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The Implication of Socio Economic Status on the Anthropometric and Dietary Intake of School Age Children in Selected Schools in Ogun State

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ABSTRACT

This study assessed the anthropometric indices and dietary intake of rural and urban school age children in selected Local Government Areas (LGAs) of Ogun state. A multistage sampling technique was used to select one thousand one hundred and thirty two school age children from the three senatorial districts. A pre-tested and structured questionnaire was used to obtain information on socio-economic characteristics as well as anthropometric measurements (weight, height and mid-upper arm circumference) were taken using standard anthropometric procedures and nutrients intake estimated from the 24-hr dietary recall information. Data were analyzed using frequency counts, percentages, means, standard deviations, correlation, T-test and Chi-Square. Results showed that 36.5% of the respondent families earned less than two hundred thousand naira annually. Also, 43.0% and 62.0% of the mothers had secondary and tertiary education respectively. WASH practices showed that 61.1% of the respondents did not have a place for hand washing and 55.6% used dirty water for washing their hands. The mean weight, height and mid-upper arm circumference of the children were 25.8kg, 1.30m, and 187.29cm respectively. Prevalence of wasting, stunting, underweight and overweight were 2.7, 20.6, 18.5 and 6.1% respectively, with significant gender (p=0.000) and sector (p=0.003) differences. Dietary intake showed that energy intake was above 60% RDA for both sexes and in the LGAs while protein and fat intake for females in urban LGA was above 80% RDA except for some micronutrients that were below 50% RDA (Vit A-42.5% RDA, Calcium – 45% RDA and Iron – 48.9% RDA). Chi-square showed a significant association between maternal education and stunting (p=0.014), family income and stunting (p=0.038) and wasting (p=0.003) while correlation shows a significant relationship between micronutrients and economic status of the family because stunting was related to vitamin A (p= -0.321) and iron (p= -0.120). This study concluded that a significant relationship exists between socio economic status and nutritional status. Hence, the study recommended a national policy for improved sanitation, school feeding programme and combining such a policy with better access to basic social services including education and health care.

Keywords: *Anthropometry, WASH, stunting, RDA*

INTRODUCTION

Anthropometric examination is appropriate means in any research to evaluate health and nutritional condition in children and the indices does not only directly reflect the socioeconomic status of the family, health and social wellbeing of the population, but also the competence of the health care system, and the influence of the immediate surroundings, and can also predict academic performance (Prista *et al.*, 2003; Srivastava *et al.*, 2012). The three common anthropometric indicators for assessing nutritional status of children include height-for-age (stunting), weight-for-age (underweight) and weight-for-height (wasting) (Wamani *et al.*, 2007). Therefore, the impact on reduction in child mortality can be achieved once consideration is given to all levels of malnutrition through appropriate identification, this identification is only likely if anthropometric measurements are regularly done (Muller & Krawinkel, 2005; Caulfield *et al.*, 2004).

Stunting is a major public health problem in low and middle-income countries because of its association with increased risk of mortality during childhood (The lancets, 2008 & WHO, 2000). Apart from causing significant childhood mortality, stunting also leads to significant physical and functional deficits among survivors (WHO, 1995; The lancets, 2008& WHO, 2000). According to reports, stunting contributes to 14.5% of annual deaths and 12.6% of disability-adjusted life-years (DALYs) in children (The lancets, 2008). Children who are stunted complete fewer years of schooling. This may be due to the fact that

stunted children are known to enroll late in school (Partnership for Child Development, 1999), perhaps because they are not grown enough to enroll. It may also be because they drop out earlier. This may lead to fewer years of education of stunted children when compared with tall children. Stunting hinders cognitive growth, thereby leading to reduced economic potential.

Adequate nutrition is essential for development, growth, and health of children (Diethelm et al, 2014). The regular monitoring of nutrition and dietary behavior is, consequently, especially relevant for those age groups. Children need more nutrients than adults in relation to their body weight (Stang et al, 2005), requiring, therefore, a diet providing a higher nutrient density. Due to their lower body weight and their not yet fully developed immune system, children are also a particularly sensitive and vulnerable group for food contamination, as well as food pollution by undesirable substances, such as pesticides and acrylamide (Cohen et al, 2014). Furthermore, the energy content of the diet has a relevant impact on the development of overweight and obesity (Popkin, 2015; Stahl et al, 2009). From a public health point of view, this aspect is especially relevant, since children with overweight or obesity tend to persist overweight or obese during adult life (WHO, 2016; Kindblom et al, 2009), and will consequently be at higher risk for obesity associated morbidity and mortality (WHO,2016; Law, 2000; Smith, 2007; Reilly,2011).

MATERIALS AND METHOD

Study Area

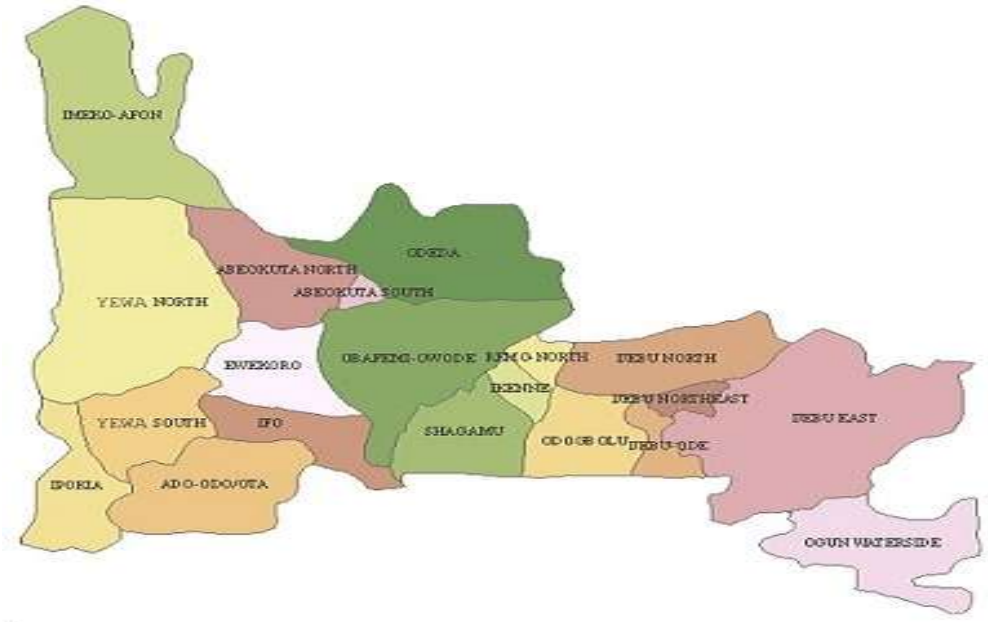

Figure1. *Map of Ogun State*

This study will provide data necessary for the planning and implementation of positive strategies for the resolution of nutrition and health problems among schoolchildren, particularly those in the rural areas, where most (about 70%) Nigerians live (Maziya-Dixon *et al*., 2004) and which are devoid of infrastructure and quality educational opportunities. It will keep people get informed and will serve as reference material to the stakeholders. This information will be useful in evaluating the impact of previous programmes, provide a new data set for meaningful and targeted intervention programmes and projects and generally to inform policy.

OBJECTIVES OF THE STUDY

General Objective

To find out the implication of socio economic status on the anthropometric and dietary intake of school age children in selected schools in ogun state

Specific Objectives

- To describe the socio-economic characteristics of school children family
- To assess the prevalence of malnutrition among the school age children.
- To assess the nutrient intakes of the school age children
- To establish the relationship between socio economic and nutritional status

Study Population

The study population consisted of primary school children (7-12 years old) in selected schools in both urban and rural local governments in Ogun states.

Inclusion Criteria

- School age children between 7-12 years attending the schools selected for the study.
- School children from primary two to six
- Children whose parents give permission for them to participate in the study.
- Children giving ascent participated in the study.
- Children who are present at the day of data collection
- Children not on medication that can affect the data analyses.
- Children with no known case of infection or inflammation

Sample Size and Sampling Procedures

Sample Size Determination

The sample size was calculated using the formula:

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Where n = The minimum sample size

t = 1.96 Confidence interval

P= 38.1% (prevalence of anemia among school children) (Akeredolu *et al.*, 2011)

m = Tolerance error (5%)

$n = 1.96^2 \times 0.4(1-0.4)$

$n = 3.8416 \times 0.24 / 0.05^2$

n = 969

However, to give room for generalization and retrieved/loss of instrument, sample size was increased to 1200.

The sampling frame consists of school age children (7-12years) from twenty four selected schools in Ogun state. All the three senatorial districts in Ogun State were considered. Two (one rural and one urban) local governments are randomly selected from each senatorial district. In each local government, four schools are selected and in each school, the pupils were stratified according to their class. The total number of pupils that are selected in each school was based on the population because same percentage of subjects was considered in each school.

- The three senatorial districts in Ogun states are selected for the study and 1132 school children were considered.
- Two local governments randomly selected in each senatorial districts (one urban and one rural).
- Four schools randomly selected in each LGA and total of twenty four (24) schools in all the LGAs.
- Pupils in each school were stratified into groups according to their class starting from primary two to six.
- Simple random sampling was used to select the required number from each class

Table1. *Selection of respondents in each senatorial district, Ogun State*

Senatorial Districts	Location	Local Govt.	Number Target	Number Achieved
Ogun West	Urban	Ado-Odo/Ota	200	195
	Rural	Ipokia	200	178
Ogun Central	Urban	Abk. South	200	192
	Rural	Obafemi Owode	200	189
Ogun East	Urban	Ijebu Ode	200	184
	Rural	Ijebu North/East	200	194

Procedure for Data Collection

Prior to the commencement of the research, submission of the research proposal were made at the State Hospital Ijaye, Abeokuta and selected local governments in the three senatorial districts and also to the headmaster of each school. Ethical consent was sought from the State hospital, Ijaye, Abeokuta and also meeting with parents with the assistance of the school management for their verbal consent. Trained fieldworkers with the principal investigator engaged in data collection.

Method of Data Collection

A pretested, structured interviewer administered questionnaire was used to collect information from the respondents. The questionnaire was used to collect information on the respondent's bio-data and socio-economic characteristics.

Anthropometric equipment such as Heightometer and portable electronic weighing scale were used to obtain anthropometric data of young children such as weight which was measured to the nearest 0.01 kg, height was measured to nearest 0.05 cm.

These were classified using WHO (2008) growth standards.

The children's height and weight were taken according to standard procedures. The weighing scale was calibrated to read zero before the commencement of measurement. Children were instructed to remove their footwear, excessive clothing and other items from their pockets, place their feet on the drawing of the two feet on the scale, and stand upright with arms hanging loosely at sides, looks straight with minimal movement and measurements were taken and recorded immediately to the nearest 0.1kg. The height measurement was taken using an improvised heightometer. The children were instructed to remove their footwear, female children were told to remove headgears such as head covers, and stand straight as they can, feet slightly apart, with the back of heels, middle of the shoulders, buttocks and back of head all aligned and looks straight with necks straight. The lower headpiece of the height meter was then pressed firmly but gently on the top of the head to make sure it touched the head and not just the hair; measurements were taken and recorded immediately to the nearest 0.5cm. The following indicators for nutritional status are used:

Weight-for-age (WA)

It measures body mass relative to biologic age. Under-weight is determined by having a less than adequate WA (z-score < 2 SD).

Height-for-age (HA)

It shows height relative to chronological age. HA is an indicator for group nutritional status and estimates past and chronic energy under nutrition (shortness or stunting) (z-score < 2 SD) and over nutrition (z-score > 2 SD).

Weight-for-height (WH)

It reflects body weight relative to height. WH is used as an index for acute malnutrition including thinness or wasting (z-score < 2 SD). It is associated with failure of gaining weight or losing weight (Gibson, 2005).

Dietary Assessment

Twenty-four (24) hour dietary recall was used to obtain food intake data from the children and their caregivers/parents according to methods of Onimawo et al (2007). During the 24-hour dietary intake interviews, various food models, local kitchen utensils, such as plates, cups, spoons, and slices commonly used in Nigeria were used to quantify foods consumed. The utensils were later used to determine the equivalent weights of various food portions in grams and later converted to nutrient equivalents.

Statistical Analyses

The frequency and percentages of all the socio economic variables considered were calculated. Mean Energy and Nutrients Intake of the children were calculated, percentage RDA met were also determined and significance was set for all analyses at $P < 0.05$.

There is no universally accepted classification system for defining Weight for age, Height for age, weight for height in terms of under nutrition and over nutrition, but most commonly used is cut-off point of z-score < 2 SD respectively below and above the median of the international standard. Children was defined as: (i) stunted or chronically undernourished if height-for-age Z-scores were below -2 SD of the median of the reference population; (ii) underweight if weight-for-age Z-scores were below -2 SD of the median of the reference population; (iii) wasted or acutely undernourished if weight-for-height Z-scores were below -2SD of the median of the reference population; and (iv) overweight if weight-for-height Z-scores were above 2 SD of the median of the reference population. The data calculated by WHO (Anthro plus) and EPI info version 6.02 was transferred into the software Statistical Package for Social Science (SPSS) 20.0 for Windows. SPSS was used for all statistical calculations and a p-value < 0.05 was considered significant.

RESULTS

Socio- Demographic Characteristic of Respondents

Table 2 shows the socio-demographic characteristics of the children and family sampled. The age of the children ranged between 7-8years, 9-10years and 11-12years but majority of the children were within the ages of 11-12years. It shows that 28.0% (urban) and 22.3% (rural) of the children were within the age range of 7-8years while 34.3% (urban) and 24.8% (rural) were within 9-10years of age and the remaining 37.7% (urban) and 52.9%(rural) were within the age range of 11-12years . It also showed that 571(50.4%) of the children were located in the urban setting while 561(49.6%) from rural setting. The percentages of children from primary two were 18.0% in urban and 14.8% in rural while 21.2% in both primary three and four in urban LGAs, 20.5%

and 21.8% in rural LGAs. There were 20.7% and 22.1% from primary five in urban and rural LGAs respectively while 18.9% and 20.9% from primary six in urban and rural LGAs.

The table also shows age range of parents of the children. The mothers within the age range of 0-20years were 2.1% (12) and 22.2% (127) were between 21-30years of age while 44.3% (253) were within 31-40, and 31.4% (179) were above 40years of age in urban LGAs but as for the rural LGAs, it shows that 6.2% of the mothers were within 0-20years while 46.0% (258) were within 21-30years of age, and 22.6% (127) were within 31-40years while the remaining 25.0% (141) were above 40years of age. Majority of the fathers in urban LGAs were above 40years of age and 31.9% (182) were within 31-40years as compared to 26.0% (146) in the same range in the rural LGAs. Only 0.7% (4) of the fathers in urban were below 20years of age but 1.3% (7) of the fathers in rural LGAs were below 20years.

More than half of the fathers had tertiary education (72.3%) in urban LGAs while 40.1% and 37.3% had tertiary and secondary education in rural LGAs. As for the mothers, 3.2% (18) and 8.4% (47) had no education in both urban and rural LGAs respectively while 5.6% (32) in urban LGAs and 22.3% (125) in the rural LGAs had primary education, 29.2% (167) in urban LGAs and 43.0% (241) in rural LGAs had secondary education but 62.0% (354) and 26.4% (148) had tertiary education. Considering the size of the family, the percentage of household within one to four members was 69.4% (396) in urban and 53.8% (302) in rural LGAs, while the size of the household within five to eight members was 22.1% (126) in urban but 30.1% (168) in rural LGAs. Above eight members were 8.6% (49) and 16.2% (91) in urban and rural LGAs respectively.

The average annual income of the family ranges from less than a hundred thousand to five hundred thousand and above with 3.5% (20) and 14.6% (82) earned less than one hundred thousand, 23.5% (134) and 36.5% (205) earned less than two hundred thousand, 18.0% (103) and 34.4% (193) earned less than three hundred thousand, 36.6% (209) and 7.1% (40) earned less than four hundred thousand, 12.8% (73) and 5.5% (31) earned less than five hundred thousand, 5.6% and 1.8% earned five hundred above. The primary energy source includes PHCN used by79.7% in urban and 51.5% in rural LGAs, personal generating set was the primary energy source used by 15.4% of the families in urban and 36.5% in rural while 4.9% urban and 23.7% rural families were using local lamps and lantern. The primary source of water to majority of the household in rural LGAs was well (63.3%)while more of the families in urban LGAs have borehole (85.0%), only 9.6% in urban and 2.1% in rural LGAs have access to pipe borne water.

Also majority has no access to good toilet facility as they defecate in bushes (32.3%) and pit latrines (49.0%), and only 18.7% make use of modern toilet facility in the rural LGAs but 69.2% of the families have access to water closet while about 29.1% and 1.8% used pit latrines and bushes as a means of defeacating in urban LGAs. In terms of waste/refuse disposal, 37.5% in urban and 44.4% in rural LGAs dump refuse in open fields and surrounding bushes (7.5% urban, 11.9% rural) and burning was the method adopted by 35.9% in urban and 34.8% in rural while only 19.1% in urban and 8.9% in rural LGAs make use of refuse management agencies, these shows the low level of hygiene.

Majority of the household heads engaged in business in both urban and rural LGAs because it shows that 43.6% (249) and 37.8% (212) were into trading in urban and rural LGAs respectively. Also, 36.6% (209) in urban and 8.4% (103) in rural LGAs are civil servants while artisan were 14.9% (85) in urban but 10.0% (56) of them in rural LGAs. The total percentage of farmers and hunters among the household head were 3.7% (21) and 1.2% (7) in urban while a good number, which totaled 179(31.9%) of the household heads were farmer in rural LGAs.

Hand washing and services utilized by the household for their healthneed was shown on table 4, Majority of the respondents in urban (67.4%) have a place to wash their hands within the house while 61.1% of rural respondents do their washing outside. Clean water and soap was always available for hand washing in urban (35.4%) while the water available for majority (55.6%) of rural respondents was not cleaned.

Table2. *Socio-demographic Characteristics of the Children*

Characteristics		Sector			
		Urban		Rural	
		Frequency	%	Frequency	%
AGE(YRS)	7-8	160	28.0	125	22.3
	9-10	196	34.3	139	24.8
	11-12	215	37.7	297	52.9
	Total	**571**	**50.4**	**561**	**49.6**
Fathers age (years)	Pry 2	103	18.0	83	14.8
	Pry 3	121	21.2	115	20.5
	Pry 4	121	21.2	122	21.8
	Pry 5	118	20.7	124	22.1
	Pry 6	108	18.9	117	20.9
	Total	**571**	**50.4**	**561**	**49.6**
Fathers age (years)	Pry 2	103	18.0	83	14.8
	0-20	4	0.7	7	1.3
	21-30	26	4.6	25	4.5
	31-40	182	31.9	146	26.0
	Above 40	359	62.9	383	68.3
	Total	**571**	**50.4**	**561**	**49.6**
Mothers age(years)	0-20	12	2.1	35	6.2
	21-30	127	22.2	258	46.0
	31-40	253	44.3	127	22.6
	Above 40	179	31.4	141	25.0
	Total	**571**	**50.4**	**561**	**49.6**
Educational level of the fathers	8	1.4	23	4.1	8
	42	7.4	104	18.5	42
	108	18.9	209	37.3	108
	413	72.3	225	40.1	413
	571	**50.4**	**561**	**49.6**	**571**

Table3. *Socio-demographic Characteristics of the Children (contd)*

Characteristics		Sector			
		Urban		Rural	
		Frequency	%	Frequency	%
Average Annual Income of the Family	<100, 000	20	3.5	82	14.6
	100,000-199,000	134	23.5	205	36.5
	200,000-299,000	103	18.0	193	34.4
	300,000-399,000	209	36.6	40	7.1
	400,000-499,000	73	12.8	31	5.5
	500,000 above	32	5.6	10	1.8
	Total	**571**	**50.4**	**561**	**49.6**
Primary Energy Source	Personal generator	88	15.4	205	36.5
	PHCN	455	79.7	289	51.5
	No electricity	28	4.9	133	23.7
	Total	**571**	**50.4**	**561**	**49.6**
Primary method of waste disposal	Bush	43	7.5	67	11.9
	Refuse dump	214	37.5	249	44.4
	City service	109	19.1	50	8.9
	Burning	205	35.9	195	34.8
	Total	**571**	**50.4**	**561**	**49.6**
Type of toilet	Pit latrines	166	29.1	275	49.0
	Water closet	395	69.2	105	18.7
	Bush	10	1.8	181	32.3
	Total	**571**	**50.4**	**561**	**49.6**

Household Size	1-4	396	69.4	302	53.8
	5-8	126	22.1	168	30.1
	Above 8	49	8.6	91	16.2
	Total	**571**	**50.4**	**561**	**49.6**
Primary Water Source	Pond/lake	0	0	21	3.7
	Spring/river	1	0.2	22	3.9
	Well	30	5.3	151	63.3
	Borehole	485	85.0	355	27.0
	Pipe borne water	55	9.6	12	2.1
	Total	**571**	**50.4**	**561**	**49.6**

Table4. *Hand washing and services the household utilize for their health need*

Characteristics		**Sector**			
		Urban		**Rural**	
		Frequency	**%**	**Frequency**	**%**
Place of hand washing	In-house	385	67.4	218	38.9
	Outside/compound/yard	186	32.6	343	61.1
	Total	**571**	**50.4**	**561**	**49.6**
Facility available for washing	Clean water	257	40.0	147	26.2
	Clean water + soap	202	35.4	102	18.2
	Uncleaned water	112	19.5	312	55.6
	Total	**571**	**50.4**	**561**	**49.6**
Service utilize for health need	Public hospitals	214	37.5	181	32.3
	Private hospitals	257	45.0	149	26.6
	Traditional healing homes	32	5.6	110	19.6
	Health centres	68	11.9	121	37.8
	Total	**571**	**50.4**	**561**	**49.6**

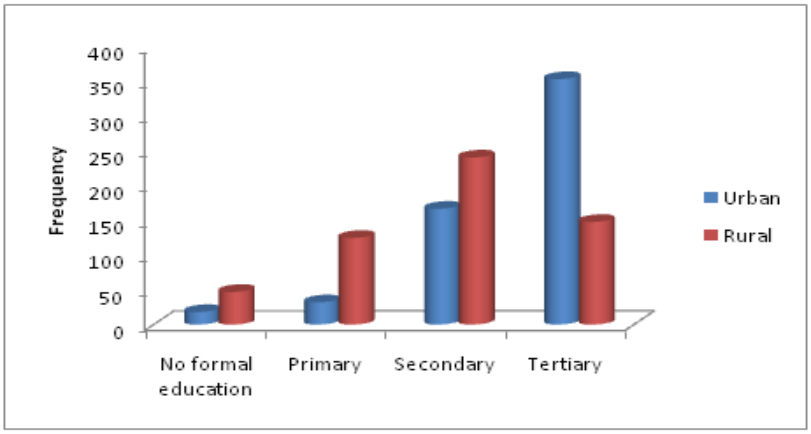

Figure2. *Mothers educational level*

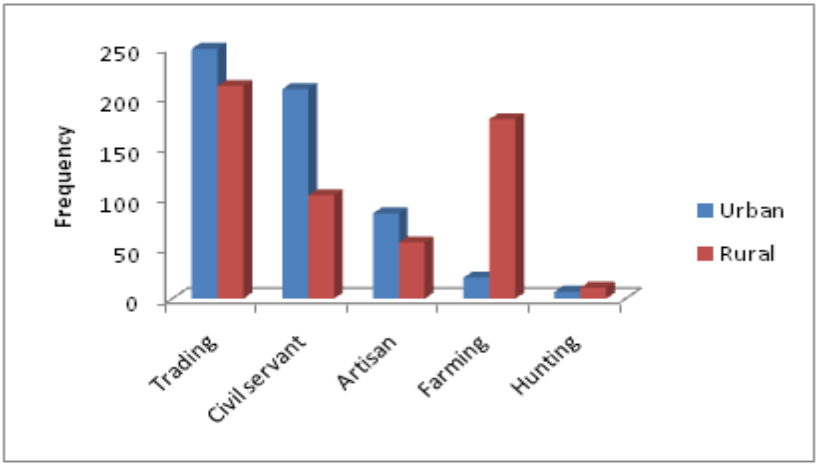

Figure3. *Primary Occupation of the household head*

Mean Anthropometric Indices of Children by sector

Table 5 shows the anthropometric status of the children in both urban and rural LGAs. The mean weight of the children was 26.84±6.06 kg, and the mean height was 130.79±9.56 cm in urban LGAs, while the mean weight of the children was 24.91±5.92 kg while the mean height was 129.86±9.45 cm in rural LGAs. The result of nutritional status of the children was shown in figure 4 which showed that 20.6% of the children were stunted, 2.7% wasted and 18.5% were underweight. The percentage of males that were stunted was 18.0% while that of female was found to be 19.7%, wasting was obtained in 2.8% males and 2.5% females. It shows that 20.7% and 3.9% of the males were underweight and overweight respectively and 18.6% and 8.4% of the females were also underweight and overweight respectively. Also 13.9% were stunted in urban LGAs while 23.9% of the children in rural LGAs were also stunted. The result shows that 2.2% and 3.4% of the children were wasted in both urban and rural LGAs while 22.6% of rural children were underweight and about 14.4% of urban children were also underweight. Overweight children were 9.7% in urban and 2.5% in rural LGAs.

Table 6 shows the severity of the level of malnutrition in the children. The height-for-age (HAZ) indices which measures nutritional stunting shows that 56.0% and 48.0% of the children were normal, 30.1% and 28.2% were mildly stunted, while 10.2% and 16.4% were moderately and 3.7% and 7.5% were severely stunted in urban and rural LGAs respectively but in considering the gender, it shows that more males(5.7%) than females(5.4%) were severely stunted while 12.3% of the males and 14.3% of the females are moderately stunted. The percentages of the children that are mildly stunted were 30.4% males and 27.8% females while the remaining 53.0% males and 50.3% of the females were normal. The weight-for-height (WHZ) indices which measures nutritional wasting shows that 81.0% were normal for both male and female, 16.1% and 16.5% were mildly wasted, while 2.2% and 2.1% were moderately wasted and the remaining 0.6% and 0.4% were severely wasted in both urban and rural LGAs respectively. The result also covers the sector of the children that were wasted; it shows that more rural (0.7%) than urban (0.4%) were severely wasted while 1.8% of the urban and 2.7% of the rural are moderately wasted. The percentages of the children that were mildly wasted are 13.1% urban and 18.4% rural while the remaining children are normal. Also BMI-for-age (BAZ) indices which measures underweight in children shows that 76.0% and 74.9% of the children were normal, 14.4% and 22.6% were underweight while 6.7% and 1.8% were overweight, 3.0% and 0.7% obese in both urban and rural LGAs respectively. The result also shows that more males (20.7%) than females (18.6%) were underweight and also more females (2.4%) when compared with males (1.4%) were overweight.

Table5. *Anthropometric measurements of children by sector*

Variable	Sector		p-Value
	Urban	Rural	
Age (yrs)	9.66±1.59[b]	10.09±1.64[a]	0.000
Height (m)	1.31±0.56[a]	1.29±0.45[b]	0.016
Weight (kg)	26.84±6.06	24.91±5.92	0.098
MUAC (cm)	193.39±30.37[a]	181.18±28.18[b]	0.000

MUAC= Mid Upper Arm Circumference, Significant at p<0.05

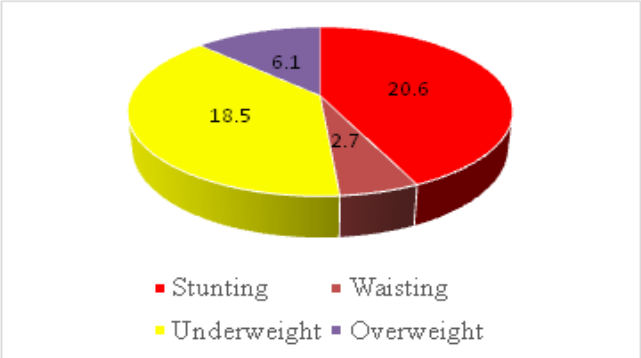

Figure3. *Nutritional status of the children*

Table6. *Nutritional status of the children*

Sector and Gender	Variables				
Stunting(HAZ)	**Severe**	**Moderate**	**Mild**	**Normal**	**N**
Urban	21(3.7)	58(10.2)	172(30.1)	320(56.0)	571
Rural	42(7.5)	92(16.4)	158(28.2)	269(48.0)	561
T-test	**66.18**				
p-value	**0.00**				
Male	33(5.7)	68(11.7)	176(30.4)	296(51.1)	579
Female	30(5.4)	76(13.7)	154(27.8)	293(53.0)	553
T-test	**68.05**				
p-value	**0.00**				
Wasting(WAZ)	**Severe**	**Moderate**	**Mild**	**Normal**	**N**
Urban	15(2.6)	23(4.0)	75(13.1)	458(80.2)	571
Rural	23(4.1)	35(6.2)	103(18.4)	400(71.3)	561
T-test	**52.69**				
p-value	**0.03**				
Male	24(4.1)	31(5.4)	88(15.2)	436(75.3)	579
Female	14(2.5)	27(4.9)	90(16.3)	422(76.3)	553
T-test	**56.42**				
p-value	**0.01**				
BMI for Age(BAZ)	**Underweight**	**Normal**	**Overweight**	**Obese**	**N**
Urban	92(16.1)	424(74.3)	38(6.7)	17(3.0)	571
Rural	137(24.4)	410(69.5)	10(1.8)	4(0.7)	561
T-test	**45.22**				
p-value	**0.04**				
Male	116(14.7)	440(80.0)	15(2.5)	8(1.4)	579
Female	113(15.0)	394(71.2)	33(6.0)	13(2.4)	553
T-test	**42.89**				
p-value	**0.09**				

Energy and Nutrients Intake of the Children in Urban LGAs

Table 7 shows the energy and nutrients intake of the respondents in Urban LGAs. Different age groups are considered based on the RDA. For age group 7-9years, the mean value of energy consumption for males is 1088.9±546.4Kcal and the percentage RDA met is 60.5% while that of female counterpart is 1105.1±483.6 and 69.1% of them met the requirement for energy. The mean protein intake for male is 20.08±14.3Kcal and that of female is 23.1±18.5Kcal and the percentage of those that met the requirement for protein is 74.4% males and 85.6% females. Except for fat intake of the female, other nutrients are below the RDA. As for calcium, the average intake for males is 853.2±505.1mg and 903.2±611.3mg for females while the percentage RDA met considering the average values are 81.3% for males and 86.0% for females. Another is iron with mean values of 7.2±5.3µg and 7.1±2.7µg and percentage RDA met as 80.0% and 78.9% for males and females respectively. The result for the vitamins shows that 75.7%, 87.5% and 75.0% males and 71.3%, 75.0% and 50.0% females met the RDA for vitamin A, B2 and B6 respectively.

For age group 10-12years, the mean value for energy for males is 1440.8±703.3Kcal while that of female counterpart is 1008.6±306.8$Kcal$, when comparing the value with standard RDA for that age group; it shows that 62.6% male and 63.0% females met the requirement for energy.

The average protein intake for male is 27.3±14.3g and that of female is 29.8±13.7g and the percentage of those that met the requirement for protein is 80.3% males and 87.6% females. As for calcium, the average intake for males is 756.6±451.5g and 792.9±332.6g for females while the percentage RDA met considering the average values are 58.2% for males and 61.0% for females. Also iron is with mean values of 6.5±4.1µg and 6.2±3.7µg and percentage RDA met as 81.3% and 77.5% for males and females respectively. The result for the vitamins shows that 57.2%, 88.9% and 80.0% males and 76.1%, 77.8% and 70.0% females met the RDA for vitamin A, B2 and B6 respectively in urban LGAs. The result showed a significant difference in the consumption of protein (p=0.032), calcium (p=0.025) and vitamin A (p=0.012) among male and female in urban LGAs.

Table7. *Energy and Nutrients Intake of the children in Urban LGAs*

		Male		Female		
Age Group	**Nutrient**	**Mean intake**	**%RDA MET**	**Mean intake**	**RDA MET**	**p-value**
7-9Yrs	Energy(kcal)	1088.9±546.4	60.5	1105.1±483.6	69.1	0.321
	Protein(g)	20.08±14.3	74.4	23.1±18.5	85.6	0.032*
	Fat(g)	27.4±14.7	97.9	30.7±10.3	118.1ǂǂ	0.365
	Cal(mg)	853.2±505.1	81.3	903.2±611.3	86.0	0.816
	Iron(µg)	7.2±5.3	80.0	7.1±2.7	78.9	0.261
	Vit A(mg)	378.7±102.2	75.7	356.6±101.3	71.3	0.318
	VitB2 (mg)	0.7±0.5	87.5	0.6±0.4	75.0	0.104
	VitB6(mg)	0.6±0.4	75.0	0.4±0.3	50.0	0.512
10-12Yrs	Energy(kcal)	1440.8±703.3	62.6	1008.6±306.8	63.0	0.072
	Protein(g)	27.3±14.3	80.3	29.8±13.7	87.6	0.812
	Fat(g)	26.2±13.7	93.6	37.6±18.1	144.6ǂǂ	0.231
	Cal(mg)	756.6±451.5	58.2	792.9±332.6	61.0	0.025*
	Iron(µg)	6.5±4.1	81.3	6.2±3.7	77.5	0.125
	Vit A(mg)	342.9±187.3	57.2	456.4±299.1	76.1	0.012*
	VitB2 (mg)	0.8±0.6	88.9	0.7±0.6	77.8	0.253
	VitB6(mg)	0.8±0.5	80.0	0.7±0.4	70.0	0.113

[a]ǂ *Inadequate intake* [b]ǂǂ *Excessive intake*

**significant at p<0.05*

Table 8 shows the energy and nutrients intake of the respondents in rural LGAs. Different age groups are considered based on the RDA. For age group 7-9years, the mean value of energy consumption for males is 1088.9±546.4Kcal and the percentage RDA met is 60.5% while that of female counterpart is 1105.1±483.6 and 69.1% of them met the requirement for energy.

The average protein intake for male is 15.1±12.3 and that of female is 18.2±14.3 and the percentage of those that met the requirement for protein is 50.6% males and 67.4% females. As for calcium, the average intake for males is 449.2±405.1 and 472.2±409.3 for females while the percentage RDA met considering the average values are 42.8% for males and 45.0% for females. Another is iron with mean values of 5.3±3.7 and 4.4±2.7 and percentage RDA met as 58.9% and 48.9% for males and females respectively. The result for the vitamins shows that 28.3%, 75.0% and 50.0% males and 42.5%, 62.5% and 75.0% females met the RDA for vitamin A, B2 and B6 respectively.

For age group 10-12years, the mean value for energy for males is 2561.6±905.4Kcal while that of female counterpart is 1750.6±511.8, when comparing the value with standard RDA for that age group; it shows that 111.4% male and 109.4% females meet the requirement for energy.

The average protein intake for male is 21.7±14.3 and that of female is 22.8±13.7 and the percentage of those that met the requirement for protein is 50.7% males and 51.9% females. As for calcium, the average intake for males is 568.6±251.5 and 610.9±310.6 for females while the percentage RDA met considering the average values are 43.8% for males and 47.0% for females. Also iron is with mean values of 4.7±3.1 and 3.7±2.4 and percentage RDA met as 58.8% and 41.3% for males and females respectively. The result for the vitamins shows that 20.0%, 77.8% and 70.0% males and 57.1%, 66.7% and 40.0% females met the RDA for vitamin A, B2 and B6 respectively. There is a significant difference in protein (p=0.021), iron (p=0.025), vit A (p=0.031) consumption among the male and female respondents in rural LGAs. It also showed that consumption of calcium, iron and vitamin A is inadequate while their energy level is beyond the requirement.

Table8. *Energy and Nutrients Intake of the children in Rural LGAs*

		Male		Female		
Age Group	**Nutrient**	**Mean intake**	**%RDA MET**	**Mean intake**	**RDA MET**	**p-value**
7-9Yrs	Energy(kcal)	1852.9±638.4	102.9ǂǂ	1614.1±527.4	100.9ǂǂ	0.543
	Protein(g)	15.1±12.3	50.6	18.2±14.3	67.4	0.021*

	Fat(g)	25.4±12.4	90.7	24.7±8.6	95.0	0.238
	Cal(mg)	449.2±405.1	42.8ǂ	472.2±409.3	45.0ǂ	0.802
	Iron(µg)	5.3±3.7	58.9	4.4±2.7	48.9ǂ	0.025*
	Vit A(mg)	141.3±*97.0*	28.3ǂ	212.6±*72.2*	42.5ǂ	0.031*
	VitB2 (mg)	0.6±*0.4*	75.0	0.5±*0.3*	62.5	0.166
	VitB6(mg)	0.4±*0.5*	50.0	0.6±*0.3*	75.0	0.072
10-12Yrs	Energy(kcal)	2561.6±*905.4*	111.4ǂǂ	1750.6±*511.8*	109.4ǂǂ	0.163
	Protein(g)	21.7±*14.3*	50.7	22.8±*13.7*	51.9	0.413
	Fat(g)	26.2±*13.7*	93.6	23.8±*15.1*	91.5	0.212
	Cal(mg)	568.6±*251.5*	43.8ǂ	610.9±*310.6*	47.0ǂ	0.125
	Iron(µg)	4.7±*3.1*	58.8	3.7±*2.4*	41.3ǂ	0.024*
	Vit A(mg)	119.9±*87.3*	20.0ǂ	242.4±*99.1*	57.1	0.032*
	VitB2 (mg)	0.7±*0.6*	77.8	0.6±*0.5*	66.7	0.373
	VitB6(mg)	0.7±*0.5*	70.0	0.4±*0.3*	40.0	0.443

[a]ǂ *Inadequate intake* [b]ǂǂ *Excessive intake*

** significant at p<0.05*

Association between the Nutritional and Socio-Economic Status

Table 9 shows the association between the nutritional and socio-economic status. No significant association exists between child's age and stunting (x^2 = 14.864, p = 0.149), child's age and BMI for age (x^2 = 9.618, p = 0.538) and also wasting and the age of the children. There was a significant association between mothers age and BMI for age (x^2 = 15.347, p = 0.046) except for wasting and stunting that do not show any association with age of the mothers. The mothers educational level also associated with stunting (x^2 = 18.456, p = 0.014) but no significant association between mothers education, wasting and BMI for age. The family average annual income was significantly associated with stunting (x^2 = 20.368, p = 0.038) and wasting (x^2 = 11.720, p = 0.003) but it does not show any association with BMI for age. Source of water used by the household was significantly associated with stunting (x^2 = 31.820, p = 0.000) but not correlated with wasting and BMI for age while Occupation of household head is significantly related with BMI for age (x^2 = 13.705, p = 0.016).

The household size is significantly related to BMI for age (X^2 = 16.124, p = 0.033) but not related to stunting and wasting while toilet facility does not have any significant relationship with stunting, wasting and BMI for age. Table 10 Showed correlation between maternal education and prevalence of malnutrition among children. Maternal education negatively correlated with stunting (p= -0.020).

Table9. *Association between the nutritional status and socio economic characteristics*

Characteristics	Stunting(HAZ)	Wasting(WAZ)	Underweight(BAZ)
Age(yrs)			
X^2	14.862	9.127	9.618
P-value	0.149	0.413	0.538
Mothers Age(yrs)			
x^2	2.636	12.336	15.347
P-value	0.431	0.195	0.046*
Mothers Education			
x^2	18.456	6.132	9.219
P-value	0.014*	0.431	0.417
Family Annual Income			
x^2	20.368	11.720	6.075
P-value	0.038*	0.003*	0.978
Source of water			
x^2	31.820	7.653	7.600
P-value	0.000*	0.178	0.264
Occupation of the household head			
x^2	1.977	2.636	13.705
P-value	0.846	0.451	0.016*

Household size			
x^2	0.736	10.436	16.124
P-value	0.858	0.196	0.033*
Toilet facility			
x^2	0.601	3.571	1.553
P-value	0.723	0.156	0.264

Table10. *Correlation between Maternal Education and prevalence of Malnutrition among Children*

Sector	Variable	Stunting	Wasting	Underweight
Urban	Maternal Education			
	No formal Education	16(18.0)	7(58.3)	15(18.3)
	Primary education	30(33.7)	5(41.7)	28(34.1)
	Secondary education	29(32.6)	0(0)	25(30.5)
	Tertiary education	14(15.7)	0(0)	14(17.1)
	Total	89(15.6)	12(2.1)	82(14.4)
	Spearman's rho	-0.043*	-0.146	-0.137
	P-value	0.020	0.123	0.081
Rural	No formal Education	40(27.8)	10(52.6)	40(31.5)
	Primary education	95(66.0)	6(31.6)	38(29.9)
	Secondary education	78(54.2)	3(15.8)	32(25.2)
	Tertiary education	28(19.4)	0(0)	17(13.4)
	Total	144(25.7)	19(3.4)	127(22.6)

**Correlation is significant at the 0.05 level (2-tailed).*

Correlations between Nutritional Status, Dietary Indices and Socio Economic Status

Table 11 shows the correlations between nutritional status, dietary indices and socio economic status. Stunting correlated positively with protein (r= 0.262, p= 0.05) but negatively correlated to Iron (r= -0.120, p= 0.05) and vitamin A (r= -0.321, p= 0.05). Wasting shows a positive correlation to Vitamin B2 (r= 0.211, p= 0.05) but negative to energy (r= -0.142, p= 0.05). Also, BMI for age shows a positive correlation to protein (r= 0.140, p= 0.05), iron (r= 0.134, p= 0.05) and Vitamin B6(r= 0.142, p= 0.05).

Childs age correlated positively to vitamin A (r= 0.228, p= 0.05) but negatively correlated to energy (r= -0.123, p= 0.05), calcium (r= -0.103, p= 0.05) and iron(r=- 0.145, p= 0.05). Mothers age positively correlated to calcium(r= 0.158, p= 0.01) and vitamin B2(r= 0.129, p= 0.05). The result also shows that fathers occupation has no significant correlation with all the dietary indices but household size positively correlated to fat(r= 0.134, p= 0.05) but negatively related to energy(r= - 0.429, p= 0.01), calcium(r= -0.207, p= 0.05) and iron(r= -0.104, p= 0.05). Health need positively related to vitamin B6(r= 0.062, p= 0.05).

Table11. *Pearson's Correlations between nutritional status, dietary intake and socio economic status*

Variable	HAZ	WHZ	BAZ	ENERG (Kcal)	PROT (g)	FAT (g)	CAL. (mg)	IRON (ug)	VIT A (mg)	VIT B2 (mg)	VIT B6 (mg)
HAZ	-	-0.282*	0.123*	-0.029	0.262*	0.093	0.026	-0.120*	-0.321*	0.062	-0.022
WHZ	-0.282**	-	-0.314*	-0.142*	0.120	0.096	0.064	0.060	0.128	0.211*	0.093
BAZ	0.102*	0.129*	-	0.241	0.140*	0.030	0.090	0.134*	0.068	0.061	0.142*
Childs Age	0.080**	0.047	0.289**	-0.123*	0.106	0.062	-0.103*	-0.145*	0.228*	0.012	0.231
Mothers Age	0.001	0.321	0.134**	0.055	0.089	0.011	0.158**	0.096	0.115	0.129*	0.033
Fathers Occ.	-0.010	-0.191*	0.159	0.059	-0.031	0.060	0.520	0.097	0.110	0.062	0.102
HH Size	0.281**	-0.129	0.112**	-0.429*	0.033	0.134*	-0.207*	-0.104*	0.001	-0.003	0.055
Health need	0.039*	0.128	-0.058	0.080**	0.047	0.093	-0.026	0.120	-0.021	-0.029	0.062*

***Correlation coefficient is significant at the 0.01 level (2- tailed)*

**Correlation is significant at the 0.05 level (2- tailed).*

Discussion

The purpose of the study was to find out the Implication of Socio Economic Status on the Anthropometric and Dietary Intake of School Age Children in Selected Schools in Ogun State, Nigeria. Malnourished children have increased risk of dying, with most deaths caused by infectious diseases and one mechanism behind this may be impaired immune function (Rytter

et al., 2014) and that is the more reason why it is necessary to assess the socio economic status of the children in relation to dietary and anthropometry indices, so that it can be easily established from the outcome of the study if all these variables are related or not.

In the light of steady decline in the socio-economic status of most Nigerians, the incidence and prevalence of malnutrition should be prevented. The relatively high prevalence of under nutrition observed among school children in this study may be due to the fact that most of these children are from parents of low socio-economic background mainly farmers and traders, who themselves attended poor schools and live in poor houses where unhygienic living standards, unsafe drinking water and insanitary conditions of the immediate environment prevail. Such environmental factors contribute to the survival of disease agents such as parasites, bacteria and viruses. After being infected by these organisms, these children may lose the protein, energy, iron and vitamins intake to the benefit of these disease agents which later adversely affect the growth and nutritional status of the individual. It shows that maternal educational status, and family size in the two areas of study were significantly related to prevalence of stunting(p=0.014), wasting (p=0.003) and underweight (p=0.016) in the study and this finding is similar to the study carried out in Zambia among school children (Mwaniki *et al*., 2013).

The findings of the study showed existence of chronic malnutrition with about one quarter of the children population stunted; with more from the rural LGAs as compared to their urban counterparts. This result is higher than 16.6% reported for Kenyan middle school children (Mukudi, 2003), 17.9% among Santa children of Puruliya district in India (Chowdhury *et al.,* 2008), Turkish children (Gur *et al.*, 2006) and by Zerfu *et al.* (2006) in Addis Ababa. The value is very close to that reported by Oninla *et al*. (2007) among urban school children in Ile-ife, 20.5% reported by Ojukwu *et al,* (2014) among school age in Ibadan-North LGA of Oyo State, 23.6% reported by Babatunde *et al.* (2011) among rural children in Kwara State. Gajendra *et al*, (2006) and Olusoga, (2008) also reported higher values among school age Children of Tea Garden Worker of Assam and among primary 1 pupils in Abeokuta South LGA of Ogun State respectively. The difference in the number of children that are stunted in the local government areas is likely to stem from differential nutritional intake (p= 0.120), socioeconomic (p=0.014) and cultural differences rather than differences in their genetic potential to achieve maximum height. The new multi-centre growth reference chart of the World Health Organization (WHO) used in this study represents the growth pattern of children; it is accepted internationally to adequately reflect variation in growth that is related to nutrition and health of children from different ethnic backgrounds (de Onis *et al.*, 1996). Thus, this finding may be a true mirror-image of overall status of children in Ogun state and capability of the population to meet its basic needs, such as access to food, housing, and healthcare, which themselves are factors closely linked to the development of undernutrition. However, there is likelihood of underestimation of the burden of stunting in this study as the survey was only on school-goers. Results of studies in Ghana and Tanzania showed that non-enrolled children were more undernourished than children enrolled in school (Fentiman *et al.*, 1997 & Beasley *et al.*, 2000). The rate of enrollment of children in school is low in Nigeria. Between 2000 and 2006, the net enrollment ratio for Nigerian primary and secondary schools ranged from 25 to 72 (United Nations Children's Fund, 2008). Therefore, the prevalence of stunting reported may just be a tip of the burden of stunting in the whole school-age population.

In this study, some of the children were found to be wasted. This value is lower than that reported among school children by other studies such as Mekonnen *et al*.(2013); Bloss *et al*. (2004), Kwena *et al.* (2003) and Mwaniki et al. (2013). However, the prevalence of wasting in this study is higher than that reported among school children in Zambia (Gillespie *et al*., 2004). Another study in Nicaragua found that 5% of school children were wasted (Morris *et al*., 2004). It showed that the males had a greater prevalence of wasting than did the females. This difference could be due to cultural factors, socioeconomic factors, or both. Among poor families, females are more likely than are males to drop out of school. As a consequence, there will be a higher percentage of males than of females from poor families attending school, which could explain the higher prevalence of wasting in males in school. Possibly, some children suffered from more than one infectious disease thus culminating in this high rate of nutritional wasting in both urban and rural LGAs. They could also have suffered acute food crisis thus becoming severely

malnourished but lack of food cannot be the sole cause of malnutrition in this study; but also socio-economic status, housing quality, water quality, children healthy condition, child characteristics, Maternal Caring and characteristics and Dietary history of child and mother were associated factors, which seem to be important contributory factors in determining the nutritional status of children.

Taking different indicators of malnutrition into account, the percentage of underweight found in the children under study was high. Most studies worldwide have also reported high rates of undernutrition among school children (Mandal *et al.*, 2014; Shreyaswi et al., 2013; Badami *et al.*, 2012; Bisai *et al.*, 2008& Sengupta *et al.*, 2010). The results of the present study are consistent with these findings. Various studies have established the fact that boys are more likely to be underweight than girls (Shahabuddin *et al*., 2000; Hall, 1998; Sebastian *et al.*, 1999; Lwambo *et al.*, 2000), which was also observed in the present study. In contrast, some other studies found no such association between gender and under nutrition (Luthra *et al.*, 2010; Goel *et al.*, 2007; Bhatia *et al*., 2007).Often coexisting with malnutrition in developing countries, overweight and obesity are complex conditions, with serious social, physiological, and psychological dimensions, affecting all age and social economic groups (Bagully, 2006). It is evident that the rapid urbanization, technology, and the dramatic lifestyle changes experienced by people in African cities are among risk factors of the overweight and obesity epidemic (Tremblay, 2011). It is indicated that the impact of urbanization on lifestyle is likely to be reflected in urban children's lower level of physical activity and higher indices of adiposity than of the rural counterparts (Ojiambo, 2012). Studies demonstrate that overweight children tend to become overweight adults (Onywera, 2013). This suggests that effective prevention and management of overweight and obesity in the society are best encountered by preventing and managing the epidemic in childhood (Reilly, 2011). This study showed that more children are overweight and obese with highest recorded in urban LGAs and also among the female gender. In support of this observation is the study of Cogil (2014) which reported overweight and obesity among children aged 6–9years. Another study conducted in Nigeria identified the prevalence of overweight, obesity among children aged 5 to 18 years to have been 11.4% and 2.8% respectively using BMI for age (Ene-Obong *et al*., 2012). This suggests that developing countries therefore face the double burden of obesity and undernutrition (Wachira, 2014). It is perceived in African settings that fatness with rounded body shapes among females is an attribute of beauty (De Onis *et al.*, 2000). It follows that female children in such setting do not feel disadvantaged when they become overweight. This implied that females were more likely to be overweight or obese than male counterparts. The findings of this study were similar to that obtained from other regional studies that females were more overweight or obese than males, of such is the study on primary school children in Nairobi, Kenya, that reported higher prevalence of overweight and obesity among females than males (Steyn *et al*., 2015). In another study, though males and females did not differ in terms of adiposity, females were more overweight than males (Muthuri *et al.*, 2014) and also a study on children aged 9 to 13 years in western Kenya (Kamau *et al*., 2011), it was found that 6.8% of the boys and 16.7% of the girls in the urban schools were overweight and/or obese. The findings are also in line with that found in South African children where higher prevalence of overweight and obesity was more among female pupils (Adamo *et al*, 2011). In another study among rural South African children, it was reported that the prevalence of underweight was significantly higher in boys than in girls (Armstrong *et al*., 2006). Similarly, some distant studies report a higher prevalence of overweight and obesity among females than in males, and example of such is a study that reported higher prevalence of overweight and obesity among females than males in Ireland health survey (Kimani-Murage *et al*., 2010).

The highest prevalence rates of childhood obesity have been observed in developed countries; however, its prevalence is increasing in developing countries as well (Popkin *et al.*, 1998). Females are more likely to be obese as compared to males, owing to inherent hormonal differences (Gupta, 2009). Childhood obesity can profoundly affect children's physical health, social, and emotional well-being, and self esteem. It is also associated with poor academic performance and a lower quality of life experienced by the child. Many co-morbid conditions like metabolic, cardiovascular, orthopedic, neurological, hepatic, pulmonary, and renal disorders are also seen in association with childhood obesity (Krushnapriya, 2015).

Childhood is a time of critical growth in which proper nutrition is absolutely necessary. Children who have poor diets whether because of a lack of food or because of patterns of eating that lead to inadequate intake of nutrients are prone to significant short-term and long-term health impacts and diseases. Children afflicted by sustained poor nutrition are at greater risk for obesity, mental and emotional health problems, and a failure to thrive academically.

According to the Children's Defense Fund (2008), children who do not have access to proper nutrition are much more likely to suffer from psychological disorders, such as anxiety or learning disabilities. These children are also significantly more likely to require mental health counseling. Poor nutrition negatively impacts a child's ability to develop properly and adapt normally to certain situations. A study in the "Indian Journal of Psychiatry" in 2008 noted a link between iron deficiency and hyperactivity disorders in children. The age groups consider in this study (7–12 years old) is potentially vulnerable and susceptible to growth and general developmental challenges. Often, the adverse effects of poor nutrition at this age are not reversible and eating habits have not been established (Mesfin *et al.,* 2015). Childhood is a time when food preferences and habits are shaped. Feeding practices in early life are important in cognitive development of the child and overall well-being of an entire lifetime (Ejekwu *et al.,* 2012).

However, while the level of protein intake was within the RDA range for both urban and rural children in the present study though the percentage was higher in urban LGAs when compared with the rural LGAs, as the result shows the rural subjects at the borderline because they met only 59.6% of the RDA for protein, Onimawo *et al.* (2007) recorded low protein intake for both groups (urban and rural). The prevailing economic trends in Nigeria have made it difficult for the low-income population to afford foods of animal origin because of their expense. This has often resulted in a serious imbalance of nutrient intake, as evidenced by the prevalence of malnutrition among rural children (Roots *et al.,* 1987 & Lanipekun *et al.,* 1992). Substantial evidence shows that imbalance of nutrients is a major food-related risk and threat to health (Roberts, 1981; Institute of Food Technologists, 1990 & Institute of Food Technologists, 1992). As a consequence of the dearth of animal protein, the low-income population increasingly depends on plant food sources to meet their protein and other nutrient demands. Roots and tubers account for 78% of the total calorie intake of Nigerians, and animal products (including fish) less than 3% (Okeahialam, 1972). The implication of protein deficiency is that the body breaks down protein-rich tissues like muscles, therefore may lead to muscle wasting accompanied by increasing weakness which may inturn lead to a greater number of infections because the immune system cannot produce enough antibodies or other immune molecules.

The Energy intakes of the rural children were higher than that of the urban children. Culturally, a large portion of Nigerian staple foods comprises carbohydrate. From the findings, about nine in ten respondents reported they fed at least thrice daily. A food intake assessment through 24hour recall showed that about the same ninety percent of them consumed more of carbohydrate with little micronutrients based foods. This result is consistent with those of several studies which reviewed that presently; there is a very low consumption of micronutrient-rich foods such as vegetables, fruits and milk by large number of children (Kelishadi *et al.,* 2014; Nnebue, 2010 & Garcia-Continente *et al.,* 2015). The food consumption pattern showed that rice was the major staple food consumed by the children in urban while garri and Lafun in rural areas. Others include yam, beans and pap. The main sources of protein for the urban children were milk, fish and meat while beans and fish were the major sources of protein for the rural children. Also, the urban children consumed more milk but not too common among rural children. The dietary assessment showed that in both groups, carbohydrate contributed a larger percent to the total energy intake. This is not surprising because root, tubers and legumes are the most abundant and cheap staple food available in Nigeria (Lemchi *et al.,* 2015). The higher calcium intake of the urban group could be attributed to their higher consumption of foods of animal origin.

It may be surprising that despite the availability of green leafy vegetables and fruit in rural areas, some of the children are not adequate in calcium. Calcium intakes were very low among school-age children in the rural LGAs which may likely be as a result of low intakes of food groups with calcium-rich food sources (green leafy vegetables), cooking methods and low consumption of dairy products. This finding corroborates Henry and Chapman (Henry &

Chapman, 2002) assessment of low calcium intakes in African populations of 300-400 mg/day which is well below the recommended daily intakes. Children with enough calcium start their adult lives with the strongest bones possible. That protects them against bone loss later in life, Rickets softens the bones and causes bow legs, stunted growth, and sometimes sore or weak muscles.

The nutrient intake results showed that the children in urban LGAs irrespective of their age groups are fairly adequate (above the RDAs) in all the nutrients in the study except for iron, calcium and Vitamin A, intakes of majority of the children in the rural LGAs were below the RDA for their age according to the Food and Nutrition Board Standards (2007). This is consistent with the findings of the survey by Onimawo *et al.* (2007) that recorded low levels of Iron, Vitamin A and Calcium in children. It is not surprising that some of the rural children did not satisfied the RDA for iron because it is earlier shown from the biochemical assessment where the PCV and heamoglobin level is low in many rural children and may be a reason why more rural children are anaemic. The human body requires a steady supply of iron, regardless of age or phase of life. Iron deficiencies are common in children and especially risky because children's bodies are still growing and developing. Iron is important for children because it helps to transport oxygen from the lungs to other parts of the body, and it allows the muscles to store and use this oxygen (Fergon, 2008). Vitamin A *which is* a fat soluble *vitamin* that is also a powerful antioxidant plays a critical role in maintaining healthy vision and neurological function. It showed from the result that vitamin A consumption was low among rural children despite their access to various fruits and vegetables, the deficiency may be largely due to ignorance on the part of the parents because part of the information gathered from the rural areas is that fruit are only consumed in the absence of other foods like rice, beans etc and the method of cooking some of the vegetables is another factor.

The result of this study shows that most of the families of the urban children were better educated and earned higher monthly income than those of the rural children, and thus may be more informed and able to provide more adequate nutrition for their children and attain higher nutritional status. The finding in this study is consistent with the survey by Oninla, Owa, Onayade and Taiwo (2007) in their comparative study of nutritional status of urban and rural children in Nigeria. The observed prevalence of stunting, wasting and under-weight in the rural children is possible due to the fact that hunger and improper selection of food are often more prevalent in the rural areas. The low level of education of mothers of the rural children, coupled with low income level often translates to reduced access to food and adequate diet in particular and thus inadequate food intake and resultant under nutrition.

Socio-demographically, the nutritional status of the urban children was better than that of the rural children in the present study. This can be attributed to a lot of factors including the fact that the rural group had comparatively large family sizes of more siblings, coupled with the fact that most of their mothers had low level of education and earn quite low income monthly and as such cannot adequately provide the basic nutrient needs of their children. Byrd-Bredbenner *et al.* (2013) rightly noted that people with inadequate education, income and poor housing often have greater risk of poor health. Limited education may also tend to reduced ability to follow instructions given by health-care providers. Moreover, large family sizes most often reduce the amount of food available to individuals and the resultant over-crowding encourages spread of diseases. These may consequently lead to malnutrition and poor health. Comparatively, the majorities of the mothers of the urban children had Bachelors degree and above, thus were more educated and earned more income, and as such are in a better position to provide the basic nutrient needs of their children to achieve desirable nutrition.

CONCLUSION

The following can be concluded from this study:

- The socio-economic status and WASH practices were very poor among the children who participated in the study, particularly in rural areas.
- The prevalence of malnutrition-measured by stunting (20.6%), underweight (18.5%) and wasting (2.7%) were high among the children and are of public health significance.
- In general, results of nutrient intakes of both male and female school children in this study were low in some nutrients (Calcium, Vitamin A and iron) compared to the RDA. More of these inadequate intakes were more in the rural areas.

The study revealed significant relationship between socio economic status, dietary and nutritional status of the children that participated in the study.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

- More efforts should be geared towards improving the nutritional status of school children through the effective implementation of the school lunch feeding programme in the country.
- Home Economists and Nutritionists should step up nutrition education advocacy and campaigns to sensitize mothers towards appropriate selection of foods to ensure adequate nutrition of children and optimization of nutrients.
- Utmost care and attention must be focused on these socioeconomically and disadvantaged children living most especially in the rural areas. Sincere efforts must be undertaken to make a significant impact on child's nutrition with multipronged approach such as giving priority to education especially for women, creating awareness regarding benefits of factors like limiting family size, proper storage of drinking water, and so forth, and providing toilet facility in the household.
- Nutrition education should also enable mothers and caregivers understand the basic needs and nutrient requirements of children for optimal growth and development, as well as sources of these nutrients.
- Advocacy for fortification of food with the essential micronutrients should be stepped up to assist in meeting the children requirements of these micronutrients in their diet for healthy development.

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