# Assessment of Nutritional Status of Primary School Pupils Using Anthropometrics in Nsukka Local Government Area of Enugu State

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**Abstract – The study assessed nutritional status of primary school pupils using anthropometrics in Nsukka Local Government Area of Enugu State. The study adopted descriptive cross-sectional survey design. The sample size for the study was 860 pupils from the selected public and private primary schools. Three research questions guided the study. A self-designed proforma, and standardized anthropometric devices of calibrated standardized digital weighing scale (OMRON BF400) and wooden statiometer were used as instruments for data collection. The data collected were analyzed using descriptive statistics of frequency and percentage. The findings of the study included that the participants (pupils) had moderate nutritional status, however, with substantial cases of underweight, stunting and overweight. The study also revealed that the female pupils had better nutritional status than their male counterparts, and the pupils in private primary schools had better nutritional status than pupils in public primary schools. The study recommended among others that parents and guardians and teachers should be properly educated in nutrition education either in formal and non-formal settings.**

**Keywords – Assessment, Nutritional status, and Anthropometrics.**

## I. INTRODUCTION

Good nutrition is vital for survival, physical growth and mental development which can translate to good health and wellbeing. Nutrition is the sum total of the process involved in the intake and utilization of good substances for growth, repair and maintenance of the body. In other hand, malnutrition is a silent emergency which has devastating effects, especially on children, the society and the future of human kind. Presently, malnutrition is a major public health challenge in developing countries. Braveman and Gruskin (2013) observed that in 2011, 160 million children were estimated to be affected by stunting worldwide, while 50 million were affected by wasting, and 100 million were underweight. And more than ninety percent of these children reside in Africa and Asia. Though, they noted gradual decline but the rates are not falling quickly enough to meet global targets of World Health Assembly, which include forty percent reduction of the global number of children less than five years who are stunted by the year 2025.

Malnutrition refers to all deviations from adequate, nutrition relative to need. According to Amigo et al (2011), malnutrition consists of undernutrition and overnutrition resulting from inadequate or excess of food respectively.

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Undernutrition is defined as a dietary energy intake which is below minimum required to maintain the balance between actual intake and acceptable levels of energy expenditure. It is the outcome of inadequate intake of food both in quantity and quality. Undernutrition has been the primary cause of ill-health (morbidity) and premature mortality among children in developing countries (Alli et al, 2015). Undernutrition can lead to growth failure (stunting), impaired cognitive condition, reduced productivity, and reproductive problems in adulthood, such as prolonged labour as a result of cephalopelic disproportion (Irikana, 2021). Alderman and Luc (2014) added that stunting is an evidence of chronic undernutrition, and may be associated with concurrent risks to the health and development of children.

Protein and energy malnutrition is also one of the major nutritional and health problems worldwide. Energy and Protein Requirement (2015) noted that protein and energy malnutrition (PEM) is an important cause of morbidity and mortality in children, and mainly a consequence of inadequate food intake, which could be a deficiency in quantity and quality. The consequences of this among school-age children include retarded physical and mental development, which are associated with either non-enrolment or late enrolment in school. In his study, Irikana (2021) reveals that apparently well-fed children who are receiving sufficient calories for their daily activities can still suffer "hidden hunger" of micronutrient deficiency. The absence of micronutrients such as Vitamins A, Iron, zinc, iodine increases risks for reduced intelligence Quotient (IQ), stunting and even death.

Overnutrition as a form of malnutrition is an emerging problem in industrialized countries and recently in some parts of Sub-Sahara Africa, especially where lifestyles have become urbanized and westernized. Overnutrition results from excessive intake of high calorie diets with large proportions of saturated fats. Some health conditions that can result from overnutrition include overweight and obesity, which may subsequently become risk factors for diabetes, dyslipideamia, coronary health disease, atheriosclerosis, hypertension, stroke, certain cancers, and arthritis at the adolescence and adulthood (Beghin, Cap, & Diyardin, 2018). Other comorbidities associated with childhood obesity include orthopaedic problems, such as Blount's disease, skin fungal infections, and acanthosis, liver diseases, such as hepatic steatosis, stea-hepatitis, and pseudotumor cerebri (Irikana, 2021).

Nowadays, many developing countries face an increasing double burden of undernutrition and overnutrition, especially among countries undergoing epidemiological transition from subsistence agriculture to increased urbanization and industrialization. Several studies have shown that poor feeding can lead to recurrent infections, stunted growth, substantial brain impairment, low intellectual competence and learning capacity of children (Frongillo, 2016).

Studies have identified some important risk factors for malnutrition in children. They include parental illiteracy, prevalence of bacterial and parasitic diseases, low socio-economic status, large family size, and poverty. Welfare of children in developing countries is largely dependent on parental literacy, especially, maternal literacy. Father's education is also an important determinant, and has a positive impacts on child's health and nutritional status. This is because father is usually the main earner and decision-maker in the family, though, there may be exceptions. However, the effect of maternal education is almost double that of paternal education. This is explained by the fact that mothers tend to exhibit a greater willingness to accept developmental initiatives, and utilize modern health information and health care services. They influence health of their children by challenging traditional beliefs and attitude that have adverse effects on health (Bhabha, 2014). There are evidences from literature to show that child's survival, nutritional status, and educational attainment are enhanced by having better educated mothers. Senbanjo, Adeodu and Adejuyigbe (2017) observed that in southern part of Nigeria, under weight and stunting were higher in children whose mothers had secondary education and below than in those children whose mothers had tertiary education.

Bacterial and parasitic diseases contribute significantly to prevalence of malnutrition in developing countries. Malnourished children are highly susceptible to infections which can lead to illness and death. The nutritional status of children is a reflection of socio-economic status of the family and social wellbeing of the community. Socio-economic status of families can usually be assessed through family income, housing conditions, parents' education-levels and occupation, and family composition. Qamra, Mehta and Deodhar (2011) stated that many studies have shown that pupils from high socio-economic sources have better anthropometric measurements (weight, height and skinfold thickness) compared to their counterparts in low socio-economic families.

Family size may positively correlated with nutritional status of children. Pelto et al (2014) showed that Mexican children from larger households were significantly shorter and consumed diets of poor quality. This is because the larger the size of a

family the more different it is for the caregivers or parents/guardians to cater for the individual needs of the children adequately. Poverty is also highly implicated with malnutrition status of primary school pupils, particularly, undernutritional status. Poverty predisposes children to undernutrition leading to underweight, stunting and wasting. Dawson (2012) observed that pupils in rural areas of Ghana, Tanzania, Indonesia, Vietnam and India ravaged by poverty became progressively shorter as they grew older and their growth retardation seemed to occur throughout the school age years.

In the face of these observations and reports, some national governments have introduced school feeding programmes in primary schools. For instance, the Federal Government of Nigeria in 2019 introduced School-Feeding Programme (NHGSFP). This followed reports of high rates of malnutrition and school-dropouts among children. The 6-item objectives of NHGSFP include: increase in number of school enrolment; pupils to perform better academically; employment of local women; local farmers to sell their agricultural produce; wealth creation distribution within the communities; and address the cross-cutting issues of out-of-school children, hunger, malnutrition and general poverty. The aim of the school/feeding programme, as good as it sounds, cannot be complete without determining or assessing the nutritional status of these pupils in order to provide appropriate nutrition intervention according to their needs, hence, the need to assess nutritional status of primary school pupils.

There are methods of assessing nutritional status of children. Hamitton (2012) identifies two possible ways to assess adequacy of food and nutrition as well as to detect the presence of inadequacy in food intake among individuals or population groups. The first, is to measure the nutritional intake of food, and the second is to assess the nutritional status of individuals. Nutritional status assessment is usually done by measuring anthropometric, biochemical or physiological characteristics to determine whether an individual is well nourished or under-nourished. The method assesses the nutritional status of individual or a representative sample of individuals within a population (Hayling, 2012). Nutritional status assessment uses objective, measurable, criteria which can detect changes in anthropometric, biochemical and physiological characteristics of an individuals. These changes could be a consequence of inadequate food intake for long periods of time or seasonal fluctuations in intake of food, or poor absorption and utilization of ingested food.

In public health, anthropometric measurements have been widely used for assessment of nutritional status of both children and adults (Energy and Protein Requirement, 2015). Anthropometry is the measurement of body parameters, such as weight, height, waist and hip circumference. It is frequently used to assess nutritional status as well as growth and development of school-age children and adolescents. According to Khan and Baker (2010), anthropometry can be used to monitor secular or seasonal changes in children nutritional status, as well as to evaluate the impact of intervention programmes. Jamal (2018) added that anthropometry can also be used to quantify the degree of nutrition and provide a continuum of assessment from under-to-over nutrition. At the level of individual level, anthropometry is useful in detecting those who are at risk of malnutrition and for selection of affected children for nutritional intervention programmes. In school community, anthropometry is used in the determination of prevalence of malnutrition. It permits stratification of survey results according to age, sex, region, urban/rural or other socio-demographic characteristics of the population. Heights and weight of children are accepted measures for monitoring their growth and nutritional status. They are also considered as indicators of nutritional status of entire school community. The indicators used for classification by comparison with a reference population include; weight for height, weight for age, height for age and Body Mass Index (BMI) (Hayling, 2012).

Weight for age reflects body mass relative to chronological age. Underweight is defined as low weight for age below 2 standard deviation (SD) of the median value of the National Center for Health Statistics (NCHS/WHO International Growth Reference) (Child, 2013). Weight for age reflects current nutritional status, and is primarily a composite of weight for height and height for age.

Weight for height is used to measure nutritional status and detect some abnormal nutritional conditions. Low weight for height is used as an indicator of wasting, which is an acute condition of current malnutrition (Gibson, 2011). Wasting or thinness is defined as a low weight for height which reflects acute malnutrition. However, it is not as common as either stunting or underweight in school-age children. De-Onis and Blossner (2010) stated that high weight for height can be considered as an adequate indicator of obesity, because most individuals with high weight for height are obese.

Height for age can be used to detect stunting and defective growth or growth failure. Low height for age is used as an indicator of stunting, which is an index of chronic malnutrition (Fetuga, 2010). Stunting refers to shortness that is a deficit or

linear growth that has failed to reach genetic potential. It is defined as low height for age, which is below the median value of NCHS/WHO International Growth Reference.

Body Mass index (BMI) can be used to assess the weight status of children, and it provides a good indicator for levels of body fat (Garza & De-Onis, 2014). It is known that having a BMI that is either too low or too high is associated with an increased risk of ill-health during childhood as well as later in life. It is used to assess underweight, overweight and risk factor for overweight.

The health of children is largely dependent on their nutritional status, as malnutrition in childhood can impair their physical and intellectual development. Therefore, assessment of nutritional status of school pupils in developing countries is imperative for application of appropriate corrective interventions, like school-feeding programmes, and policy formulation.

## II. RESEARCH QUESTIONS

1. What is the nutritional status of primary school pupils using anthropometrics in Nsukka Local Government Area of Enugu State?

2. What is the nutritional status of primary school pupils in Nsukka Local Government Area of Enugu State based on gender?

3. What is the nutritional status of primary school pupils in Nsukka Local Government Area of Enugu State based on ownership of the schools (public and private)?

## III. METHODOLOGY

The study adopted descriptive cross-sectional survey design. The sample size for the study was 860 pupils comprising 393 and 467 pupils from public and private primary schools, respectively, selected using multi-stage sampling procedures. The instruments for data collection were a self-designed proforma and standardized anthropometric devices calibrated in line with the National Center for Health Statistics (NCHS/WHO International Growth Reference). The devices included calibrated standardized digital weighing scale (OMRON BF 400) and wooden statiometer for height measurement. Age data were collected from the schools' records of the birth details of their pupils. Only pupils with documented age details were used for the study. The self-designed proforma had two sections A and B. Section A was used to collect data on gender of the pupils and the ownership of the schools, while section B was used to record and collect results of anthropometric measurements taken by the researchers. Consent was obtained from the authorities of the selected schools before the commencement of the study. The data obtained were analyzed using descriptive statistics of frequency and percentage.

## IV. RESULTS

**Research Question 1**

What is the nutritional status of primary school pupils using anthropometrics in Nsukka Local Government Area of Enugu State?

Table 1: Frequency and Percentage Scores of Distribution of Nutritional Status of Primary School Pupils (N = 860)

| Nutritional status | Frequency (f) | Percentage (%) |
|---|---|---|
| Normal | 491 | 57.1 |
| Underweight | 206 | 24.0 |
| Overweight | 112 | 13.0 |
| Stunting | 51 | 5.9 |
| **Total** | **860** | **100.0** |

Table 1 showed that 57.1% of the pupils had normal nutritional status. 24.0% of them had underweight, while 13.0% and 5.9% had overweight and stunting respectively.

## Research Question 2

What is the nutritional status of primary school pupils in Nsukka Local Government Area based on gender?

Table 2: Frequency and Percentage Scores of Distribution of Nutritional status of Primary School Pupils based on Gender (N = 860)

| Nutritional Status | Male | | Female | |
|---|---|---|---|---|
| | f | % | f | % |
| Normal | 210 | 24.4 | 281 | 32.7 |
| Underweight | 124 | 14.4 | 82 | 9.5 |
| Overweight | 47 | 5.5 | 65 | 7.6 |
| Stunting | 33 | 3.8 | 18 | 2.1 |
| **Total** | **414** | **48.1** | **446** | **51.9** |

Table 2 showed that female pupils had better nutritional status than their male counterparts with 3.7% for female and 24.4% for males. Male pupils recorded higher cases of underweight with 14.4% than the females with 9.5%. The table further revealed that the female pupils had more cases of overweight (7.6%) than the males (5.5%), while males had more cases of stunting than the female counterparts with 3.8% and 2.1%, respectively.

## Research Question 3

What is the nutritional status of primary school pupils in Nsukka Local Government Area based on ownership of the schools (public/private)?

Table 3: Frequency and Percentage Scores of Distribution of Nutritional Status of Primary School Pupils based on Ownership of the Schools (Public/Private) (N = 860)

| Nutritional Status | Public school | | Private school | |
|---|---|---|---|---|
| | f | % | f | % |
| Normal | 199 | 23.1 | 292 | 34.1 |
| Underweight | 118 | 13.7 | 88 | 10.2 |
| Overweight | 44 | 5.1 | 68 | 7.9 |
| Stunting | 32 | 3.7 | 19 | 2.2 |
| **Total** | **393** | **45.6** | **467** | **54.4** |

Table 3 displayed that pupils in private schools had better nutritional status with 34.1%. Public schools recorded higher cases of underweight (13.7%) than private schools that had 10.2%. The cases of overweight were higher in private schools with 7.9% than the public schools with 5.1%. The table further showed that public schools had more cases of stunting (3.7%) than the private schools with 2.2%.

## V. DISCUSSION OF FINDINGS

### Nutritional Status of the Pupils

Table 1 showed that pupils in primary schools in Nsukka Local Government Area of Enugu State had normal nutritional status of 57.1 percent. The moderate normal nutritional status of these participants could be attributed to improved educational and socio-economic levels of parents due to the presence of the first university in Nigeria, university of Nigeria Nsukka in the local

Government Area. The finding agrees what the assertions of Bogin and Macvean (2011) that there is an established association between child nutrition and socio-economic status. The nutritional status of children is a reflection of the socio-economic status of the family. Qamara, Mehta and Deohar (2011) added that girls from upper socio-economic class have higher anthropometric measurements (weight, height and skinfold thickness) compared to their counterparts in the lower class. The findings of Fazili et al (2012) also corroborated this study's findings. They documented low rates of underweight, stunting and wasting among school children in north India using World Health Organization score system which was acknowledged to have been influenced by good socioeconomic status in North India. The finding of the study of normal nutritional status of primary school pupils, however, is contrary to the findings of Braveman and Gruskin (2013), which revealed that in the year 2011, 160 million children were estimated to the effected by stunting worldwide, while 50 million were affected by wasting and 10 million were underweight, and more than ninety percent of these children reside in Africa and Asia. This was attributed to poverty.

More so, the substantial cumulative percentage of 42.9 of the pupils with poor nutritional status ranging from underweight (24.0%), overweight (13.0%) to stunting (5.0%) revealed by this study, is worrisome and of concern, considering the implications of malnutrition for the physical mental and social development of children, who are the seeds and leaders of tomorrow. These disturbing findings align with some findings of studies carried out in Nigeria. Akor et al (2010) reported prevalence of undernutrition, stunting and wasting among newly enrolled primary school children in Jos, Plateau State. Oninla et al (2017) in their study compared the nutritional status of urban and rural Nigerian school children attending public schools in Ife, South-Western Nigeria and found that prevalence rates of underweight wasting and stunting were high with higher rates among rural pupils than the urban pupils. Similarly, Amuta et al (2012) documented high prevalence of undernutrition among pupils both in rural and urban public schools in Makurdi, Benue State. The researchers attributed the findings to the low socioeconomic status of the parents of the children in rural and urban public primary schools.

**Gender Differences in Nutritional Status of Primary School Pupils**

Table 2 showed that female pupils had better nutritional status than their male counterparts. The male pupils recorded higher cases of underweight and stunting while female pupils had higher cases of overweight than the male ones. These findings agree with the findings of Prista et al (2013) which showed that in Mozambique, boys were more stunted and wasted while the girls were more overweight. They explained the reasons for the gender differential in nutritional status as the influence or impact of socioeconomic and cultural factors. They further stated that females from low socio-economic backgrounds are more likely to remain at home while the males who are wasted or stunted remain in school. Second, females are usually more involved in food preparation hence, they may have more access to food than the males. Similarly, Akesode and Ajibode (2013) reported prevalence of obesity among school pupils with a percent of 3.2 and 5.1 for males and females, respectively, based on weight for age. On the nutritional status of the male pupils, reasons could be that male children are trained in hard way to prepare them to be real men in future to handle all different kinds of situations as head of households and future leaders of the community. Therefore, they are not to be pampered with food like the girls, who are specially cared for to grow well and look good for marriage in their adulthood. In addition, male children play a lot and engage in stressful activities with all their strength which may cause them burn food and loose weight faster than the females who, often, engage in less stressful activities.

**Nutritional Status of Pupils in Public and Private Primary Schools**

Table 3 revealed that pupils in private schools had better nutritional status than their counterparts in public schools, however, they recorded higher cases of overweight than those in public schools. These findings support the findings of Ijarotimi and Ijadunola (2017) who assessed the nutritional status and intelligence quotient (IQ) of primary school children attending public and private schools in Akure, Southwest, Nigeria. Their study revealed higher prevalence of undernutrition and higher proportion of children with intellectual deficit in the public schools compared to their counterparts in private schools. Other researchers such as Amuta et al (2012) and Oninla et al (2017) stated in their different works that prevalence of underweight, stunting, and wasting among primary school pupils is due to their parental low socioeconomic levels, and prevalence of overweight and obesity in private school pupils is attributed to the fact that parents of middle and high socioeconomic levels send their children and wards to private schools., But, contrary to this, Opara et al (2017) in a study found more prevalence of underweight and stunting among pupils in private schools in Uyo, Nigeria. The finding was unexpected bearing the fact that private schools are mainly patronized by elites, the middle class and the rich. Opara and his colleagues attributed the findings to the tendency of the middle class to over school their children while cutting down on food intake. In a similar finding, Wang (2014) found that in USA, obesity was more prevalent in the lower socioeconomic class. In justifying the finding, the researcher stated that food deprivation or fear of

deprivation can lead to overeating when food is available, and consumption of junk food are major contributors to obesity among children from low socioeconomic class,

The higher prevalence of underweight and stunting among pupils in public schools than the private ones in Nsukka Local Government Area may be attributed to the facts that majority of parents in public schools are of low income status and most of their children could not be adequately provided with basic necessities such feeding healthcare, clothing and other care. The children, often, engage in more physical demanding activities, such as long trek to and from schools, while the prevalence of overweight among pupils in private schools can be explained by the belief or impression that private schools are meant for the children of the rich, and as a result, parents do a lot of provision to their children to live up to the expectation. This may lead to over provision of edibles to their children which may cause them to engage in bad eating habits of overeating, living on high caloric snacks and drinks and eating in between meals, that may lead to overweight and obesity.

## VI. CONCLUSION

Proper and adequate nutrition is absolutely essential for physical, social, mental and intellectual development of children, and reduction in child morbidity and mortality is largely dependent on the nutritional status of children. Hence, assessment of primary school pupils nutritional status is imperative for identification of deviations from good nutrition, and subsequent application of appropriate corrective interventions and feeding policy formulation.

## VII. RECOMMENDATIONS

Based on the findings, the study recommended the following:

1. There should be first of all, assessment of nutritional status and the risk factors for malnutrition among primary school pupils before any feeding interventions are provided in schools, either by government or non-governmental agencies.

2. Parents, guardians, teachers and handlers of school feeding programmes should be properly trained in nutrition education and child developmental processes and needs.

3. Teachers and school administrators should be properly trained and equipped with knowledge and skills in anthropometric applications in assessing or determining nutritional status of their students.

4. School feeding programmes should be holistic, comprehensive, and transparent, devoid of any forms of discrimination based on age, gender, religion, geographical region, tribe, socio-economic status, health status, and political affiliations.

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