Original Article

Dietary Intake, Nutritional Status, And The Double Burden of Malnutrition Among School-Aged Children in Benue South Senatorial District, Nigeria

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ABSTRACT

School-aged children in developing countries continue to face a high burden of malnutrition with adverse consequences for health, cognitive development, and educational performance, yet data remain scarce in Benue South Senatorial District despite Benue State's reputation as Nigeria's "food basket." This school-based cross-sectional study assessed dietary intake, growth patterns, and the prevalence of malnutrition among 1,527 children aged 6–15 years selected through multistage sampling from Ogbadibo, Otukpo, and Ohimini Local Government Areas. Data were collected using interviewer-administered questionnaires and anthropometric measurements, with nutritional indices calculated using WHO growth standards and analyzed using SPSS version 16.0. The mean age of participants was 9.7 ± 1.8 years, and findings revealed a high prevalence of undernutrition, particularly stunting (24.8%) and wasting (21.5%), with wasting increasing from 22% at age 10 to 27% at age 15, while underweight remained below 5% and overweight/obesity was observed in 6.0% of children. Dietary assessment showed limited dietary diversity, with beans as the main protein source and fewer than 25% of children consuming eggs. Socio-economic status was significantly associated with malnutrition outcomes ($p < 0.05$). These findings demonstrate a persistent burden of undernutrition among school-aged children in an agriculturally productive region and highlight the urgent need for targeted school-based nutritional interventions aimed at improving dietary diversity and addressing the emerging double burden of malnutrition.

Keywords: Anthropometry, Benue State, Dietary intake, Malnutrition, Nigeria, Overweight, School-aged children, Stunting, Wasting

INTRODUCTION

Malnutrition, encompassing the dual challenges of undernutrition and overnutrition, remains a critical public health problem with profound short- and long-term consequences on child health, cognitive development, and future economic productivity[1] The 2022 Global Nutrition Report emphasizes that poor diets are among the greatest societal challenges of our time[2] . Globally, one in three people is affected by some form of malnutrition[1] .

The double burden of malnutrition (DBM) refers to the simultaneous presence of undernutrition (including stunting, wasting, and micronutrient deficiencies) alongside overnutrition (overweight, obesity, and diet-related non-communicable

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diseases) within the same population, household, or even individual. This phenomenon increasingly characterizes low- and middle-income countries undergoing rapid social, economic, and dietary transitions.

The school-age period and adolescence represent a dynamic phase of physical growth and mental development. During the adolescent growth spurt, the body's demand for nutrients increases significantly; deficiencies during this critical window can lead to growth retardation, scholastic backwardness, and reduced work capacity[3] . While malnutrition in children under five has been extensively studied, school-aged children and adolescents are often a neglected demographic in health and nutrition surveys, creating a significant data gap[4,10] . School-aged children represent a critical but often overlooked population in nutrition epidemiology. Unlike children under five, they are rarely included in routine nutrition surveillance systems, yet they undergo significant physical growth, cognitive development, and metabolic programming that can influence health trajectories into adolescence and adulthood[12].

Nutritional deficits or excesses during this period can result in impaired linear growth, delayed pubertal development, reduced academic performance, and increased susceptibility to both infectious and non-communicable diseases later in life. From a life-course perspective, school age provides a strategic window for identifying and correcting malnutrition before its consequences become irreversible.

In Nigeria, the national nutrition picture is concerning, with 33% of under-five children reported as stunted and 19.4% as underweight [5.16]. Benue State, traditionally regarded as the nation's "food basket," is not immune to these challenges. Nigeria is currently experiencing a nutrition transition characterized by a shift from traditional diets rich in whole grains, legumes, and vegetables toward increased consumption of energy-dense, nutrient-poor processed foods. This transition is driven by urbanization, changing food systems, socioeconomic inequalities, and evolving lifestyle patterns, even in predominantly agrarian regions.

As a result, undernutrition persists among socioeconomically disadvantaged populations, while overweight and obesity are emerging among others, creating conditions conducive to the double burden of malnutrition. This paradox is increasingly observed among school-aged children, who are exposed simultaneously to food insecurity and unhealthy dietary environments.

In food-producing states such as Benue, the coexistence of agricultural abundance with childhood malnutrition highlights structural challenges related to food access, dietary diversity, and household utilization rather than food availability alone. However, there is a paucity of data on the dietary intake and nutritional status of school-age children in the Benue South Senatorial District. It is also unknown to what extent the double burden of malnutrition (DBM)—the co-existence of undernutrition and overnutrition—exists in this population. This study, therefore, aimed to determine the nutritional status, growth patterns, and dietary habits of school-aged children (6-15 years) in this region to generate evidence for targeted public health interventions.

Despite growing recognition of the double burden of malnutrition and the importance of school-aged children within the nutrition transition framework, empirical data on dietary intake patterns and nutritional status in this age group remain scarce in many parts of Nigeria, including Benue South Senatorial District. Understanding how undernutrition and overnutrition coexist in this population is essential for designing effective, context-specific public health and school-based nutrition interventions. This study therefore assessed dietary intake, growth patterns, and the double burden of malnutrition among school-aged children in Benue South Senatorial District, Nigeria.

GENERAL OBJECTIVE

To determine the types of diet and nutritional status of school age children in Benue South senatorial district of Benue state.

SPECIFIC OBJECTIVES

1. To determine the prevalence of stunting, wasting and underweight among school age children using anthropometric indices

2. To determine the sex distribution of overweight and obesity in the study group.

3. To determine the types of food consumed by school age children and

4. To assess the risk of malnutrition and over nutrition in the study population

MATERIALS AND METHODS

Study Design and Area

A school-based cross-sectional study was conducted in the Benue South Senatorial District. The study was carried out in three Local Government Areas (LGAs): Ogbadibo, Otukpo, and Ohimini, selected to represent the district.

Sample Size and Sampling Technique

The minimum sample size was calculated to be 359 students per LGA using the formula for a population >10,000: $n = Z^2pq/d^2$[17], where p (prevalence of malnutrition) = 11.7% from a previous study[6,19], Z=1.96, and d=0.05. A multistage sampling method was employed:

1. Stage 1: Three LGAs were selected by simple random sampling (balloting).

2. Stage 2: Two wards were randomly selected from each LGA[20].

3. Stage 3: Two public and two private secondary schools were selected from the listed schools in these wards using a lottery method. All children aged 6-15 years in the selected schools were invited to participate, resulting in a total sample of 1,527 subjects.

Inclusion and Exclusion Criteria

Children aged 6-15 years attending registered public and private primary schools in the selected LGAs were included. Children with skeletal deformities, those whose age could not be ascertained, those on medications known to affect growth (e.g., steroids), and those with known sickle cell disease were excluded.

Data Collection

Data were collected via:

1. Questionnaire: An interviewer-administered questionnaire was used to obtain demographic, socio-economic data, and dietary intake information.

2. Anthropometric Measurements: Weight was measured using a calibrated bathroom scale. Height was measured to the nearest 0.1 cm using a locally fabricated stadiometer[11]. The stadiometer was calibrated using a standardized height metre to ensure data quality. Measurements were taken twice by trained field assistants, and average values were used to minimize intra-observer variation

3. Dietary intake was measured using a combination of 24 hour recall and Food Frequency Questionnaire (FFQ).

Data Analysis

Data were analyzed using SPSS Version 16.0. Means and standard deviations were calculated for continuous variables. Nutritional indices: Weight-for-Age (WFA), Weight-for-Height (WFH) for children between the ages of 6-10 years; Height-for-Age (HAZ), and Body Mass Index (BMI)-for-age (BAZ) were calculated and interpreted using WHO growth standards to determine stunting (HFA < -2 SD), wasting (WFH < -2 SD), underweight (WFA < -2 SD), and overweight/obesity (BMI > +1 SD)[21,22]. Descriptive statistics (frequencies, percentages) summarized the variables. The Chi-square test was used to test associations between socio-economic characteristics and malnutrition, with a p-value <0.05 considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the FUHSO Ethics Committee. Permission was obtained from school authorities. Teachers, parents, and students were informed about the study, and verbal assent was obtained from the participants.

RESULTS

Socio-Demographic Characteristics

The study included 1,527 subjects, comprising 748 (49%) males and 779 (51%) females, with a male-to-female ratio of approximately 1:1. The mean age was 9.7 (±1.8) years, and the modal age was 10 years (Fig. 1). 1450 (95%) of fathers had an identifiable source of livelihood, with 626 (41%) employed full-time.

Dietary Intake

Dietary assessment revealed that the major source of protein was beans, a plant-based source (Fig.2). Less than one quarter (25%) of the respondents reported consuming eggs, indicating low intake of animal source protein.

Nutritional Status and Growth Patterns

- **Anthropometric Indices:** Analysis of growth patterns showed a gradual decrease in Weight-for-

Age (WFA) and Height-for-Age (HFA) Z-scores from ages 6 to 10, suggesting a trend of falling behind in weight and height relative to age. In contrast, Weight-for-Height (WFH) showed progressively higher rates in older age groups.

• **Prevalence of Malnutrition:** The prevalence of stunting and wasting was relatively high. In the early school age (6-8 years), both conditions were present in similar proportions. Stunting declined with age as children approached adolescence (Fig. 5), while wasting increased markedly from 22% at age 10 to 27% at age 15. The prevalence of underweight remained consistently low (<5%) across all age groups. The overall prevalence of overweight and obesity was 6.0%. There was a gradual increase in the proportion of overweight at ages 12-13 and a sharp rise in those aged 14 and 15 years (fig. 5).

Socio-economic Determinants

Socio-economic characteristics, including parental employment and education, showed a statistically significant association ($p < 0.05$) with the prevalence of malnutrition.

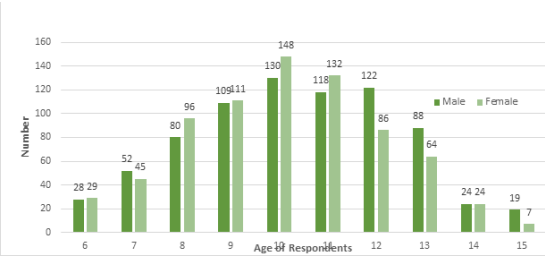

Fig. 1: Age and sex distribution of respondents

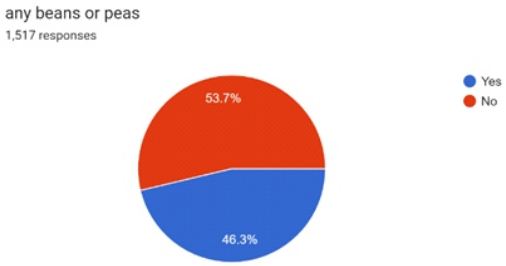

Fig 2: Distribution of plant based source of protein

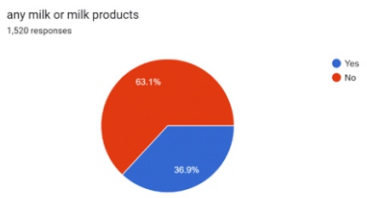

Fig. 3: Distribution of milk-based source of protein in the study

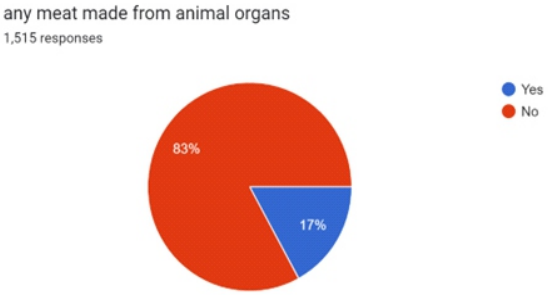

Fig. 4: Distribution of meat-based source of protein in the study population

Fig. 5: Age distribution of stunting and overweight

Table 1: Socio-economic factors associated with malnutrition

FACTORS	MALNOURISHED ≤ 2SD N =655 (42.8%)	ODDS RATIO 95% CI	P VALUE
Maternal Education			
No formal education	512(78.1%)	4.68	0.03*
Literate	143(21.8)		
Maternal Occupation			
Not working	579(38%)	0.63	0.134
Working	947(62.2%)		
Fathers Education			
No formal Education	702 (46.1%)	1.2	0.067
Literate	809(53.9%)		
Fathers occupation			
Not working	1282(84%)	0,44	0.187
working	245(15.6%)		

DISCUSSION

This study provides a critical snapshot of the nutritional status of school-aged children in Benue South, Nigeria. The findings reveal a complex picture dominated by undernutrition but with a notable presence of overnutrition, indicative of an emerging double burden of malnutrition. The

coexistence of high levels of stunting and wasting alongside emerging overweight in this population reflects an early manifestation of the double burden of malnutrition, a pattern increasingly observed in low- and middle-income countries undergoing rapid nutrition transition[23].

The high and age-dependent prevalence of stunting and wasting is a primary concern[13]. The declining Height-for-Age (HFA) trend indicates chronic malnutrition, which can lead to long-term consequences for immune function, cognitive development, and adult productivity[7]. The sharp increase in wasting with age suggests acute undernutrition, potentially linked to inadequate dietary intake to meet the high energy demands of the adolescent growth spurt, recurrent infections, or both. The low consumption of high-quality protein sources, such as eggs, is a key finding that likely contributes to this poor growth pattern. The reliance on a single plant-based protein (beans) may not provide the necessary bioavailable nutrients for optimal linear growth and tissue maintenance.

The 6.0% prevalence of overweight and obesity, while lower than rates reported in urban Nigerian studies[8,18], signals a shifting nutritional landscape. This finding aligns with the global nutrition transition, where traditional diets are increasingly supplemented with energy-dense processed foods[9] . The significant association between socio-economic factors and malnutrition underscores its multifactorial nature, where household food security, parental education, and income are critical determinants. In the Nigerian context, this pattern likely reflects a nutrition transition in which persistent food insecurity and low dietary diversity coexist with increasing exposure to energy-dense, low-nutrient foods, underscoring the need for integrated interventions that simultaneously address undernutrition and the prevention of diet-related non-communicable diseases among school-aged children.

LIMITATIONS

This study has several limitations. Its cross-sectional design precludes the establishment of causal relationships. Dietary data based on recall are subject to bias and may not represent habitual intake. The use of a locally fabricated stadiometer, while practical, may introduce minor measurement error compared to a standardized instrument. The use of certain anthropometric indices beyond recommended age ranges may have influenced prevalence estimates. Finally, the study was conducted in one senatorial district, which may limit the generalizability of the findings to other regions.

CONCLUSION

This study concludes that school-aged children in Benue South Senatorial District face a significant burden of malnutrition, characterized primarily by stunting and wasting, with a concurrent, lower prevalence of overweight and obesity. This double burden exists despite the region's agricultural potential.

RECOMMENDATIONS

We recommend the following

1. **Targeted School Feeding Programs:** Implement and enhance school meal programs that are diversified and include adequate amounts of animal-source protein (e.g., eggs) to combat stunting and wasting.
2. **Nutritional Education:** Integrate nutrition education into the school curriculum for children and conduct workshops for parents to promote balanced diets and healthy eating habits.
3. **Public Health Policy:** Strengthen public health policies to address the dual burden of malnutrition, focusing on both undernutrition and the prevention of diet-related non-communicable diseases[15].
4. **Further Research:** Conduct longitudinal studies to monitor trends and investigate the specific socio-economic, cultural, and environmental determinants of malnutrition in this population.

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