# Impact of Food Consumption Pattern on the Body Mass Index (BMI) of School Children (5-12 Years) in Selected Motherless and Orphanage Homes in Imo State

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## Abstract

**Objectives:** The study was conducted to evaluate the impact of food consumption pattern on the body mass index (BMI) of school age children in selected motherless and orphanage homes in Imo State.

**Materials and methods:** Seven motherless and orphanage homes representing 58% of the government approved homes were drawn from the three geopolitical zones in Imo State. A total of 115 school age children aged 5-12 years (male and female) were selected through a stratified random sampling method. A well-structured and validated food frequency questionnaire (FFQ) was used to elicit information on the prevailing feeding pattern in the selected homes. Height and weight of the school age children were measured using standard methods. The WHO reference standard was used to classify the BMI of the school children.

**Results:** It was observed that the frequency and quantities of consuming fresh fruits and vegetables cooked and uncooked (125 ml/50 g) by the children were low compared to can/packed fruit juice/drinks (175 ml). Carbohydrate rich foods such as Gari/fufu, rice, and indomie/spaghetti were found to be frequently consumed by the children in almost all the homes compared to beans. Animal based protein like egg/ meat /smoked fish were found to be consumed often but in small quantity (10 -50 g). The mean BMI of the children ranged from 13.9 - 24.0 kg/m$^2$ (male) and 13.1 -33.0 kg/m$^2$ (female). Prevalence of obesity, overweight and underweight were 4.8%, 33.3% and 38.1%. Overweight was higher among male children (22.2%) and children between 5-8 years (25.3%) while underweight was higher among the female (23.8%) children and children between 9-12 years (31.8%). Weak positive correlation (0.14) was observed between the frequency of food consumption on the body mass index (BMI) of the respondents and weak negative correlation (-0.19) with quantity of consumption of certain foods on the BMI of the respondents.

**Conclusion:** High rate of overweight and underweight was observed among the school children. Caregivers in motherless and orphanage homes in Imo State need nutrition education.

**Keywords:** Food frequency questionnaire; Feeding pattern; School age children; Obesity; Underweight; Motherless; Orphanage homes

## Introduction

School age children as defined by the American heritage dictionary [1] is the age at which a child is considered old enough to attend school, usually between 5-12 years. School aged children constitute an important segment of any society as they represent 20 to 30% of the population [2]. School age is considered as a dynamic period of growth and development because children undergo physical, mental, emotional, and social changes. The foundation of good health and a sound mind is laid during this period [3]. Available information shows lack of data on the actual nutritional status of school age children in developing countries [4]. This is because most researches have focused on under five children neglecting the school age. It has been assumed that by school age a child has survived the most critical period and is no longer vulnerable to certain health and nutrition challenges [5]. Based on this assumption, school age group is most of the time being neglected as far as food and adequate nutrition is concerned [6]. Although statistics have shown that school age group has the lowest mortality and morbidity rate than any other group [7]. This is not enough to disregard adequate feeding pattern for this group. The deprivation of proper and adequate nutrition for the school age leads to poor growth, malnutrition and poor mental, physical and emotional development [7]. During the school age period the foundation including food habit are led for future adult roles. Children who fail to grow optimally during this crucial period may not make-up the loss in growth even on an excellent diet in later life [3]. However, the

school age children are often willing to eat a wide variety of foods (http://www.stanfordchildrens.org/). Eating variety of foods among this group need to be encouraged by family members and care givers as this will contribute to healthy food intakes. Unfortunately the diets commonly offered to young children are of low quality and often lack variety, which is the key to specific nutrient adequacy [8]. The Food Consumption and Nutrition Survey in Nigeria (FCSN, 2001-2003) reveal that the nutritional status of Nigerian children is very poor [9]. The data showed that 42% of Nigerian children were stunted, 25% were underweight and 9% were wasted. In a study conducted by Ene-Obong and Ekweagwu, the prevalence of overweight, underweight and thinness of school age children in Ebonyi State of Nigeria were found to be 4.7%, 23.3% and 6.1%. While prevalence of mild to severe stunting of 42.5%. Similarly, Asinobi and Nwankwo [10], reported

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poor nutritional status of 48.4% (stunting), 38.2% (underweight), 27.3% (wasting) and 47.3% (anaemic) among adolescent girls in Ohaji/Egbema of Imo State Nigeria. In India school age children in orphanage homes were found to be stunted (18.57%) wasting (15.71%), underweight (22.86%) and thinness 17.14% [3]. In spite of the health risk associated with inadequate food intake among school aged, study on the nutritional requirements and way forward of this group has been neglected [11]. Studies have shown that school age children living in the developing world tend to consume monotonous meals containing very little animal products [12]. This was confirmed by the report of Ene-Obong and Ekweagwu, where most frequently consumed staple by school age children in Ebonyi state, Nigeria was cassava- based product akpuf *(ufu) and gari*, ranking 73. 9% while legume ranked only 11.9%. This applies to most households in South eastern Nigeria due to the fact that animal products are soldemly not available, especially to the low income group, which may lead to inadequate food intake in such households.

Thus understanding the nutritional status of school children has far reaching implication for the development of any society. Good health and adequate nutrition of school age children will improve growth and development of the children, improve learning potentials; contribute to decreasing risk of leading health conditions, enable healthy adulthood and ageing, and consequently contributes to national aconomic growth and development [13]. Nevertheless, some factors are known to interfere with the benefits of maintaining healthy nutritional status among the school age children. The main factors found to have significant effect on the nutritional status of school children were the alternate caregiver's level of education and food consumption and frequency patterns (particularly the frequency of meal per day) [14]. The frequency of meal per day can be assessed using the food frequency questionnaire (FFQ), which is the advanced form of the diet history method aimed to assess habitual diet by asking how often and how much of selected food items or specific food groups are included in a course or consumed in a reference period [15].

The present research is therefore designed to evaluate the impact of prevailing feeding pattern in selected motherless and orphanage homes on the body mass index (BMI) of school age children in Imo State.

## Materials and Method

### Area of study

The study was conducted in Imo State, which is located in the South eastern part of Nigeria. The school age children (5-13 years) located in selected motherless and orphanage homes in the three geopolitical zones of Imo State constitutes the study group.

### Population

Seven homes representing 58% of the government approved motherless babys and orphanage homes in Imo state were selected for the study. The selection of the homes was based on the consent of the home authorities to allow their wards participate in the research, since the study was part of an experimental (bioassay) research that will involve biochemical assessment of the nutritional status of school age children. Total population of 150 school age children were located in the seven homes.

### Sampling

A stratified random sampling technique a method described by Okafor [16] was adopted in selecting 115 school age children for the study.

### Data collection

A validated food frequency questionnaire (FFQ) was used to elicit information on the prevailing feeding pattern in each home from the caregivers since the children are living in a confined environment. The care givers in each home were made to answer the fifty four (54) questions in the FFQ. Those who could not read were properly guided. While the height and weight measurement of the individual children (both boys and girls) was measured to calculate their body mass index (BMI).

### Anthropometric measurement

Anthropometric measurement of height and weight of the respondents were taken following the method of NHCS [17]. The height of the respondents were measured on a vertical calibrated board constructed with a non-stretchable wood with a flat surface beneath and a moveable head piece, placed firm on the wall. The measurement was taken with the children on barefoot with their back heels, buttocks and head touching the wall, readings were taken to the nearest 0.1 cm. The body weight of each child was measured with the use of portable bathroom scale to the nearest 0.1 kg.

The weight and height measurements were used to calculate the body mass index (BMI) (Weight (kg)/Height (m²).

### Statistical analysis

Data generated from the study (FFQ) were coded (in excel spread sheet) and analyzed using percentages and frequency and later summarized using SPSS 20.0 version. The BMI of the respondents were classified using the WHO [18,19] reference standard BMI-for-age (percentile score) for children 5- 19 years. Children with BMI ≤ 3rd percentile are classified as underweight, 3rd-15th percentile as moderately underweight, 85th -95th percentile as overweight and ≥ 95th percentile as Obese.

Correlation analysis was used to determine the relationship between the frequency of consumption of certain foods and the quantity on the BMI of the school age children.

### Results and Discussion

Information on the consumption of selected food options in the different homes is summarized in Table 1. The table reveals that the school children in the different homes consume more of carbohydrate food groups than other food groups. *Garri* (210-400 g) a commonly known cassava-based staple was found to be consumed on a daily basis by the children in 6 homes. It was found that 200 – 300 g of noodles (indomie/spaghetti) were included in the children's meal 5 -7 times a week in almost (85.7%) all the homes. Rice was found to be consumed as a lone diet in various forms (jellof or with stew) 2-3 times a week in 6 homes while consumption of rice in combination with beans was given to the children 2-3 times a week only in few (3) homes. This finding is similar to the report of Ene-Obong and Ekweagwu,, where most frequently consumed staple foods by school age children in Ebonyi state, Nigeria was cassava- based product *akpu (fufu) and garri*. The table clearly shows that cereals such as pap and oat were always consumed by the children in combination with fried ripe plantain, fried potato or with bread 2-3 times in a week in 5 homes. Care givers in 4 of the homes claimed to be giving the children pap enriched with milk once in a week. It was observed that the children's cereal were often (2-3 times in a week) enriched with 10 -15 g of chocolate like ovaltine, milo or cowbell. Soybean milk (10-15 g) was also found to be consumed minimally (once a week) by the school children in few

homes (3). It was found that 5 (71.4%) of the selected homes give the children 175 ml of soft drink 2-3 times in a week. The school children were also found to regularly (once a day) consume the same quantity of can fruit juice (e.g bobo, hollandia and happy family) as reported by 5 homes. On the other hand, 125 ml of fresh fruit drink was given to the children once a day in 2 homes and once a month in 3 homes, while smaller quantity of whole fruits (50 g) was given to these children 2-3 times a week in 5 of the homes. School children were found to be consuming 10 – 50 g of nuts (coconut, walnut and groundnut) in all the homes once a week while 50 g of cooked vegetable (pumpkin) and raw vegetables (garden egg, cucumber etc.), were consumed more regularly 2-3 times a week in almost all the homes (71.4%). Studies have shown associations between diet quality an academic performance Florence et al. [20] and low health status [9]. Bordi et al. [21] rightly pointed out that healthy eating habits among children play a key role in their mental and physical development and also promote growth and reduce many risks associated with both immediate and long-term health problems (Table 2).

Foods that contain proteins (animal and plant) were found to be consumed less frequently compare to the carbohydrate rich foods (Figure 1). For instance, beans prepared in various forms like porridge or pudding was found to be included in the children's meal 2-3 times a week in 5 homes. Most of the homes 5(71.4%) claimed to be given the children food from meat and fish group 2- 3 times a day but the quantity (10-50 g) was very small and may not provide adequate protein intake for children within the age group. Although milk was found to be given to the children always in 5 homes, the quantity was not enough between 5 – 15 g. This finding confirms the report that school age children living in the developing world tend to consume monotonous meals containing very little animal products [12]. However, crayfish was found to be included in the daily meal of the children in all the homes the quantity consumed by the individual child was not determined. The high and regular consumption of carbohydrate meals by the school children observed in the different homes could be attributed to the availability and affordability of these major stables in Nigeria. This confirms the review of Oniango et al. [22], on the "contemporary African Food habits and their nutritional and heath implication'.

The BMI of the school children ranged from 13.9 - 24 (male) and 13.1 - 33 (female). The mean body mass index (BMI) of male and female school children is presented in Figure 2. Prevalence of overweight and underweight were 28.6% and 36. 5%. The prevalence of underweight found is similar to the rate reported by Asinobi and Nwankwo [10] among adolescent girls in Ohaji Egbema while the prevalence of

| Food options | Frequency (%) | | | | | | | Quantity (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Once a day | 2-3 times a week | Once a month | Every meal | Once a week | 5-7 times a week | 2-3 tim3 a day | 10 to 50 g/ml | 60 to 100 g/ml | 110 to 200 g/ml | 210 to 300g/ml |
| Fruit juice | 57.1 | 14.3 | - | 14.3 | - | - | - | - | 14.3 | 71.4 | - |
| Fresh fruit juice | 28.6 | 28.6 | 14.3 | - | - | - | - | - | - | 71.4 | - |
| Whole fresh fruits | 14.3 | 57.1 | - | - | 14.2 | - | - | 85.7 | 14.3 | - | - |
| Nuts | - | 14.3 | - | - | 71.4 | - | - | 57.1 | 2 | - | - |
| Pap with fried ripe plantain | - | 71.4 | - | - | - | - | - | - | - | 42.9 | 42.9 |
| Pap/oat enriched with milk | - | 14.3 | - | - | - | 85.7 | - | 100 | - | - | - |
| Ovaltin/milo/choco. | - | 57.1 | - | - | 14.3 | 85.7 | - | 100 | - | - | - |
| Soybean milk | - | 85.7 | - | - | - | - | - | 100 | - | - | - |
| Dry garri | 14.3 | - | - | - | 14.3 | - | - | - | 42.9 | - | - |
| Cooked vegetable | - | 71.4 | - | - | - | - | - | 85.7 | - | - | - |
| Raw vegetable | - | 71.4 | - | - | - | - | - | 85.7 | - | - | - |
| Corn/maize | - | 57.1 | - | 28.5 | - | - | - | - | - | 85.7 | - |
| Rice and beans, | - | 57.1 | - | - | - | - | - | - | - | - | 100 |
| Pasta (indomie/spaggeti) | - | - | - | - | - | 100 | - | - | 28.5 | 71.4 | - |
| Garri/fufu | 85.7 | 14.3 | - | - | - | - | - | - | - | 100 | - |
| Beans | - | 85.7 | - | - | - | - | - | - | 28.5 | 42.9 | - |
| Smoked fish/meat | - | - | - | - | - | - | 71.4 | 71.4 | - | - | - |
| Crayfish | - | - | - | 100 | - | - | - | - | - | - | - |

Table 1: Prevailing feeding pattern in the selected motherless homes.

| BMI | | | | | |
|---|---|---|---|---|---|
| Sex | Normal | Obese | Overweight | Underweight | Total |
| | Median | >97th | >85th -97th | <3rd -15th | |
| Male | 10(15.9 %) | - | 14(22.2 %) | 9(14.3%) | 33(52.4%) |
| Female | 5(7.9 %) | 3(10 %) | 7 (11.1 %) | 15(23.8 %) | 30(47.6%) |
| Total | 15(23.8%) | 3(4.8 %) | 21(33.3 %) | 24(38.1%) | 63(100) |
| Age range | | | | | |
| 5- 8 years | 8(12.7%) | 3(4.8%) | 16(25.3 %) | 4(6.3%) | 20(49.2%) |
| 9-12 years | 7(11.1 %) | - | 5(7.9%) | 20(31.8%) | 32(50.8%) |
| Total | 15(23.8%) | 3(4.8 %) | 21(33.2 %) | 24 (38.1%) | 63(100) |

Table 2: Percentage BMI status of respondents by sex and age.

overweight does not correspond with the finding of Ene-obong and Ekwegwu who reported a prevalence rate of 4.7% overweight among school age children in Ebonyi state. The incidence of overweight was higher among children between 5 – 8 years (33.3%) (male and female), obesity (4.8%) was observed among the female children (5-8 years) [18,19]. While underweight was observed to be higher among children between 9 - 12 years (38.1%) for both boys and girls. This could be that older children in the selected homes are given smaller portions of food or the same portion of food with the younger children. This supports the fact that overweight and obesity are no more diseases of the affluent and are emerging as serious problem in developing countries. The high rate of overweight among the children could be attributed to the fact that school children in the different homes were fed with carbohydrate rich foods (Figure 1) or due to the fact that these children may be restricted to certain level of physical activity (especially the age affected 5-8 years) that could help them maintain normal weight. According to American Society of Nutrition [23], over feeding with certain nutrients and lack of physical activities changes body composition and could lead to high risk of overweight among children. Table 3 reveals weak positive (0.14) correlation between the frequencies of consuming certain foods
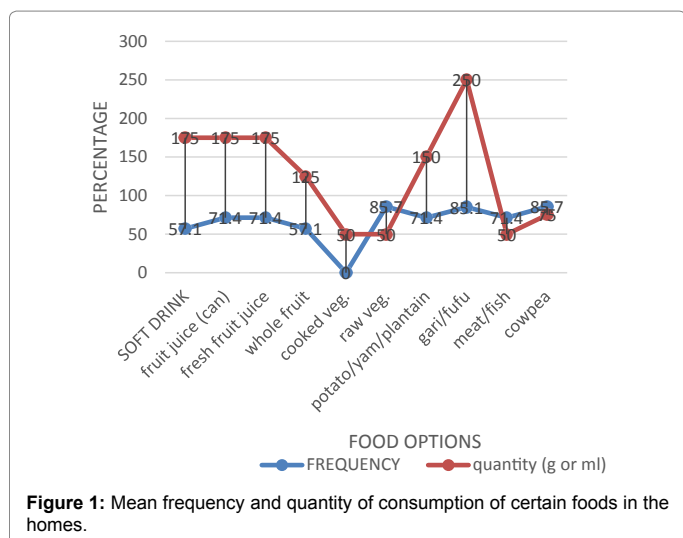
on the BMI of the respondent [24]. This finding could be attributed to the use of WHO reference standard which has also been observed to overestimate overweight and obesity in a population. On the other hand, weak negative correlation (0.19) was observed with quantity of consumption of certain foods on the BMI of the respondents.

## Conclusion

The results of this study indicate high prevalence rate of malnutrition especially overweight and underweight among school children in orphanage homes in Imo State.

## Recommendation

Nutrition talk and counseling on how to care for the school age is therefore recommended for the caregivers in the motherless and orphanage homes to improve the nutritional status of children in these homes.



**Figure 1:** Mean frequency and quantity of consumption of certain foods in the homes.
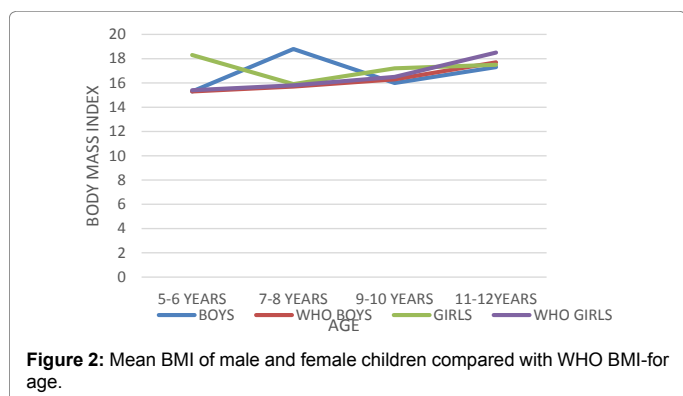


**Figure 2:** Mean BMI of male and female children compared with WHO BMI-for age.

| Variables | | BMI |
|---|---|---|
| **Frequency** | Correlation Coefficient | 0.144 |
| | p-value | 0.712 |
| **Quantity** | Correlation Coefficient | -0.196 |
| | p-value | 0.613 |

**Table 3:** Correlation analysis on food consumption and BMI.

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