Comparison of Food Security and Dietary Diversity among Home-Grown School Feeding Programme Enrolled and Non-enrolled School-Aged Children in Zaria LGA, Nigeria

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ABSTRACT

Background and Objectives: National home-grown school feeding programme (HGSFP) aims to improve the food security and nutritional status of school-aged children (SAC) in Nigeria. Sparse evidence exists on the impact of HGSFP on the food security and dietary diversity of SAC in Zaria.

Objective: To assess the impact of National HGSFP on the food security and dietary diversity of SAC attending public primary schools in Zaria LGA, Nigeria.

Methods: A school-based comparative cross-sectional study was conducted among SAC attending public primary schools in Zaria, Nigeria. The participants' dietary and food security data were collected using standard methods. Data obtained were summarized as mean (±SD) (for continuous variables) and percentages (for discontinuous variables) using the IBM SPSS Statistics version 21 and Microsoft Excel. T-test and chi-square were used to compare two continuous and categorical variables, respectively (at $p < 0.05$).

Results: The study population consisted of enrolled (n = 263) and non-enrolled participants (n = 217) aged 6-9 years. The non-enrolled children had a significantly higher Household Food Insecurity and Access Scale score than the enrolled participants (5.0 ± 3.1 vs 3.7 ± 3.2). Furthermore, more enrolled participants had adequate food security compared with their non-enrolled counterparts (16% vs 0%). In addition, a higher dietary diversity score ($p = 0.00$) was seen among the enrolled participants (5.8 ± 0.7) compared with the non-enrolled participants (3.6 ± 0.9). Moreover, a higher proportion of enrolled participants had high dietary diversity compared with the non-enrolled participants (51% vs 3%).

Conclusion: National HGSFP has improved the food insecurity and dietary diversity of SAC in Zaria.

KEYWORDS:

- Malnutrition,
- Homegrown School Feeding Programme,
- Zaria, Food security, dietary diversity, Nigeria.

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INTRODUCTION

Nutritional status refers to an individual's or population's current body status concerning macro or

micronutrients. Malnutrition occurs when the body gets too little (undernutrition) or too much (overnutrition) nutrients than it requires for its normal physiological processes and has been associated with increased risk of morbidity and mortality among individuals of all ages, sex, and income categories. In developing countries, undernutrition is the main reason why children die before they attain their fifth birthday. Early life undernutrition is detrimental to children's current and future health and personal development. For instance, malnourished children are more likely to develop life-threatening diseases and are more likely to have low productivity in the later stages of their lives. Despite its debilitating consequences and the availability of interventions to curtail it, the rate of malnutrition is still high in Nigeria. A recent National Food Consumption and Micronutrient Survey reported a national prevalence of stunting, underweight and wasting among under-five children as 33.3%, 25.3%, and 11.6%, respectively[1].

The nutritional status of school-aged children (SAC) is an important determinant of their health, cognition, and school performance [2]. Malnutrition among SAC is a public health problem, especially in developing countries and those in transition [2]. Undernutrition among SAC severely hampers their capacity to learn and perform adequately in school [3], as suboptimal nutrition lessens their mental and cognitive development [4]. Factors contributing to suboptimal nutrition, hence higher rates of undernutrition among SAC in developing countries include inadequate dietary intake of essential nutrients due to pervasive poverty and hunger, high rates of infectious diseases, and suboptimal care and access to healthcare facilities –[5]. The exact prevalence of undernutrition among SAC in Nigeria is largely unknown as this important group of individuals is neglected in all national nutrition surveys. However, results from several studies in different regions of the country hinted at an unprecedented level of undernutrition among SAC. For example, Hassan et al. reported 41.2% and 48.0% rates of stunting and underweight, respectively among SAC attending conventional primary and integrative Qur'anic schools in Kaduna State [6]. In another study, 34.9%, 13.5%, and 10.3% prevalence rates for stunting, underweight, and thinness, respectively among SAC and adolescents in Ondo and Gombe States in Nigeria were reported [7]. High rates of undernutrition among SAC were similarly reported in other studies [8-10], indicating that undernutrition is also a public health challenge among the SAC in Nigeria.

Higher rates of undernutrition among SAC triggered the introduction of school feeding programmes (SFPs) by various governments and developmental partners. The programmes aim to reduce hunger and improve the overall health and nutritional status of SAC, thus improving their overall health and academic performance. Currently, about 390 million children in at least 161 countries are benefitting from the programme [11]. Through the programme, beneficiary children are given one meal every school day either on-site or as a take-home ration to complement what they receive at home for optimum nutrition [11]. In 2016, the Federal Government of Nigeria in collaboration with the Partnership for Child Development launched the largest SFP in Africa. The programme, national home-grown SFP (HGSFP) is aimed to boost pupils' enrollment rate, improve the health and nutrition of the pupils, create jobs for cooks who are mostly from poor households, and provide immediate markets for local farmers [12]. The programme serves an onsite meal every school day (worth 100) to about 10 million children from more than 60,000 public primary schools spread across the 36 States of the federation [13]. In Kaduna State, over 700,000 pupils from primary 1-3 are currently enrolled in the programme, with about 70,000 beneficiary pupils from Zaria LGA[14].

The positive impact of the HGSFP in Nigeria on the pupils' enrollment rate, attendance, and dropout has been widely reported [15-17]. However, the impact of the programme on the dietary diversity and food insecurity of the beneficiary children remains to be determined. Therefore, this study was undertaken to explore the effect of the National HGSFP on the dietary diversity, and food insecurity status of the enrolled participants in Zaria LGA, Nigeria.

MATERIALS AND METHODS

Study design

This research was a school-based comparative cross-sectional study involving the SAC attending public primary schools in Zaria LGA. SAC enrolled in

the national HGSFP were recruited and matched with non-enrolled children (control). Sociodemographic, dietary, and food security-related information of the participants was collected.

Study area

Zaria is one of the 23 Local Government Areas in Kaduna State. It is located between Latitudes 10°58'00"N to 11°80'00"N and Longitudes 7°42'00"E to 7°53'00"E. It covers a total land area of 563km^2 with an altitude of about 762 meters above sea level. It has a population of 408,198 in 2006 (NPC, 2006) and a projected population of 599,997 in 2019 using an annual growth rate of 3%. It is bordered by Sabon Gari to the north, Igabi to the south, Soba, and Giwa to the east and west respectively.

Study population

The study population comprised of SAC in primary 1-3 attending public primary schools in Zaria LGA.

Exclusion criteria

Sick children, those whose ages cannot be ascertained, or those whose parents denied consent were excluded from the study.

Sample size

The sample size was estimated using the formula:

$$n = \frac{Z^2pq}{m^2}$$

Where:

n = minimum sample size.

z = standard deviation score at 95% confidence interval (1.96)

p = prevalence of undernutrition among SAC in Kaduna State (26.4%)[8] .

q = complement probability (1-p)

m = Absolute precision (error tolerance = 0.05)

A non-response rate of 10% and a design effect of 1.5 gave the total number of the sample as 494.

The calculated sample size was proportionately divided between the enrolled and non-enrolled children.

Sampling method

Four (4) wards were randomly selected from the 13 wards in the study area by simple random sampling using a random number generator (https://www.calculator.net/random-number-generator). A list of the public primary schools in the selected wards was collected from the Zaria Local Government Education Authority. Schools in the wards were ranked based on the student's enrollment and a major primary school from the ranking was selected from each ward, making 4 schools (2 with HGSFP and 2 Without HGSFP). In the schools, the children were assessed for eligibility and informed consent were sought from their parents/guardians. We used the principle of probability proportion to size to estimate the number (n) of participants to be recruited from each school using the following formula:

$$n = \frac{Total\ population\ of\ the\ selected\ school}{Sum\ of\ the\ population\ of\ the\ 4\ schools} \times 494$$

Field data collection

Information on the socio-demographic characteristics of the participants' households was collected with the aid of pretested validated semi-structured questionnaire administered through semi-structured interviews by trained field assistants.

Determination of food security of the participants

Household food security was assessed using the Household Food Insecurity Access Scale (HFIAS) Food and Nutrition Technical Assistance (FANTA) guideline [18]. A standard HFIAS questionnaire consisting of 9 food insecurity-related questions was translated into the local language (Hausa) and was pretested by the field assistants. Each question in the questionnaire was scored by; giving zero if the situation did not occur, I point for occurrence between 1-2 times, 2 points for occurrence between 3-10 times and 3 points if it frequently occurs (10 or more times). For each participant's household, the HFIAS score was obtained by summing up points from each question, which ranges between 0 (no food insecurity-related situation) and 27 (highest food insecurity). The HFIAS scores were converted into food insecurity categories as described –[19]. HFIAS score of 0-1 is considered adequate food security, a 2-7 score is mild food insecurity, 8-11 is moderate food insecurity, and 12-27 is severe food

insecurity –[19].

Determination of dietary diversity scores (DDS) of the participants.

Dietary information of the participants was collected using the qualitative 24-hour dietary recall method. The participants were asked by trained field assistants to mention all the foods and drinks they consumed in the previous 24 hours (from the breakfast of the preceding day to that of the current day) and dietary diversity scores were computed according to the FANTA guide based on the consumption of 8 food groups (grains, roots and tubers; vitamin A-rich foods; pulses, nuts, and legumes; foods cooked in oil; other fruits and vegetables; milk and milk products; meat, poultry, or fish; and eggs) [20]. This was achieved by awarding a point for each food group consumed by a participant in the reference period and DDS was the total of these points. The DDS of the participants were further converted to categories of dietary diversity with a DDS of less than 3, 4-5, and 6 considered low, medium, and high DDS, respectively[21]

Ethical approval

This study was reviewed and approved (ABUCUHSR/2021/12) by the Committee on Use of Human Subjects for Research, Ahmadu Bello University, Zaria and the Ministry of Health, Kaduna State (MOH/ADM/7444/VOL.1/1160). Written permission was obtained from the Zaria Local Government Education Authority (EZAR/LGEA/HRM/VOL.1). Informed consent was obtained from the Heads of the selected schools and the guardians of the participants before the commencement of the study. The children participated voluntarily in the study.

Statistical analysis

IBM SPSS Statistics version 21 was used for data analysis. Continuous data obtained were presented as mean ± standard deviation. Categorical variables were expressed as percentages. A t-test was used to compare 2 means where necessary. Chi-square test was used to compare 2 categorical variables. A p-value of <0.05 was considered statistically significant

RESULTS

Socio-demographic and household characteristics of the participants

The socio-demographic characteristics of the participants and their households are presented in Table 1. A total of 480 (263 enrolled and 217 non-enrolled) (97.2% response rate) children participated in the study. Most of the participants in the two groups were between 6-9 years (90%, enrolled and 94%, non-enrolled) and were from households with an average monthly income of < 20,000. The mean (±SD) ages of the enrolled and non-enrolled participants were 7.2 ± 12 and 7.0 ± 0.9 years, respectively and they were from households with a mean (±SD) size of 5.6 ± 1.1 and 6.6 ± 2.1, respectively. Most of the mothers of the enrolled participants were employed (61%) and had formal education (60%). On the contrary, mothers of the non-enrolled participants were predominantly unemployed (61%) and had no formal education (59%). Statistically significant differences ($p < 0.05$) in mothers' occupation, average household monthly income and household size existed between the enrolled and non-enrolled participants.

Table 1: Sociodemographic and Household Characteristics of the Participants

Variables	Non - enrolled (n= 217)	Enrolled (n = 263)	P value
	N(%)	N(%)	
Age (years)			
6-8	203 (94)	229 (87)	0.174
9-12	14 (6)	34 (13)	
Age	7.0 ± 0.9	7.2 ± 1.2	0.261
Sex			
Boys	106 (49)	129 (49)	0.872
Girls	111 (51)	134 (51)	
Mothers Occupation			
Unemployed	132 (61)	103 (39)	0.006*
Employed	85 (39)	160 (61)	
Mothers level of Education			
Formal education	89 (41)	103 (60)	0.741
No formal education	128 (59)	155 (40)	
Household Monthly Income			
<₦20,000			0.002*
>₦20,000	208 (96)	208 (79)	
	9 (4)	55 (21%)	
Household Size	6.6 ± 2.1	5.6 ± 1.1	0.000**

Differences in categorical and continuous variables were assessed using the Chi-squared test and t-test, respectively. (*p <0.01, **p <0.001)

Food security status of the participants.

Enrolled participants had a more favorable HFIAS score than the non-enrolled participants (p = 0.01) (Figure 1A). Both the enrolled and non-enrolled participants were characterized by a high rate of food insecurity (83% vs 99%); however, the percentage is higher among the non-enrolled participants (Figure 1B). In addition, 16% of the enrolled participants had adequate food security, contrary to the non-enrolled participants (1%).

Dietary diversity of the participants

The dietary diversity scores of the participants is shown in Figure 2. The enrolled participants had a higher DDS (p = 0.00) compared with the non-enrolled participants (Figure 2A). In addition, more non-enrolled participants had low dietary diversity scores compared to the enrolled participants (59% vs 0%) (Fig.1B). Contrarily, a higher proportion of enrolled participants had high dietary diversity scores compared with the non-enrolled participants (51% vs 3%) (Fig.2B).

Food consumption patterns of the participants

Figure 3 shows the food consumption patterns of the participants based on the 24-hour dietary recall data. There was a widespread consumption of grains, roots, and tubers (100%); foods cooked in oil (100%), and vitamin A-rich foods by the participants in the two groups. More enrolled participants consumed pulses, nuts, and legumes compared with non-enrolled participants (91% vs 48%). Other fruits and vegetables; milk and milk products; and meat, poultry, or fish were less consumed by the participants in all groups. Further, low consumption of eggs among the non-enrolled participants (5%) compared to the enrolled participants (50%) was similarly observed.

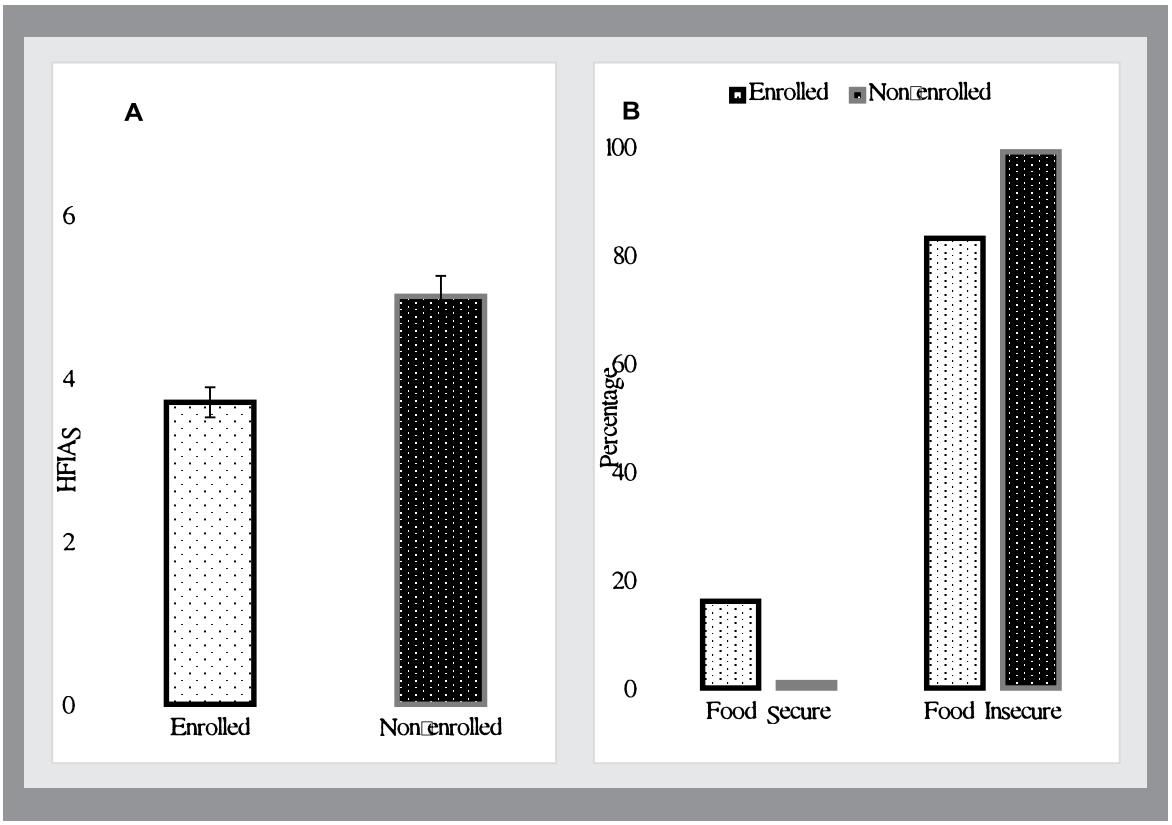

Figure 1: Food security status of the participants.

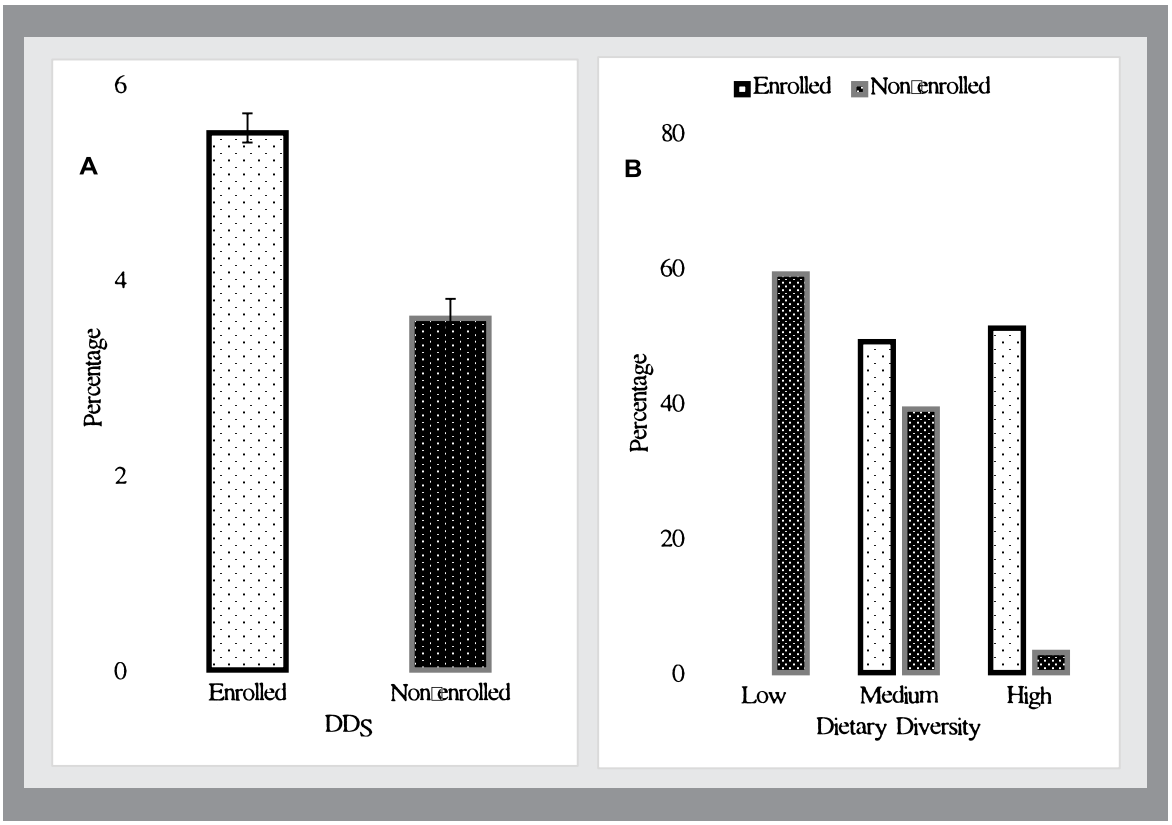

Figure 2: Dietary diversity scores of the participants

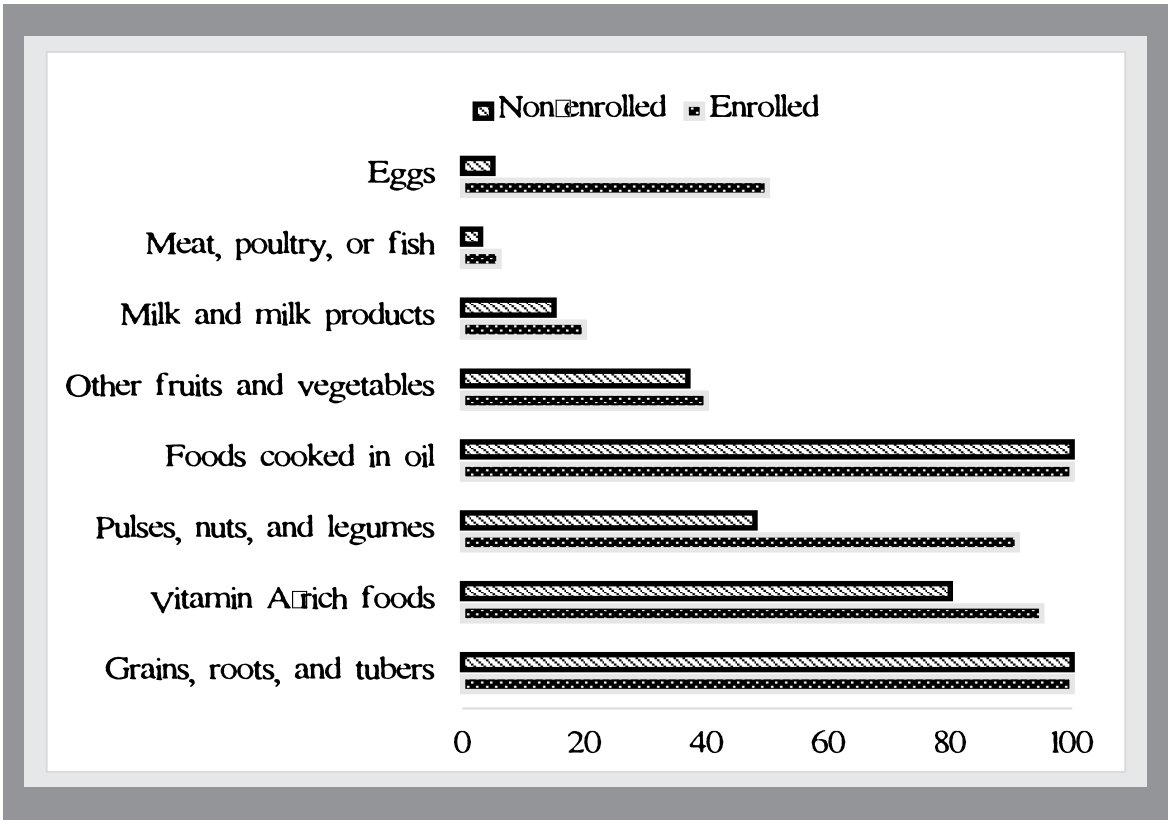

Figure 3: Food consumption pattern of the participants

DISCUSSION

This study assessed the effect of the National HGSFP on dietary diversity and food security of the school-aged children attending public primary schools in Zaria, Nigeria. We found out that the children enrolled in the programme had lower mean HFIAS and were more food secure than the non-enrolled children. This finding agrees with a study done in Ethiopia among school children aged 10-14 years enrolled [22]. In the study, children who are beneficiaries of SFP had a lower mean HFIAS score and less prevalence of food insecurity compared with the non-beneficiary children [22]. Our finding was further supported by a study conducted in Brazil among children and adolescents [23]. The positive benefit of SFPs on food security is not unexpected because these programmes are food distribution programmes that provide free food on-site or as take-home-rations to the beneficiary children to complement what they receive at home for optimum nutrition.

We also discovered that the participants enrolled in the national HGSFP had a higher DDS (an indirect measure of diet quality) compared with their non-enrolled counterparts. This compares well with the finding from a study among school children in Kenya, where the children enrolled in a Kenyan HGSFP had a higher DDS than the non-enrolled children [24]. Zenebe et al. similarly reported a significantly higher DDS in children receiving school meals compared to the children not receiving the meals [22]. Another study conducted among Ghanaian school children reported enhanced DDS of the children enrolled in the Ghana SFP [25]. The positive benefit of national HGSFP on DDS recorded from this, and other similar studies can be attributed to the fact that SFP adds food groups into the diets of the beneficiary children that would otherwise not be present in their home meals, hence resulting in improved dietary diversity[26].

There was a widespread consumption of grains, roots, and tubers and less consumption of fruits and

vegetables; milk and milk products; and meat, poultry, or fish by all the participants in this study. This agrees with the findings from other studies which reported high consumption of starchy staples and low intakes of animal products among Kenyan school children [24, 27]. In another study, only a few percentage of rural school children aged 5-12 years (2%- 5%) in Ebonyi State, Nigeria were reported to consume poultry, meat, and fruits in the preceding 24 hours [28]. Olumakaiye et al. [29] also reported suboptimal consumption of food from organ meats and milk and milk products among the SAC in Southwestern Nigeria. In summary, SAC in developing countries mainly consumes plant-based diets which are predominantly from cereals, roots and tubers with limited animal source foods [30]. Higher consumption of eggs (50% vs 5%) and pulses, nuts, and legumes (91% vs 48%) recorded among the enrolled children when compared with the non-enrolled children may be a result of the HGSFP, as these food groups are provided by the school meals.

An important limitation of this study is it's cross-sectional and these types of studies are highly susceptible to confounding effects, hence, we could not directly attribute our findings to the HGSFP. Thus, we recommend a well-designed intervention study with adequate follow-up period to fully assess the effect of the HGSFP on the dietary diversity, food security as well as nutritional status of the enrolled SAC.

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Conflict of Interest

The authors of this paper have no conflict of interest to declare

Author Contributions

Conceptualization and Methodology: HZ & OAO, Data curation and analysis: HZ, Investigation and original writing: HZ, Writing, review, and editing: HZ, SA, OAO, CCN, BIC & WAA, Supervision: OAO and DO.

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