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ORIGINAL RESEARCH

# Access to Nutrition Information, Dietary Diversity and Shortfall Food Groups among Nigerian In-School Adolescents

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**Abstract**

**Background:** Healthy dietary behaviour is essential for adolescents to promote psychosocial development and cognitive performance and prevent nutrition-related chronic diseases. Yet, the prevalence of micronutrient malnutrition remains high among Nigerian adolescents.
**Objective:** To assess access to nutrition information, dietary diversity, and shortfall food groups among in-school adolescents in Mokola, Ibadan, Oyo, Nigeria.
**Methods:** This descriptive, cross-sectional study involved 360 in-school adolescents selected using a multistage sampling technique. The data, which included sociodemographic characteristics, access to nutrition information and dietary intake, were obtained using a semi-structured, interviewer-administered questionnaire. Dietary intake was assessed using a 24-hour recall approach to determining dietary diversity using Food and Agriculture Organisation (FAO)'s Minimum Dietary Diversity for Women procedure.
**Results:** The mean age of the respondents was 15.5±2.3 years, and 58.1% were females. Only 5.4% had access to information on healthy eating. The minimum dietary diversity score during the previous 24 hours was 5.41±1.3, and only 46.5% of the respondents met the minimum dietary diversity for women. Shortfall food groups included nuts and seeds (4.1%), dairy foods (6.1%), pulses (7.2%), fruits (10.3%), other vegetables (10.3%), and eggs (15.3%).
**Conclusion:** Poor access to nutrition information and low dietary diversity were observed among in-school adolescents in Mokola, Ibadan, Nigeria. Policymakers should strengthen the educational system to promote active learning of healthy eating and improve access to the varieties of foods and snacks made from the shortfall food groups.

**Keywords:** *Dietary diversity, Diet quality, In-school Adolescents, Shortfall food groups.*

## Introduction

Adolescence is a transitional period from childhood to adulthood, which usually begins with puberty and physical and mental development, including biological, social, and psychological changes occurring between 10-19 years of age. [1] Adequate nutrition during adolescence is crucial to meet the increased energy and nutrient demands of growth and development. [2,3] During adolescence, healthy dietary behaviour is essential for psychosocial

development and cognitive performance and preventing nutrition-related chronic diseases in adulthood.[4] Globally, over 340 million children and adolescents aged 5-19 years are overweight and obese. [5] Dietary habits in adolescent populations are frequently sub-optimal, with a high saturated and total fat intake but a low intake of fruit, vegetables, fibre, and calcium-rich foods. [6] In Nigeria, poor dietary practice, characterised by poor dietary habits and low nutritional diversity, remains common among adolescents and manifests in the form of the high prevalence of overweight and obesity. [7-10] Low dietary diversity signifies a poor-quality diet and largely contributes to micronutrient malnutrition and several health risks. In many nations and households, there is evidence of co-existence of underweight, overweight, obesity, stunting and micronutrient deficiencies. [11,12]

Studies have shown that most adolescents need more knowledge about their health, development, and nutritional needs. [13-15] Therefore, ensuring good adolescent dietary habits is crucial as a nutrient-poor diet predisposes to poor physical and cognitive development. [16,17] Dietary diversification is one of the globally recognised strategies for addressing the problem of malnutrition, particularly micronutrient malnutrition. This strategy is one way of enhancing healthy eating behaviour and nutrient adequacy of the diet. [18,19] Studies in Nigeria have shown poor dietary diversity among adolescents. [8,10,20, 21] However, the peculiar food groups that need to be adequately represented in the diet of these adolescents still need to be clarified. Likewise, improving access to accurate nutrition information is essential to promote healthy adolescent growth, nutrition, and development. [22] In Nigeria, information on access to nutrition information among adolescents is limited. Therefore, this study assessed access to nutrition information, dietary diversity, and shortfall food groups among in-school adolescents in Mokola, Ibadan, Nigeria.

## Methods

*Study design*

The study was descriptive and cross-sectional in design. The study spanned five months (August to December 2021).

*Study Area*

The study was conducted in the Mokola area of Ibadan North Local Government Area, Oyo State, Nigeria. Ibadan North Local Government Area has the highest level of urbanisation in Oyo State, with a projected population of 856,988 spread over an area of 27 km$^2$. Mokola Area is a densely-populated commercial hub with a mix of different ethnic groups and cultures, good tarred road networks, good drainages and organised refuse sites. There are 45 public secondary schools in the Ibadan North Local Government Area, including nine public schools in the Mokola community at the time of this study.

*Study population and sampling procedure*

Three hundred and sixty in-school adolescents in selected public secondary schools in the study area participated in the study. The respondents were selected using a multistage sampling procedure. In the first stage, a compilation of all the public secondary schools within the Ibadan North Local Government Area was obtained and stratified by location. In the second stage, three public schools in Mokola with a population of 300 or above were purposely selected. In the third stage, a simple random sampling technique was used to choose the arms of classes and adolescent students participating in the study. Adolescents who had no disability, were capable of effective communication, and consented to participate, regardless of their area of residence, were considered eligible.

*Sample size determination*

A total of 360 in-school adolescents completed the study and this was considered adequately representative based on the minimum sample size of 254 calculated using the Fishers' formula ($N = [Z\alpha^2 \times p(1-p)/d^2]$ for estimating minimum sample size for descriptive studies, assuming standard normal deviate ($Z\alpha$) at 95% (of 1.96), percentage of in-school adolescents with inadequate micronutrients intake (80.0%) [23], 5% level of precision and 40% non-response rate.

*Data collection*

Information such as the respondents' sociodemographic characteristics, access to nutrition information, and dietary intake were obtained using a pre-tested, semi-structured questionnaire. The perceived level of income was categorised according to the 2018 World Bank Poverty and Equity Brief in Nigeria. Low income was classified as income less than ₦11,000/month, middle income as income starting from ₦ 19,000/month and high income as income starting from ₦32,000/month. [24] Thirty questionnaires were pre-tested during a pilot study conducted in a public secondary school in Ibadan North Local Government Area. The results were used to adjust the questionnaire before actual data collection began. Access to nutrition information was assessed using a five-item questionnaire, and dietary intake was assessed using a multi-pass 24-hour dietary recall procedure. Dietary diversity was determined using the Food and Agriculture Organisation (FAO)'s Minimum Dietary Diversity for Women (MDD-W) [25] by scoring the number of foods consumed from each of the ten food groups. Adolescents with a score of five or more out of ten food groups were considered to have met the MDD-W.

*Data analysis*

The data were analysed using the IBM Statistical Package for the Social Sciences version 25.0. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to analyse sociodemographic characteristics, access to nutrition information exposure, dietary diversity and food groups.

*Ethical considerations*

Ethical approval for the study was obtained from the University of Ibadan/University College Hospital Research and Ethics Committee at the Institute of Advanced Medical Research and Training (IAMRAT), Ibadan, with Approval Number UI/EC/21/0602. Participation in the study was entirely voluntary, and informed consent was obtained from the respondents. The ethical principles guiding research among human subjects, as contained in the Helsinki Declaration, were adhered to.

## Results

***Sociodemographic characteristics***

The sociodemographic characteristics of the respondents are presented in Table I. The mean age of the respondents was 15.5±2.3 years. Most adolescents (68.9%) were aged 15-19 years, 58.1% were females and 58.3% were Christians. About 86% of the respondents' fathers had primary education, including 67.8% and 12.2% with secondary and tertiary education, respectively. Also, about 90% of the mothers had primary education, 48.3% and 13.1% had secondary and tertiary education, respectively. In addition, 40.8% of the respondents' fathers were traders, while 12.8% were unemployed. Sixty per cent of the respondents' mothers were traders, while 11.7% were unemployed. Based on the respondents' perception, 53.6% belonged to a middle-income family, 33.1% were from a low-income family, 11.1% belonged to a high-income family, and 2.2% were unclassified.

**Table I: Sociodemographic characteristics of respondents (n = 360)**

| *Variables* | | *Frequency* | *Percentage* |
|---|---|---|---|
| Gender | Male | 151 | 41.9 |
| | Female | 209 | 58.1 |
| Age (years) | 10-19 | 112 | 31.1 |
| | 15-19 | 248 | 68.9 |
| | Mean±SD | 15.5±2.3 | |
| Religion | Christianity | 210 | 58.3 |
| | Islam | 142 | 39.4 |
| | Traditional | 8 | 2.3 |
| Perceived level of income | Low income | 119 | 33.1 |
| | Middle income | 193 | 53.6 |
| | High income | 40 | 11.1 |
| | Unclassified* | 8 | 2.2 |
| Respondent's Father Education | No formal education | 52 | 14.4 |
| | Primary education | 20 | 5.6 |
| | Secondary education | 244 | 67.8 |
| | Tertiary education | 44 | 12.2 |
| Respondent's Mother Education | No formal education | 41 | 11.4 |
| | Primary education | 98 | 27.2 |
| | Secondary education | 174 | 48.3 |
| | Tertiary education | 47 | 13.1 |
| Respondent's Father Occupation | Civil Servant | 52 | 14.4 |
| | Artisan | 89 | 24.7 |
| | Trader | 147 | 40.8 |
| | Unemployed | 46 | 12.8 |
| | Others | 26 | 7.2 |
| Respondent's Mother Occupation | Civil Servant | 11 | 3.0 |
| | Artisan | 73 | 20.3 |
| | Trader | 216 | 60.0 |
| | Unemployed | 42 | 11.7 |
| | Others | 18 | 5.0 |

*''Others'' - Various occupation(s) reported but not listed, such as farming, schooling, etc.*

**Unclassified - Missing responses as some respondents were unsure of the perceived level of income*

*Access to Nutrition Information*

The respondents' access and exposure to nutrition information are presented in Table II. About 89% had taken school subjects with components on food and nutrition. The leading subjects included basic sciences (30.3%), home economics (29.7%), and agricultural sciences (19.7%). However, only 10% of the respondents were familiar with nutrition information, and the sources of information were largely billboards

(30.0%), newspapers, social media, textbooks (20.0% each) and health facilities (10.0%). In addition, only 5.3% of the respondents had ever seen a nutrition poster, billboard or signage on healthy eating, yet 52.6% needed to remember the information displayed on such materials.

**Table II: Access to food and nutrition information among the respondents (n = 360)**

| *Variable* | *Response* | *Frequency* | *Percentage* |
|---|---|---|---|
| Taught on any subject with components on food and nutrition | Yes | 320 | 88.9 |
| | No | 40 | 11.1 |
| If yes, list the subject/subjects | Agricultural science | 71 | 19.7 |
| | Home Economics | 107 | 29.7 |
| | Basic science | 109 | 30.3 |
| | Food and Nutrition | 7 | 1.9 |
| | Others | 21 | 5.8 |
| | No response | 45 | 12.5 |
| Had familiarity with any source of nutrition information | Yes | 10 | 2.8 |
| | No | 350 | 97.2 |
| If yes, mention | Billboard | 3 | 30.0 |
| | Newspaper | 2 | 20.0 |
| | Social media | 2 | 20.0 |
| | Textbook | 2 | 20.0 |
| | Hospital | 1 | 10.0 |
| Have you ever seen a nutrition-related poster, billboard, or signage on healthy eating | Yes | 19 | 5.3 |
| | No | 341 | 94.7 |
| Message displayed on the signage | Don't talk while eating | 4 | 21.1 |
| | Wash your hands before eating | 2 | 10.5 |
| | Stay healthy! Eat good food always | 3 | 15.8 |
| | Don't remember | 10 | 52.6 |

*Dietary Diversity and food groups consumed*

The dietary diversity among the respondents is presented in Figure 1. The mean minimum dietary diversity score during the preceding 24 hours was 5.41±1.3, and only 46.5% of the respondents met the minimum dietary diversity for women. Furthermore, only 0.1%, 1.8% and 2.4% had dietary intake covering eight, seven or six food groups. The food groups covered by the dietary intake of the respondents during the previous 24 hours are also presented in Figure 2. The result showed high consumption of starchy grains, roots and tubers (100.0%), other vitamin A-rich fruits and vegetables (100.0%), dark green leafy vegetables (97.8%), and meat, poultry and fish (91.4%). However, few of the respondents consumed nuts and seeds (4.1%), dairy foods (6.1%), pulses (7.2%), fruits (10.3%), other vegetables (10.3%), and eggs (15.3%). A massive shortfall in consumption was observed in nuts and seeds, dairy foods, pulses, fruits, other vegetables, and eggs.

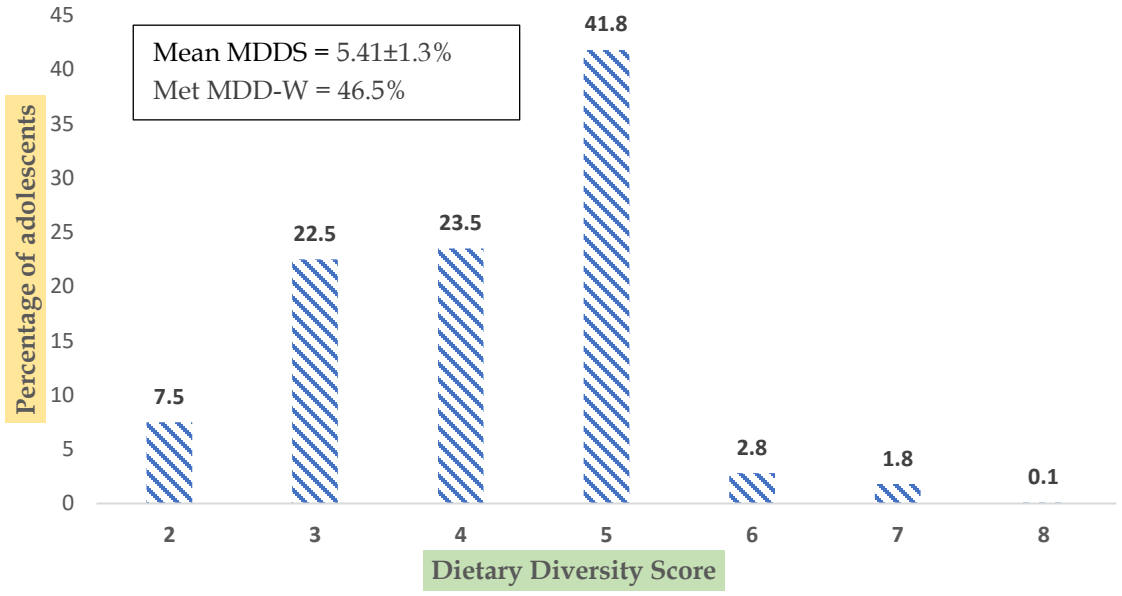


**Figure 1: Dietary diversity among in-school adolescents in Mokola, Ibadan**

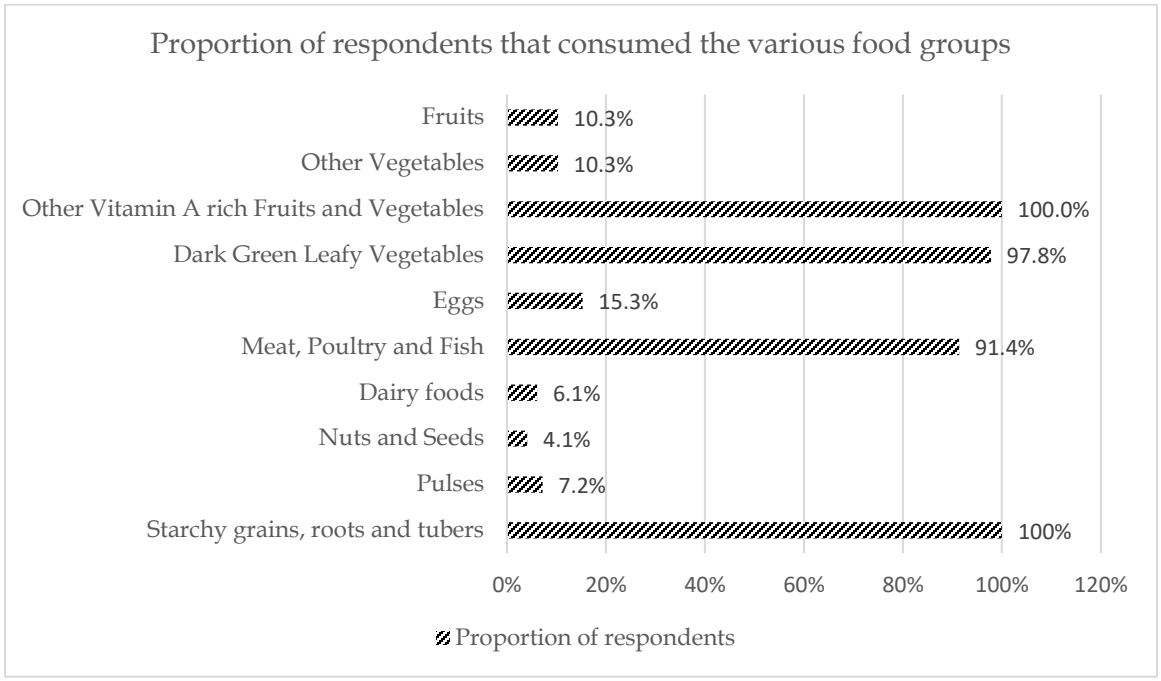


**Figure 2: Food groups consumed by in-school adolescents in Mokola, Ibadan**

## Discussion

The mean age (15.5±2.3 years) of the respondents in this study is similar to the mean age of in-school adolescents reported by Adepoju *et al.* [21]

The study population was dominated by the females in agreement with a previous study conducted among adolescents in Lagos, Nigeria. [26] This observation may be suggestive of increasing female education in the study area. These similarities might be attributed to the fact that both studies were conducted in southwest Nigeria. In this study, many in-school adolescents offered school subjects with food and nutrition components. However, only a few had access to information on healthy eating. Also, dietary diversity is low, with less than half achieving the minimum dietary diversity for women, and a vast shortfall was observed in the consumption of nuts and seeds, dairy foods, pulses, fruits, other vegetables, and eggs. Improving access to accurate nutrition information is one of the key strategies for healthy adolescent growth, nutrition, and development. [21] Despite this evidence, studies have reported poor nutrition knowledge among Nigerian adolescents. [9,14,22,25,27] The inadequate knowledge of food among adolescents can be attributed to limited access to nutrition information.

The consequences of limited access to nutrition information among adolescents include unhealthy dietary practices, disordered eating patterns, limited food choices, reduced ability to make informed decisions, and increased risk of diet-related health risks. [28, 29] These consequences are recognised among Nigerian adolescents. This finding suggests that poor access to nutrition information among Nigerian adolescents may be responsible for the poor dietary practices among this population group. This observation calls for strengthening the country's nutrition information and education system to ensure the availability of the correct, age-appropriate, and up-to-date nutrition information using multiple platforms. Another key finding is the large proportion of adolescents who needed help remembering the nutrition information they had encountered. Evidence has shown that a multi-strategy intervention incorporating school-based, media, community and parents-supported approaches is critical in promoting better nutrition outcomes among adolescents. [30,31] The poor recall of nutrition information among the in-school adolescents in this study may be due to the weakness of the nutrition information channel they have accessed or the lack of reinforcement, both of which could limit the likelihood of behaviour change for better nutrition outcomes. Therefore, there is a need to identify innovative approaches to presenting nutrition information to Nigerian adolescents to aid in the active learning and retention of key messages. This strategy is required to promote behavioural changes and enhance the adoption of healthy dietary behaviours. In this study, the respondents derived nutrition information from diverse subjects, yet, recall of crucial nutrition messages could be better. The spread of the nutrition components across the various subjects is advantageous as this may likely increase access by many students. There is an additional need to strengthen these nutrition components of subjects with skilled-based activities to enhance learning and promote the adoption of healthy dietary practices early in life. The need to improve the capacity of the teachers to deliver on such subjects is equally pertinent. Hargreaves *et al*. recommended prioritising existing knowledge gaps to accelerate action for adolescent nutrition and calling for expanding school curricula to include relevant skills-based training to promote adolescent nutrition. [22]

The low dietary diversity and low proportion of the respondents meeting the minimum dietary diversity for women reflect poor diet quality and suggest a high likelihood of micronutrient malnutrition. Earlier studies have reported that low nutritional diversity affects Nigerian adolescents' nutrition and health. [8,19,32,33] Regular consumption from different food groups is required to meet the energy and nutrient

requirements sufficiently during this phase of development. According to the Food and Agriculture Organization (FAO), dietary diversity provides information about the diet quality of an individual consumed from diverse food groups in the past 24 hours. [25] Dietary intake among the respondents was largely starchy staples with dark green leafy vegetables and animal protein. At the same time, a vast shortfall was observed in the consumption of nuts and seeds, pulses, dairy products, and fruits. A similar finding has been reported among adolescents in Nigeria and Ghana, who primarily consumed grains, roots and tubers, while a relatively low proportion consumed from other food groups. [8, 34] Studies have also reported poor dietary intake of fruits, meats, vegetables, and milk products among adults in low- and middle-income countries. [35, 36] The massive shortfall in consumption of nuts and seeds, dairy foods, pulses, fruits, other vegetables, and eggs suggests an increased susceptibility to micronutrient malnutrition, particularly deficiencies of iron, calcium, fat-soluble vitamins, riboflavin, vitamin B12, among others. This finding indicates the need to increase emphasis on the nutritional benefits of these food groups in the design of nutrition education for in-school adolescents in Ibadan and other areas.

## Conclusion

Poor access to nutrition information and low dietary diversity were observed among in-school adolescents in Mokola, Ibadan, Nigeria. Furthermore, dietary intake is limited mainly to nuts and seeds, dairy foods, pulses, fruits, and eggs. There is a need to deliberately promote active learning of healthy eating among Nigerian in-school adolescents. The school curriculum should be revised to incorporate or strengthen nutrition information. Educational systems using innovative and multi-strategy approaches should also be adopted. Moreover, there is a need to promote dietary diversity among in-school adolescents. This goal can be achieved by improving access to the varieties of foods and snacks made from the shortfall food groups including nuts and seeds, dairy products, pulses, fruits and eggs.

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**Authors' Contributions:** AO and AEJ conceived and designed the study. AEJ did the literature review and data collection. All the authors analysed and interpreted the data. AO, OF, and AM drafted the manuscript and revised the draft for sound intellectual content. All the authors approved the final version of the manuscript.
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