



Full Length Research

**Impact of School Feeding Program on the Anthropometric Indices of
Preschool Children in Owerri West Local Government Area, Imo State.**

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ABSTRACT

This study assessed the impact of a school feeding program on the anthropometric indices of preschool children in Owerri West Local Government Area, of Imo State, Nigeria. A case-control study was conducted with 400 preschools (2-5 years) selected from 44 government-owned primary schools in the study location. Purposive sampling was used to identify the enrolled and non-enrolled schools, while simple random sampling was employed to select 200 preschool children from each category. Anthropometric measurements, including weight (kg) and height (m²), were obtained, and the WHO Anthro Software Analyzer was used to assess the wasting and underweight status of respondents. A student T-test was conducted to compare anthropometric indices and the nutrient composition of food samples between the two groups. The findings revealed a 50% improvement in underweight, and wasting among preschool children participating in the school lunch program over the 6-month study period, compared to the control group. It was found that 100% of preschool children in the intervention group met their recommended intakes for energy, protein, iron, vitamin A, and vitamin C, but did not meet requirements for fat and calcium. Similarly, 75% of children in the control group met their recommended intakes for energy, protein, zinc, and vitamin A, but did not meet fat, calcium, iron, and vitamin C requirements. In conclusion, the school feeding program had a positive impact on the anthropometric indices of preschool children. We recommend extending the program to more schools to further improve the nutritional status of preschool children in Imo State.

Keywords: Wasting, underweight, preschool children, school lunch programme, anthropometric indices.

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INTRODUCTION

Malnutrition refers to when a person's diet does not include the correct amount of nutrients for optimal health (Akombi,2021). The triple burden of malnutrition in children remains a significant public health issue in Nigeria (John *et al.*,2024). Morbidity related to malnutrition leads to a loss in human capital through an education gap and a resultant low-skilled workforce owing to poor cognitive development and reduced school attainment (Chakravarty *et al.*,2019). To maintain optimal growth and development, growing children require an adequate consumption of nutritious food (Jesmin, 2011). Therefore, children who are well-nourished with balanced diets are more likely to be healthy, productive, and able to learn (Uzosike *et al.*, 2020).

School feeding is simply the provision of food to children through schools (Oyafade, 2014). School feeding programs is practiced in both developed and developing countries of the world to enhance academic performance of pupils (Adekunle *et al.*,2010). In Nigeria, the School Feeding Program (SFP) aims to decrease hunger and malnutrition among school children, enhance the health and nutrition of primary school students, promote local agricultural output, and raise farmers' incomes through the use of food produced locally by small-holder farmers (Bosah *et al.*,2019).

Anthropometric indices such as weight, weight-for-height, triceps skinfold, and middle-upper arm circumference performed well to detect short-term changes in the nutritional situation of a population (Frison, 2016). Currently, Z-scores are routinely used in clinical practice to assess and monitor children's growth and nutritional status and in the analysis of data from child

nutrition surveys (Mishra, 2020, Mutunga,2021 & Dah, 2022). Some states in Nigeria stated a high incidence of wasting, which was above the national prevalence in Nigeria, including Enugu (South East; 25.0%) (Alamu *et al.*,2020), Osun (South West; 24.0%) (Abolurin *et al.*,2020) The lowest prevalence of wasting (1.0%) was realized in Ifedore, Ondo state (South West) (Adekunle *et al.*,2010). The malnourished prevalence in Nigerian states extended from 5.9% in the Osun state (South West) (Abolurin *et al.*,2020) to 42.6% in the North West zone of Nigeria (Moeteke, 2019). Thus, this study assessed the Impact of the School feeding programme on the anthropometric indices of preschool children in Owerri West Local Government Area, Imo State.

MATERIALS AND METHODS

Study Area

The study was carried out in Owerri West Local Government Area, Imo State Nigeria. It is located on the Western part of the former Owerri Local Government Area; bounded in the North by Mbaitolu Local Government Area; on the south by Ngor Okpala Local Government Area; East by Owerri Municipal Council; and West by Ohaji/Egbema Local Government. Owerri West Local Government Area is made up of 15 communities consisting of Avu, Oforola, Umuguma, Okuku, Emeabiam, Okolochi, Eziobodo, Ihiagwa, Nekede, Obinze, Amakohia-ubi, Ndegwu, Total enrolment figure in government-owned primary school in Owerri west were 8000, respectively (Universal Basic Education, 2014).

Study design

A case-control design, involving preschool children benefiting from school lunch programme and those not benefiting from school lunch in government-owned primary schools.

Study population

The population was made up of eight (8) government-owned primary schools comprising 8000 preschools (2-5 years) children as shown in Table 1.

Table 1: Distribution of preschools in the case study

S/N	School	Population
1.	Community school, Ohii	1,108
2.	Central School Okuku	1, 000
3.	Community School Ndegwu	1,100
4.	Community School Irete	906
5.	Ukwuezi Primary School, Orogwe	560
6.	Teachers Training College Practising School Obinze	1,300
7.	Umualum Primary School Nekede	1,200
8.	Primary School Ohii	816
	Total	8000

(Source: Education Management Board (SPEB,2015)

Sampling size determination

The sample size was calculated using the method of Taro Yamane (1976).

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

$$8000 / 1 + 8000(0.005)^2$$

$$8000 / 1 + 8000 \times 0.0025$$

$$8000 / 1 + 20$$

$$8000 / 21 = 381$$

$$381 / 100 \times 5 = 19.5 \text{ (5\% non-response error)}$$

$$381 + 20 = 400$$

Sample size $381 + 19.5 = 400$.

Sampling Procedure

A case-control study comprising 400 preschools (2-5yrs) was drawn from 44 government-owned primary schools enrolled for the school feeding programme and those not enrolled for the school feeding

programme in Owerri West Local Government Area, Imo State Nigeria. Schools were selected based on purposive sampling, while simple random sampling techniques were used to select 200 pre-schools from each group of schools. Daily lunch served to preschools in the control group was obtained from parents and/or caregivers on special arrangement while samples of daily school lunch served to children in the test group were collected from the cooks in each school.

Instrument for Data Collection

Height (cm) and weight (kg) measurements of the preschool children was obtained with a manual stadiometer and bathroom scale. With the assistance of their class teachers, individual child height was measured.

Height Measurement

For the height measurement, children were measured with a vertical measuring rod using a stadiometer. Each of the children stood erect looking straight on a leveled surface with heels together and toes apart without shoe and the reading was taken to the nearest 0.1cm (Oguizu *et al.*, 2024).

Weight Measurement

Bathroom scales were used to measure the weight of preschool children and children were asked to remove their shoes and empty their pockets, with very light clothing. The children were made to stand erect, facing forward with hands placed by their sides. Readings were taken to the nearest 0.1kg

STATISTICAL ANALYSIS

Raw data generated from chemical analysis of food samples were summarized in excel spread sheet. Malnutrition (weight-for-age and weight-for-height) status of children was obtained using the WHO Antro Software Analyzer. Student T-test was used to compare the nutrient composition of food samples and the anthropometric indices for the test and control groups.

RESULTS

Table 1 reveals the anthropometric status of the population. It was found that the 10% (males) and 12.5% (females) level of underweight among the test group was reduced to 5% and 6.5% for males, and females, respectively, after the feeding intervention. The wasting status of the pre-school in the test group was 14% (males), and 16% (females) after the school feeding intervention for six months. Wasting reduced to 6% (male) and 8% (female) respectively. On the other hand, the baseline underweight status of preschool children in the control group were 19% for males and 20% for females after school feeding intervention.

Underweight status for pre-school children in the control group reduced to 17.5% (male) and 6% (female). Similarly, the wasting status of preschools in the control group reduced from 14% (male), and 16% (female), baseline, to 6% (male) and 8% (female), after the study. There was a reduction in the prevalence of underweight and wasting in both preschool children in the test group and control group, the reduction was higher in the test group, preschools on school.

Table 2: Prevalence of malnutrition among preschools before and after the study

Malnutrition Status		Test Group		Control Group	
		Male	Female	Male	Female
		n (%)	n (%)	n (%)	n (%)
Weight-for-age	Base-line	20(10)	25(12.5)	38(19)	40(20)
(<-2SD WHO Ref)	End-line	10(5)	13(6.5)	35(17.5)	36 (8)
Underweight	% Reduction	10(50)	12(48)	3 (7.8)	4(10)
Weight-for-height	Base-line	28(14)	32(16)	40(20)	43(21.5)
(<-2SD WHO Ref)	End-line	12(6)	16(8)	38(19)	40(20)
Wasting	% Reduction	16(57)	16(50)	2(5)	3(6.9)

Table 2 shows that Pre-school children from the test group met their recommended daily energy, protein, zinc, iron, vitamin A, and vitamin C for both males and females in all age groups but did not meet their recommended daily fat, and calcium. Also,

the control group met their recommended daily energy, protein zinc and vitamin C for both males and females in all age groups but did not meet protein, fat, calcium, iron, and vitamin A intakes.

Table 3: Mean Nutrient Compositions of School Lunch for the pre-school children

Food Nutrient	Test Group			Control Group			t-ratio	p-value (p<0.05)
	n	$\bar{X}$	SD	n	$\bar{X}$	SD		
Energy Kcal	200	1804±352		200	2058±392		-14.26	<0.001
KJ		427±84.22			488±94.07		-64.69	<0.001
Protein (g)	200	14.71±6.50		200	6.51±1.66		40.71	<0.001
Fat (g)	200	9.76±6.69		200	13.38±4.72		-15.19	<0.001
Calcium(mg)	200	78.59±18.58		200	72.22±13.50		15.88	<0.001
Iron (mg)	200	2.86±1.24		200	1.51±0.81		13.37	<0.001
Zinc (mg)	200	5.39±3.63		200	3.72±3.28		9.00	<0.001
Pro-Vitamin A(mg)	200	473.30±680.62		200	299.38±437.31		73.65	<0.001
Vitamin C(mg)	200	25.56±41.92		200	33.25±32.18		-12.65	<0.001

DISCUSSION

The result of the findings in Table 1 showed that there was a reduction in the prevalence of underweight and wasting in both preschool children in the test group and control group, which was higher in preschool children who received school lunch after the survey in both preschool children in the test group (5% for males and 6.5% for females) and control group (17.5% for males and 8% for females). This finding is similar to the report of Abdulzahra et al. (2022) and Okafor et al. (2023) on the prevalence of wasting (1.3% - 7.7%) and underweight (0.4%- 1.3%). The observed higher prevalence of underweight and wasting among female infants agrees with

the findings of Akubugwo et al. (2014). However, a higher prevalence of wasting (17.9%) and underweight (18.9%- 34.7%) have been reported in preschools (Mehvish et al. 2024., Kpurkpur, 2017).

The results of the study, as shown in Table 2, revealed a significantly higher difference in energy composition and contribution in the control group compared to the test group. The energy content of school lunches in all the studied schools exceeded the FAO/WHO requirements. This finding aligns with the study by Owusu et al. (2017) in Ghana, which reported that meals provided by non-governmental school

feeding programs (NSFP) featured larger portion sizes and contributed 28% to the children's energy intake.

Similarly, Osowski et al. (2015) observed comparable results. Ayogu et al. (2018) also reported abnormal nutritional status among school children, findings that were consistent with the present study, where preschool children exceeded their recommended protein intake for lunch by over 100% across all age groups in both the

test and control groups. These results are in agreement with Ayogu et al. (2018), who noted that school meals provided more than one-third of the recommended protein intake of pre-schools. However, this contrasts with findings by Verma et al. (2010), who reported that male and female preschool children achieved 91.56% and 88.8%, respectively, of their protein dietary allowance, lower than the recommended levels.

The fat intake in both the test and control groups showed a significant difference ($p < 0.05$) but did not meet the Recommended Nutrient Intake (RNI). This contradicts the findings by Chin En Yen (2020). Which indicated that fat contributions from public preschool lunches were significantly higher than those from private preschools.

In terms of calcium intake, both the test and control groups did not meet the recommended values due to insufficient calcium consumption from their diets. This finding is consistent with studies by Danquah et al. (2012) and Owusu et al. (2017), which reported that school meals in Ghana rarely met micronutrient requirements, especially calcium. Similar findings were reported by Nelson et al. (2007), who stated that school lunches did not meet one-third of the recommended

calcium intake, and Mungai et al. (2024), who highlighted low calcium intake among preschool children both in and out of lunch programs.

The iron intake of the preschool children from their school lunch, in the test group met the recommended value. This differs from the findings by Nelson et al. (2007), who reported that school lunches did not meet one-third of the recommended iron intake. However, it is in line with Mungai et al. (2024), who observed higher iron intake among preschool children participating in school lunch programs compared to those who did not.

Preschool children in the test group met the recommended values for zinc, vitamin A, and vitamin C, whereas the control group failed to do so. This aligns with the findings of Ayogu et al. (2018), who reported that meals provided more than one-third of the recommended intake for these nutrients. However, it differs from Mungai et al. (2024), who found that preschool children in both school programs met their requirements for provitamin A and vitamin C, the findings in Ethiopian by Alderman et al. (2016), which reported low intake of vitamins A and C, and with Mungai et al. (2024), who observed very low zinc intake among preschool children, in the lunch program (12%) and 2% for those not in the program, not meeting the recommended zinc intake.

CONCLUSION

In conclusion, the study revealed notable differences in nutrient intake between the test group and the control group regarding school lunches for preschool children. While both groups exceeded FAO/WHO requirements for energy and protein intake, there were deficiencies in calcium and fat intake. The test group met the recommended values for iron, zinc, vitamin A, and vitamin C, whereas the control group fell short in these areas. These findings underscore the variability in nutrient contributions of school lunch programmes and highlight the need for further adjustment in meal planning to address deficiencies, especially in calcium and fat intake, and ensure adequate nutrition for preschool children.

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Informed Consents

The consent of the selected school heads, and the parents of preschool children (aged 2-5 years) was obtained. Additionally, individual assent from children aged 3 years and above was secured before data collection. In line with the regulatory guidelines, the information of the preschools was kept confidential and used exclusively for research purposes.

Authors' Contributions

Anyanwu, H.O is the main researcher who designed and carried out the experiment, Asinobi, C.O supervised the research and Agugo, U.A. proofread and edit the work before submission for publication.

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