest dietary source of fructose (a lipogenic sugar) is CSBs (Vos *et al*., 2008), which provide extra calories that are somehow less recognized" than solid food, and which replace milk and decrease calcium consumption (Keller *et al.,* 2009). In a longitudinal study of girls, Fiorito *et al*., (2009), showed that CSB consumption is moderately stable over time, that the increased BMI associated with this consumption is durable, and that, when present in a 5-year-old child, increased BMI will persist into adolescence. Lim *et al.,* (2009) prospectively followed young

(3-5 years old) African American children, and showed that increased fruit juice and CSB intake at baseline predicted increased weight gain at follow-up 2 years later. In the study by Fiorito *et al*., (2009), no associations with weight were found for fruit juice, but the difference in the two studies likely is from the length of follow-up, because fruit juice consumption decreases as children age and thus would have less effect in adolescents. Although the amount of CSB consumed in childhood does not seem to be associated with BMI in adulthood, in a 21-year, longitudinal study of Finnish children (Nissinen, 2009), increases in CSB intake over time predicted increased BMI in women, suggesting that the persistent intake of CSB promotes weight gain.

However, Soft drink consumption (p=0.243) was not significant, This could be due to children´s preference for sweets which are many per pack (quantity) and can be used all day round compared to same worth of soft drink which will finish after few sips.

Other pastries consumption increases obesity among primary school children in urban and rural areas- Akara, Buns, Cake, Cheese ball, Chin-chin, Doughnut, Gala, Peanut, Pop-corn**,** Coco-pop, Egg roll, Fish pie, Fish roll, Groundnut, Moi-moi, Mr. Fruits, Pan-cake was also significant (p=0.002). This aligns with the findings that families with high socio-economic status were seldom eating food prepared in a kitchen; instead they were eating artificial foods not cooked by water and fire. Findings from the study also revealed that, over 20% of urban children were eating canned foods; among them, 30.4% were overweight and obese. These findings confirm those of Gavin, (2005) who argued that, today's busy families have fewer free moments to prepare nutritious cooked meals. Instead they depend on canned foods which have considerable contribution to weight gains. Most of canned foods have a lot of additives of which are thought to have significant contribution to weight gains. Gavin, (2005) adds that one contributing factor in the onset of these complications of overweight and obesity is taking in a diet lacking fibres and antioxidants, but rich in processed foods loaded with added fats and sugars.

However, dietary patterns such as; Restaurant, vendors/fast food consumption, Bread consumption and obesity among primary school children in urban and rural areas were statistically not significant (p=0.254) and (p=0.099) respectively. This could be as a result of low patronage following post COVID-19 economic fall-out, prudent management of the available resources, and also, the mothers and other care givers who are workers in a certain salary grade level in a formal, informal or both sectors were asked to work from home. Many businesses, establishments and organization did not resume their full operations earlier shut-down due to COVID-19 pandemic. All these gave them enough time to unite with their families and prepare food for them (Lavelle *et al*., 2016).

This study found that, physical activities- (In-door games or games with less physical activities) such as; frequent watching of Television, frequent surfing of internet (browsing) and obesity among primary school children in urban and rural areas were statistically significant (p=0.004) and (p=0.003) respectively. This meant that In-door games or games with less physical activities- (watching of television, and surfing of internet (browsing)) on frequent basis tends to increase obesity while on occasional basis tends to decrease obesity in the urban and rural areas.

For physical activities- In-door games/ activities such as frequent watching of Television and obesity among primary school children in urban and rural areas (p=0.004). This is consistent with the findings in another study Horton *et al*., (1995), which found that children were 21.5% and 7.3 times respectively more likely to be overweight when watching television for 4 or

more hours per day. A similar study in India Lowry *et al*., (2002), stated that one of the major reasons for childhood obesity was watching television, as was also shown by another study of 12 to 17 year-old urban adolescents in Hyderabad, India (Laxmaiah *et al*., 2007). Another study in United States (Robinson, 2001) found that watching television for more than 2 hours per day was associated with being overweight and obesity.

Similarly, Physical activities- In-door games/ activities such as frequent surfing of internet (browsing) and obesity among primary school children in urban and rural areas (p=0.003). This is consistent with the findings that Screen time (television and surfing of internet (browsing)) is an important potentially modifiable component of sedentary behavior. Almost half of obese children engaged in ≥2 h a day of screen time, compared to 33% of normal-weight children (Fulton *et al.*, 2009).

Furthermore, This studies showed that out-door games or physically active games- (playing of games, sport or exercises- athletics e.g running, jumping etc.) and weight status categories (obesity) among primary school children in urban and rural areas was statistically significant (p=0.046). This meant that, Out-door games or physically active games- (playing of games, sport or exercises- athletics e.g running, jumping etc.) on frequent basis tends to reduce weight obesity while occasional engagement promotes development of obesity in the urban and rural areas. This is consistent with results from another study among 12- 15 year adolescents in Mangalore, Karnataka, India (Cooper *et al*., 2003) which reported that regular physical activity was an important factor in reducing the prevalence of overweight and obesity, which was also consistent with other studies (Tudor-Locke *et al.*, 2003). This study also agrees with findings that, most of the urban schools of recent have neither a plot for cultivation nor a play ground for sports activities. However it is known in Tanzania that since 2001, the Tanzanian government abolished competitive sports and physical education in schools (Bulamile, 2002Unpublished M.A (Education) Dissertation). This makes urban children to have limited opportunity for sports and becoming more vulnerable to overweight and obesity than their counterparts in rural areas who frequently engage in farming and other physical activities after school hours.

Participation in physical activities and sports has a lot to do with children's life. Physical activities are considered important in enhancement of physical fitness and good health as well as development of good mind. The ancient Greeks believed that a sound mind existed in a health body as it was previously stated by Plato that" mens sana en corpore sano (cited in Rowland, 1990). According to Mabagala, (2002 Unpublished M.A (Education) Dissertation), sports and physical activities have a potential role in the development of good body health and fitness. It is also potential in developing good mind and thus improving academic performance among school children (Mabagala, 2002 Unpublished M.A (Education) Dissertation). Mood *et al*. (1995) argued that in order to provide and maintain optimum health, it was necessary for people of all ages to participate in physical exercises such as walking, jogging, hiking, swimming and cycling.

A study by Kafyulilo, (2008 Unpublished, M.A (Ed), Dissertation) on overweight and obesity revealed that over 76% of children from urban schools were not participating in physical activities both at their homes and school. Activities such as school cleanliness and domestic works at home were being done by employed workers. In rural areas children were exposed to the long way travel to fetch water or collect firewood and participating in the farming activities. Urban school children have no place to cultivate and play games, most of the open spaces in urban areas have been utilized for other infrastructures such as house quarters and so on. Also, in the analysis of children's level of activeness, Kafyulilo, (2008 Unpublished,

M.A (Ed), Dissertation) it was revealed that, majority of inactive children were overweight and obese. Very few children who were very active were overweight, and none of them was obese. Majority of overweight and obese children were moderately active or inactive. Sedentary life was previously mentioned by Johnson (2002) and Gavin (2005) as a factor for the prevalence of overweight and obesity among school children. Children with limited physical activities were more vulnerable to overweight and obesity than children who were engaging in various physical activities.

Prospective examination of cardiorespiratory fitness in school-aged children demonstrated that children with low fitness had significantly higher risk (3.5-fold) of being overweight and had disproportionate increase in weight gain (McGavock *et al.,* 2009). Together with the study by (Roberts *et al*., 2010)showing that low aerobic fitness predicts lower test scores in math, reading, and language.—A finding that was independent of parent education level and the child's BMI. These studies confirm that increasing cardio-respiratory fitness should be a key area of focus for school-aged children.

Lastly, this study also showed that, means of transportation to school and obesity among primary school children in urban and rural areas was statistically significant (p=0.011). This meant that means of transportation-such as trekking, bicycle and others-skating, motor cycle etc., tends to decrease weight status categories while vehicles increases weight status categories in the urban and in the rural areas. This aligned with the studies which shows that children who used school buses, own or public vehicle as their primary means of transport to and from school did not stress or expend a lot of energy as compared to those who traveled on foot, perhaps over a long distance (Kotian *et al*., 2010; Ramachandran *et al*., 2002).

On the other hand, this study found that, physical activities- (In-door games or less physically activities) such as; playing of video games, use of Computer and obesity were statistically not significant (p=0.193) and (p=0.131) respectively. It was contradictory to other studies that showed a significant association (Ekblom, 2005 and Gavin, 2005). This could be due to early exposure of these children in Crèches or early childhood education (ECE) in schools to watching of cartoons and audio rhymes as part of instructional materials or teaching aids. These early influence spur them up for the use of other smart devices or gadgets like ipad, tablet, cell phones etc to access social media platforms, play music or MPEG (Motion Picture Experts Group) Layer-3 sound file popularly known as (MP3) and browse at the same time which serves as a very good substitute to the use of conventional table and lab top computers which are relatively large in size or outdated window versions for screen recreation.

CONCLUSION

The result of this study showed a high prevalence of obesity among primary school children in urban and rural areas of Anambra state. Higher proportion of children had obesity in the urban than in the rural areas.

Similarly, this study showed that, obesity in children varies with age. Bulk of the children between age bracket (7-9 years, 10-12 years and 13-15 years) presented higher BMI weight status- (obesity). Urban areas also presented higher BMI weight status- (obesity) than the rural areas. Also, BMI weight status-(obesity) was higher among the females than the males and in the urban areas than in the rural areas.

In the same vein, this study found that mother's level of education, mother's occupation, and father's occupation predisposes primary school children in urban and rural areas to obesity.

Furthermore, this study showed that, children who ate thrice or more daily, consumed meat pie, biscuits, sweets frequently and other pastries were more obese.

Lastly, Physical activities- In-door games or games with less physical activities- (watching of television, and surfing of internet (browsing)) on regular basis increases obesity while Out-door games or physically active games- (playing of games, sport or exercises- athletics e.g running, jumping etc.) on regular basis reduces obesity. Also, Means of transportation-such as trekking, bicycle and others-skating, motor cycle etc., were found to decrease obesity while vehicles increases obesity among primary school children in urban and rural areas.

CONFLICT-OF-INTEREST

The authors declare that they have no conflict of interest and there was no funding from anywhere.

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