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NUTRIENT CONTENT OF SCHOOL MEALS AND THE NUTRITIONAL STATUS OF PRIMARY SCHOOL CHILDREN IN LAGOS STATE, NIGERIA

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ABSTRACT

The nutrient content of school meals and the nutritional status of primary school children in Agege Local Government Area, Lagos State were examined in this study. A total of 438 healthy school children [boys (205) and girls (233)] aged 6 to 12 years were selected from five public primary schools using multi-stage sampling procedure. Data on socio-economic characteristics and dietary habits were obtained with a structured interviewer-administered questionnaire, while food consumption patterns and nutrient intake data were collected using a food frequency questionnaire and 24-hour dietary recall, respectively. Data on food intake were converted to nutrient intake using Total Diet Assessment software. Data collected were analyzed with descriptive (mean and standard deviation) and inferential statistics. The mean nutrient intake from school meals were calorie (308.61±146.99 kcal), protein (6.05±3.15 g), fiber (1.60±1.17 g), fat (4.04±2.96 g), vitamin A (79.23±52.10 RE), vitamin B1 (0.24±0.09 mg), vitamin C (3.37±2.97 mg), calcium (12.05±10.4 5 mg), and zinc (1.64±1.13 mg). Furthermore, 65.0% of the respondents had normal BMI-for-Age, 28.5% were underweight, while 5% and 1.6% were overweight and obese, respectively. Based on BMI-for-age across the two age groups, girls were significantly ($p \leq 0.05$) better nourished than boys. In conclusion, the nutrient content of school meals from all the schools had inadequate nutrients except carbohydrates and iron, which could have contributed to their poor nutritional status.

Keywords: Nutrient content, Nutritional status, School meal, and School children

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INTRODUCTION

Children who are malnourished are more likely to have slowed growth, delayed development, difficulty in school attendance, and may remain malnourished to adulthood (Storey et al., 2002; Abidoye et al., 2000 and Scrimshaw, 1998).

Malnutrition is a known major contributor to the total global disease burden and the possibility of these school children becoming malnourished is very high (Adamu et al., 2012). Malnutrition is said to cast long shadows, affecting close to 800 million people - 20% of all developing countries. In other words, 1 out of every 8 people in the world suffers from malnutrition (Edukugho, 2004).

The Food Consumption and Nutrition Survey in Nigeria (FCSN 2001 -2003) reveals that Nigerian children's nutritional status is very poor. The data showed that 42% of Nigerian children were stunted, 25% were underweight and 9% were wasted. 29.5% of the children under -five years of age suffer from vitamin A deficiency while over 27% were at different iron and iodine deficiency (Adebambo, 2006). According to Ejekwu et al. (2012), the prevalence of stunting, underweight and wasting in Nigeria was 27.7%, 29.9% and 25.5% respectively among school age children in South-East and 44.8%, 43.1% while Olanipekun et al. (2012) report indicated the prevalence to be 41.1% among boys in public primary schools in the South-West. About 30% of school children had low body mass index for age in Nigeria (FMOH; 2006).

The effect of malnutrition on school children cannot be over emphasized because children who are malnourished are more likely to have delayed learning process, slowed growth, delayed development, reduced adult size, reduced work capability, difficulty in school attendance and they may remain malnourished to adulthood, which in turn impacts on economic productivity at the national level (Abidoye, et al., 2000). If not solved by good nutrients intake supplied by adequate diet from foods of both plant and animal origin that supplies essential nutrients and these nutrients taken in the right quantity, can cause ill-health and even death.

The current regulation required that one-third of the Recommended Dietary Allowance (RDA) for protein, vitamin A, vitamin C, Iron, Calcium and calorie be provided from the school meal (USDA, 2005; SACN, 2009).

There is a dearth of Information on the nutrient content of school children meals and their nutritional status in Nigeria. Since children's diet may influence their lives in many ways, it is therefore important to evaluate the nutrient content of public primary school children and assess their nutritional status, which is the aim of this study using Agege Local Government Area as a case study. Furthermore, looking at the portion size and the cost of the pupils' meals with their food intake.

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METHODOLOGY

Study design

The study was descriptive and cross-sectional. School children were selected randomly from 50 public primary schools in Agege Local Government Area, Lagos. The study was carried out in 2012/2013 academic session.

Study population

The study populations are primary school age children between ages 6 to 12 years attending Government primary schools in Agege, Lagos. Lagos state has a population of 17,552,942, out of which Agege L.G.A. with a population of 459,939, and children constitute 45% of the population (206, 972.55).

Sample Size and Sampling Technique

- Sample Size was determined to be 399 using the formula of Yamene (1967) by random sampling technique

$$\mathbf{n = \frac{N}{1 + N(e)^2}}$$

n = Sample size

N = Population size and

e = Level of precision

n = 206,972.55

$$\mathbf{n = \frac{206{,}972.55}{1 + 206{,}972.55(0.05)^2}}$$

n= 399

The less variable (more homogeneous) a population is, the smaller the sample size (Glenn, 2012). In the end, a total of 438 respondents were used.

Sampling Procedure

Multi-stage random sampling was used to select 438 Pupils aged 6-12 years in public primary class (1-6). There are fifty (50) public primary schools in Agege Local Government Area, sub divided into five (5) zones. One school was randomly selected from each of the 5 zones. Lists of schools obtained from Lagos State Ministry of Education were assigned a number from 001 separately in ascending order. Thereafter, the schools were selected according to a random

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number table. Schools were sampled using a simple random sampling technique, while systematic random sampling was used to select the pupils from the school register, ensuring that respondents were given an equal chance of being selected.

Method of Data Collection

A structured self-administered questionnaire designed in English was used to obtain information from four hundred and thirty-eight (438) respondents. The questionnaire was used to generate information with the specific objectives of the study in view. The questionnaire has five (5) sections and was sectionalised as follows: personal data; Socio demographic and economic characteristics of the respondent parents; Dietary habit and food intake pattern; Direct weighing of school meals consumed; Anthropometric measurements; and Physical observation of the children.

Data analysis

The data was scrutinized, cleaned, and then entered into the computer for analysis using SPSS, Window version 16.0 and Epi Info (TM) 3.5.1. The data generated were analyzed using descriptive statistics such as means, standard deviations, percentages, and frequencies of participant's characteristics; anthropometrical test measurements were computed and provided for each age and gender. The differences between male and female pupils were determined using students t-test. Pearson's chi-square test was used to test the existence of a significant association between categories of nutritional status (BMI-for-Age) and socio-economic characteristics.

RESULTS

Socio Demographic characteristics of the Respondents parents

Table 1 showed the personal information of the pupils' sex and age. Female respondents constituted the highest percentage being 53.2% while male constituted 46.8%. Pupil's age were between 6-12 years, 6-8 year old pupils had 62.8% while 9-12 year old were 37.2%.

Table 1: Personal Data of the Respondents

	Frequency	Percentage
Sex		
Male	205	46.8
Female	233	53.2
Total	438	100.0
Age(years)		
6-8	273	62.8
9-12	163	37.2
Total	438	100.0

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Table 2 showed the pupils' fathers educational level, which revealed that 15.8% had no formal education, while 40.6% had primary education, 41.3% had secondary education, and 2.3% had tertiary education. Mother's educational level showed that 29.7% had no formal education, 42.9% had primary education, 26.0% had secondary education, and 1.4% had tertiary education. The respondents' fathers' occupation showed that 7.3% of them were civil servants, 26.3% were artisan, while 3.2% of the respondents' mother were civil servants and 58.7% of the respondents' mothers were petty trader. Majority of the respondents' household sizes were between 5-8 people, while 1.4% of the respondents had household size of over 17 people.

Table 2: Socioeconomic and Demographic Characteristics of the Respondents Parents

	Frequency	**Percentage**
Education level of Father		
No formal education	69	15.8
Primary education	178	40.6
Secondary education	181	41.3
Tertiary education	10	2.3
Total	438	100.0
Education level of Mother		
No formal education	130	29.7
Primary education	188	42.9
Secondary education	114	26
Tertiary education	6	1.4
Total	438	100.0
Occupation of Father		
Petty trader	87	19.7
Artisan	115	26.3
Transporter	64	14.6
Civil servant	32	7.3
Total	438	100.0
Occupation of Mother		
Petty trader	257	58.7
Artisan	57	13
Housewife	93	21.2
Civil servant	14	3.2
Total	438	100.0
Household size		
1-4	41	9.4
5-8	337	76.9
9-12	47	10.7
13-16	7	1.6
17 and above	6	1.4
Total	438	100.0
Living with parent		

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Yes	403	92
No	35	8
Total	438	100

Mean Calorie and Nutrient Intake of Respondents based on Sex and Age

Table 3 showed the daily nutrient intake of respondents in comparison with FAO/WHO 2002 Recommended Daily Allowance of nutrients using 24-hour dietary recall. In the energy section, the mean value of both female and male aged 6-8 years were 1006.93±454.13 kcal and 1039.39±500.43 kcal were less than the RDA by 25.76%, while aged 9-12 years was 981.48±284.94 kcal for both male and female. Carbohydrate mean intakes of the respondents were above the RDA by 24.18% and 15.40%, for both female and male, while Fat, fibre, and B vitamins mean intakes were below RDA for both sex and age.

TABLE 3: Mean Nutrient Intake of Respondents Based On Sex and Age

NUTRIENT	**MEAN ± SD Female (6-8 years)**	**RDA**	**RDA (%)**	**MEAN ± SD male (6-8 years)**	**RDA**	**RDA (%)**
	Mean ± SD			Mean ± SD		
Calorie (kcal)	1006.93±454.13	1200	83.91	1039.39±500.43	1400	74.24
Protein (g)	26.07±14.00	19	137.21	27.67±16.55	19	145.6
Carbohydrate (g)	161.44±58.94	130	124.18	150.04±44.60	130	115.4
Fiber (g)	3.19±1.16	17	18.76	4.79±2.87	20	23.93
Fat (g)	15.41±12.72	30	51.37	16.95±14.4	30	56.5
Vitamin A (RE)	302.4±266.9	400	75.6	332.3±281.14	400	83.0
Vitamin C (mg)	1.85±0.53	25	7.4	1.31±0.69	25	5.24
Folate (mcg)	133.89±111.85	200	66.95	115.19±107.86	200	57.6
Vitamin	0.50 ±0.28	0.6	83.3	0.45 ±0.22	0.6	75.0

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B1(mg)						
Vitamin B2(mg)	0.23 ±0.16	0.6	38.3	0.23 ±0.15	0.6	38.3
Vitamin B3(mg)	4.92 ±1.34	8.0	61.5	4.68 ±1.11	8.0	58.5
Vitamin B6(mg)	0.24 ±0.13	0.6	46	0.16± 0.05	0.6	26.7
Vitamin B12 (mcg)	0.44±0.30	1.2	36.67	0.79±0.32	1.2	65.83
Calcium (mg)	80.68±58.21	800	10.09	116.07±108.24	800	14.5
Zinc (mg)	4.79±2.23	5	95.8	5.21±2.23	5	104.2
Iron (mg)	8.12±3.12	10	81.2	8.31±2.89	10	83.1

TABLE 3: Mean Nutrient Intake Of Respondents Based On Sex And Age (cont'd)

NUTRIENT	**MEAN ± SD** **Female** **(9-12 years)** Mean ± SD	**RDA**	**RDA (%)**	**MEAN ± SD** **male** **(9-12 years)** Mean ± SD	**RDA**	**RDA (%)**
Calorie (kcal)	981.48±284.94	1600	61.34	981.48±284.94	1800	54.5
Protein (g)	23.47±10.87	34	69	24.84±8.55	34	73.1
Carbohydrate (g)	164.05±51.17	130	126.2	185.21±60.35	130	142.5
Fiber (g)	1.74±1.97	22	7.91	2.23±2.71	25	8.92
Fat (g)	12.84±8.32	30	42.8	13.41±8.19	30	44.7
Vitamin A (RE)	294.34±266.0	600	49.1	424.02±3.16	600	70.67
Vitamin C (mg)	1.65±6.37	45	3.67	1.60±5.88	45	3.60

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Folate (mcg)	138.72±149.13	300	46.24	170.66±168.88	200	85.33
Vitamin B1(mg)	0.49 ±0.46	0.9	54.4	0.57± 0.53	0.9	63.3
Vitamin B2(mg)	0.24 ±0.25	0.9	26.7	0.27± 0.23	0.9	30.0
Vitamin B3(mg)	4.94 ±2.34	12	49.8	5.97± 3.44	12.0	49.8
Vitamin B6(mg)	0.18 ±0.16	1.0	18.0	0.21± 0.19	1.0	21.0
Vitamin B12 (mcg)	0.51± 0.38	1.8	28.3	0.65±0.17	1.8	36.11
Calcium (mg)	59.56± 28.27	1300	4.6	65.53±37.65	1300	5.04
Zinc (mg)	4.98± 2.51	8	62.3	4.90±1.79	8	61.3
Iron (mg)	8.73±2.89	8	109.1	9.68±3.03	8	121.0

Anthropometric characteristics of the respondents

Table 4 showed that height, MUAC, and BMI were significantly different in both ages and sexes ($p \leq 0.05$). There is no significant difference between the mean weights of age 6-8 years for boys.

Table 4: Anthropometric indices of the respondents

Variable	Age 6–8(n= 275)	Age 9-12(n=163)		
	Mean±SD	Mean±SD	t-value	p-value
Male				
Weight (kg)	21.98±3.34	28.10±4.92	2.26	0.06
Height (cm)	119.95±0.07	132.73±0.75	3.51	0.03*
MUAC (cm)	16.10±1.11	17.27±1.27	4.92	0.00*
BMI (kg/m^2)	15.73±1.36	16.07±2.11	3.14	0.00*

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Female				
Weight (kg)	22.72±3.27	27.94±5.18	5.62	0.00*
Height (cm)	122.3± 0.07	132.01±0.09	4.01	0.01*
MUAC (cm)	16.13±1.47	17.19±1.22	4.30	0.00*
BMI (kg/m^2)	15.73±1.52	16.15±2.08	-3.70	0.00*

***Statistically significant ($p \leq 0.05$)**

Table 5 showed the nutritional status of the pupils using *BMI-for-Age* percentile based on the WHO reference standard. Majority of the pupils 64.8% were normal, 28.5% were underweight, while 5.0% were overweight.

Table 5: Nutritional Status of the school Respondents

Variable	Frequency (N)	Percentage (%)
WAZ		
Normal	335	77.5
Mild underweight	86	6.7
Moderate underweight	33	4.1
Severe underweight	13	1.7
Total	438	100.0
HAZ		
Normal	229	52.3
Mild stunting	122	27.9
Moderate stunting	67	15.3
Severe stunting	20	4.6
Total	438	100.0

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BMI-for-age Z		
Underweight	125	28.5
Normal	284	64.8
Overweight	22	5.0
Obese	3	1.4

Table 6 showed the distribution of socioeconomic characteristics by BMI-for-Age among pupils. Out of 438 pupils, 4.3% of the female pupils were found to be overweight and 5.9% was found to be overweight among male, which shows significant at $P \leq 0.05$. There was no significant association between the BMI-for Age and age of the respondents with age 6-8 and 9-12 years at $P \leq 0.05$. Mothers level of education was significant, while sex, age, fathers and mothers occupation, and father education were not significant ($P \leq 0.05$).

Table 6: Association of Socioeconomic Characteristics of Respondents with their BMI-for-age Percentile

	Underweight	**Normal**	**Overweight**	**Obese**	**$\chi 2$**	**P-value**
Sex						
Male	61 (29.8)	129 (62.9)	12 (5.9)	3(1.5)	1.852	0.708
Female	64(27.5)	155 (35.4)	10 (4.3)	4 (1.7)		
Age (years)						
6 – 8	72 (26.2)	188 (68.4)	12 (4.4)	3 (1.1)	5.599	0.231
9 – 12	53 (32.5)	96 (58.9)	10 (6.1)	4 (2.5)		
Family background						
Monogamy	57 (10.2)	204(68.8)	6 (2.1)	6 (1.9)		
Polygamy	4 (2.6)	19 (13.6)	0 (0.0)	1 (0.6)	3.138	0.371
Education level of mother						
No education	42 (32.3)	82(63.16)	2 (1.53)	0 (0.00)		
Primary education	46 (24.47)	127 (67.55)	12 (6.38)	3 (1.60)	20.686	0.014

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Secondary education	35 (30.70)	71 (62.28)	8 (7.02)	0 (0.00)		
Tertiary education	2 (33.3)	4 (66.67)	0 (0.00)	0 (0.00)		
Education level of father						
No education	2 (2.90)	6 (8.70)	2(2.90)	(0.00)		
Primary education	49 (27.53)	118 (66.29)	9 (5.06)	1(0.56)	13.275	0.349
Secondary education	49 (27.07)	119 (65.75)	9(4.97)	(0.00)		
Occupation of father						
Civil servant	7 (21.88)	22 (65.64)	3 (9.38)	0 (0.00)		0.452
Trader	16 (18.39)	68(78.16)	3(3.45)	1(1.15)		
Employee of Private Organization	40 (28.57)	92 (65.71)	7(5.00)	1 (0.71)		

*Statistically significant ≤0.05)

Table 6: **Association of Socioeconomic Characteristics by BMI-for- age Percentile Cont'd**

	Underweight	**Normal**	**Overweight**	**Obese**	**χ2**	**P-value**
Occupation of mother						
Civil servant	2 (14.29)	11 (78.57)	1 (7.14)	0(0.00)		
Trader	75 (27.78)	176 (65.19)	15 (5.56)	4 (1.48)		
Artisan	18 (31.58)	34(59.65)	5 (8.77)	0(0.00)	16.181	0.881
House wife	28(30.11)	61 (65.59)	1 (1.08)	2 (2.16)		
Employee of Private Organization	2 (50.00)	2 (50.00)	0 (0.00)	0 (0.00)		

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Living with parent						
yes	115 (28.55)	264 (65.51)	17 (4.22)	7 (1.74)		
No	10 (28.57)	20 (57.14)	5 (14.28)	0 (0.00)	464.191	0.000*
Household size						
1 – 4	12 (29.27)	28 (68.29)	1 (2.44)	0 (0.0)		
5 – 8	91 (27.00)	221()	18(65.58)	7(2.08)		
9 – 12	16(34.04)	30 (63.83)	1 (2.13)	0(0.00)	26.146	0.010*
13 -16	4 (57.14)	2 (28.57)	1 (14.29)	0(0.00)		
Others	2 (33.33)	3 (50.00)	1(16.67)	0 (0.00)		
Source of water						
Borehole	29 (24.37)	83 (69.75)	5 (4.2)	0(0.00)		
Pipe borne water	70 (29.29)	150 (62.76)	14 (5.86)	5 (2.09)		
Well	26(32.5)	51(63.75)	3 (3.75)	0(0.00)	83.078	0.000*

*Statistically significant ($p \leq 0.05$)

DISCUSSION

Children in the age group 6- 12 years are often considered as school age. Nutritional status of children is still an important determinant of child health (Okolo et al; 2003). The prevalence of malnutrition among school aged children attending public primary schools in Agege Local Government Area in Lagos State is similar to those found in the literature. The prevalence of underweight was 28.5%, using BMI for age. Prevalence of underweight is highest among age 9 to 12 (32.5%) than age 6 to 8 years. Almost two-thirds of the school aged children studied had normal nutritional status of 64.8% which is similar to studies on school aged children in Sagamu and Pakistan with 65% to 87% respectively (Fetuga, et al, 2010). Adegun et al., (2011) in assessing the school age children in Ekiti found that 45.5% of the respondents had normal nutritional status; these findings also showed the various forms of under nutrition (stunting, underweight, and thinness) occurred more frequently than overweight/obesity in the population studied.

A major study of school age children from developing countries indicated that the overall prevalence of underweight between 34 -62%; the SCN notes that among school age children underweight is more prevalent than wasting (SCN, 2002), which is in agreement with this

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present study. Stunting was the most common form of under-nutrition while wasting was the least among children in the present study. Overall, 28.5%, 24.0% and 47.7% were underweight, thinned and stunted respectively, similar to findings of Fetuga, et al, (2010) in Sagamu, Ogun state, and Kaushik, et al. (2008), in West Bengal, India, which showed that the prevalence of underweight and stunting (61.2% and 27.8% respectively), prevalence of underweight in west Bengal, India was 27% and 30% in Pakistan. Similarly, the prevalence of stunting in the present study was lower (23%) than reported among children in West Bengal, India 15% and 35% prevalence reported among the aforementioned Pakistani children, but closer to the prevalence rate 14.2% in Sagamu, Ogun state.(Fetuga et al, 2010).

Considering the BMI -for –age of the respondents based on gender, age and class, the results showed that male respondents (29.8%) had higher prevalence of underweight than the female respondents (27.5%), which is in agreement with findings of Ekhator, et al, (2012) in Edo state of Nigeria and Fetuga, (2010) in Ogun State, with prevalence of stunting more common in male than female (16.2% and 16.9%) and (13.4% and 11.7%) respectively. Across the age group, underweight was most common among 9 to 12 years and lesser in ages 6 to 8 both gender, this is similar to the findings of Fetuga, (2011). Whereas prevalence of overweight and obesity were least recorded in all the age groups as observed in this study as well as in the findings of Ekhator in Benin state of Nigeria. Underweight was more prevalent in primary six pupils (44%) and least recorded in primary three pupils in this study.

The mean nutrient intake of the respondents using the 24 hour dietary recall showed that only the female respondents of age 6 to 8 years had adequate calorie intake (83.91%), close to the findings of Mario, (2009) in Mexican children reported energy adequacy of 88.0%. The mean protein and carbohydrate, of age 6 to 8 years exceeded RDA 137.21% (26.07g) and 124.18% (161.44g) respectively, whereas, the fat and fiber intake of this age group were 15.41 (51.37%) and 18.76% (3.19g) were inadequate and also lower than that of Mexican children (Mario, 2009), the vitamin A (75.6%) slightly below the RDA, vitamin B1,B2, B3, B6 and B12 did not meet the RDA, also observed for age 9 to 12 in both sexes, which is similar to the findings in Ekiti, Osun and Sagamu in Ogun state.

The adequacy of nutrient intake of school children which was low could also contribute to the high prevalence of malnutrition seen among the school age children with stunting level recorded to be as high also 36.3% in age 6 to 8 years and 16% in age 9 to 13 years, as well as micronutrient deficiencies.

CONCLUSION

Malnourished children have multiple functional disadvantages that persist throughout adulthood and poor nutrition almost certainly plays a role. It is probable that nutrient intake of the school age children is particularly important. The poor development of malnourished children is likely to limit economic productivity in individual adults and nations.

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RECOMMENDATION

There is the need for effective multifaceted policies and programmes at all levels aimed at reducing and combating all forms of childhood; under-nutrition, illnesses/diseases, and micronutrient deficiencies in view of the high prevalence of protein energy malnutrition observed in the study population. It will contribute immensely to reduction in the burden of disease and enhance national productivity.

Limitation

Meals consumed at home and elsewhere were not taken into account in this study.

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