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Research Article

Dietary diversity, lifestyle, and hydration practices among athletes in Lagos State, Nigeria: A cross-sectional study

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Highlights/Key Messages

- Snacking between meals linked to higher dietary diversity in athletes.
- Dietary diversity increased with more meals per day
- Meal skipping showed no significant link with dietary diversity.
- Nearly half of the female athletes were at risk due to high waist circumference

Background
Athletes require adequate dietary diversity, healthy lifestyle behaviours, and appropriate hydration to support performance, recovery, and long-term health. However, local evidence on these practices among Nigerian athletes remains limited.

Objective
To assess dietary diversity, lifestyle and hydration practices, and related factors among athletes in Lagos State, Nigeria.

Methods
A descriptive cross-sectional study was conducted among 150 athletes recruited from five stadia in Lagos State. Data were collected using a pre-tested interviewer-administered questionnaire covering socio-demographics, lifestyle and hydration habits, and a single 24-hour recall to compute the FAO dietary diversity score (DDS) across nine food groups. Anthropometric measurements were taken and BMI calculated. Data were analysed in SPSS v20 using descriptive statistics and chi-square tests ($p<0.05$).

Results
Participants were predominantly male (78.0%) and mostly aged 18–24 years. The mean DDS was 5.0 ± 1.11. Dietary diversity was largely medium (64.5%), with 10.0% low and 23.3% high. All respondents consumed starchy staples (100%); consumption of organ meat was rare (2.0%). Most athletes reported snacking between meals (78.0%), and breakfast was the most commonly skipped meal (61.3%). Most drank water between meals (84.7%) and during physical activity (72.0%), though many lacked knowledge of recommended daily water intake (58.7%). Dietary diversity was significantly associated with alcohol consumption and snacking between meals, whereas meal skipping was not. Nearly half of the female athletes had a moderate (44%) or high (6%) risk of overweight based on waist circumference.

Conclusion
Age was positively associated with BMI ($p=0.027$). Athletes in Lagos showed generally moderate dietary diversity and mixed lifestyle/hydration practices, with clear behavioural links to dietary diversity

Keywords: dietary diversity, hydration practices, lifestyle practices, athletes, nutrition knowledge; Lagos State, Nigeria.

Introduction

Athletes are individuals who compete in sports or other athletic activities. They participate in various sports disciplines, ranging from team sports like soccer, basketball, and football to individual sports such as tennis, track and field, shot put, gymnastics, and many more. Athletes dedicate significant time and effort to their sport, aim to achieve high levels of performance, excel in their chosen discipline, and often compete at local, national, or international levels. (Thomas et al., 2016) reported that the role of nutrition in assisting athletic training, enhancing muscle recovery, and reducing the risk of injuries. For athletes with higher nutrient requirements due to increased physical activity and energy expenditure, dietary diversity becomes even more crucial for supporting their performance, recovery, and injury prevention. Effective stress management techniques, such as mindfulness and relaxation strategies, have been shown to improve performance and well-being among athletes (Orji & Yakubu, 2020). Dietary diversity plays a pivotal role in achieving optimal nutrition and maintaining overall health (Oladoyinbo et al., 2017). It entails consuming a variety of foods from multiple food groups to ensure adequate intake of macronutrients and micronutrients required for normal physiological function and disease prevention (Sibhatu & Qaim, 2018).

Alongside diet, lifestyle factors such as physical activity, sleep, stress management, and hydration strongly influence health outcomes. Adequate sleep and recovery are particularly important for athletes, supporting cognitive performance, hormonal balance, and physical recovery (Nédélec et al., 2015). Conversely, poor dietary habits, skipping meals, inadequate fluid intake, or micronutrient deficiencies can hinder performance, delay recovery, and increase the risk of fatigue or illness. Moreover, effective stress-management strategies, such as mindfulness and relaxation, have been shown to enhance athletes' mental resilience and performance (Orji & Yakubu, 2020).

However, athletes, particularly in developing regions, often face challenges such as limited access to nutrient-dense foods, food insecurity, low nutrition knowledge, and poor hydration practices (Malsagova et al., 2021). In Nigeria, these challenges are compounded by economic constraints and a scarcity of qualified sports dietitians or nutritionists. Consequently, many athletes exhibit imbalanced nutrient intake and inconsistent lifestyle habits that may compromise their health and athletic potential. While studies have examined dietary diversity in the general population, limited research has specifically examined how athletes in Lagos State, a major sports hub in Nigeria, combine dietary practices, hydration, and lifestyle behaviours. Understanding the interplay between dietary diversity, lifestyle, and hydration among this group is vital for designing targeted nutrition education and performance-improvement interventions. Evidence from Nigeria suggests that dietary diversity can remain suboptimal even where nutrition knowledge is relatively high, reflecting broader constraints such as affordability, access, and food environments (Ogunniyi & Okoye, 2025). This study, therefore, assesses the dietary diversity, lifestyle, and hydration practices of athletes in Lagos State, Nigeria, and explores the relationships between socio-demographic characteristics, dietary diversity scores, lifestyle behaviours, and nutritional status.

Methods

Study Area

This study was conducted in Lagos State, located in the southwestern region of Nigeria. Despite being the smallest state by landmass, Lagos is the most populous, with a population of 9,113,605 as recorded in the 2006 census. It is Nigeria's primary economic and financial hub, lying along the Bight of Benin on the Atlantic Ocean.

Study Location

The research was carried out in five major stadiums within Lagos State:

- i. National Stadium, Surulere
- ii. Agege Stadium
- iii. Teslim Balogun Stadium
- iv. Onikan Stadium
- v. Campos Memorial Mini Stadium

These facilities were selected to capture a representative population of active athletes across various sports disciplines in the state.

Study Design

This study used a cross-sectional design. Because exposures and outcomes were measured simultaneously, temporal relationships cannot be established, and findings should be interpreted as associations rather than as causation.

Sample Size and Sampling Technique

Given athletes' irregular training schedules, competitions, and travel commitments, a specific sample size could not be determined due to their availability. Thus, an exhaustive approach was used; we attempted to include all athletes present in the stadium, and simple random sampling was applied. A total of 155 respondents participated in the study, but only 150 questionnaires were valid.

Data Collection Instruments/Research Instruments

Data were collected using a pre-tested, structured interviewer-administered questionnaire comprising five sections:

- i. Socio-demographic and economic characteristics
- ii. Dietary diversity (assessed using the FAO dietary diversity questionnaire)
- iii. Lifestyle practices (including sleep, stress management, and social behaviour)
- iv. Hydration habits and assessment
- v. Anthropometric measurements

The questionnaire was designed to be simple, culturally relevant, and easy to administer. Data were collected on weekdays to avoid variations caused by competition or festive periods.

Socio-Demographic and Economic Data

Information on respondents' age, gender, marital status, educational level, occupation, and income sources was collected using a structured questionnaire.

Anthropometric Measurements

Anthropometric data, including weight, height, and waist circumference, were obtained using standard procedures. Weight was measured using a portable bathroom scale calibrated in (kg) with participants wearing light clothing and no shoes. Height was measured with a calibrated stadiometer in (cm) while participants stood upright against a wall without footwear. Waist circumference was obtained using a non-elastic measuring tape calibrated in (cm), which was placed between the ribcage and the top of the hip bone and classified as > 88cm for women and > 102cm for men (WHO 2008). Body Mass Index (BMI) was computed as weight (kg) divided by height squared (m^2) and categorised according to WHO (2015) standards:

- Underweight: <18.5 kg/m^2
- Normal: 18.5–24.9 kg/m^2
- Overweight: 25.0–29.9 kg/m^2
- Obesity Class I: 30–34.9 kg/m^2
- Obesity Class II: 35–39.9 kg/m^2
- Morbid Obesity: ⩾40 kg/m^2

Dietary Diversity Assessment

Dietary diversity was assessed using the FAO Dietary Diversity Score, which records the number of 9 food groups consumed by respondents in the previous 24 hours. A dietary diversity score (DDS) was calculated as the total number of food groups consumed, serving as a proxy for dietary quality and nutrient adequacy.

The following formula can be used to determine the respondents' average dietary diversity score:

$$= \frac{\text{Sum (Individual dietary diversity score)}}{\text{Total Number of Individuals surveyed}} \quad \text{(FAO, 2021)}$$

$$=763/150 \quad = 5 \pm 1.11$$

Lifestyle and hydration assessment

Lifestyle practices were evaluated using an adapted short lifestyle assessment questionnaire covering eating habits, physical activity, sleep patterns, stress management, and social interaction. Hydration behaviour was assessed using the Hydration Habit and Assessment Questionnaire (HHQ/HAQ), as developed by Ayotte and Corcoran (2018), which explored athletes' frequency of fluid intake, preferred beverage types, and hydration practices before, during, and after sporting activities.

Data Analysis

Data were coded using Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 20.0. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarise data. Inferential statistics, including Pearson correlation and chi-square analyses, were used to examine associations among variables. Statistical significance was determined at $p < 0.05$. We assumed the data followed a normal distribution, and cases of missing data were excluded from analysis.

Ethical Considerations and Informed Consent

Ethical approval was obtained from the Department of Nutrition and Dietetics at the Federal University of Agriculture, Abeokuta, Nigeria. A formal introduction letter was submitted to the Lagos State Sports Commission and the stadium authorities to request permission for the research. Participation was voluntary, and informed consent was obtained from all respondents after they were informed of the study's objectives and procedures. Data confidentiality and anonymity were strictly maintained throughout the study.

Results

Characteristics of Respondents

The study involved 150 athletes from five stadia in Lagos State. Most respondents were male (78%) and aged 18–24 years (35.3%). Their socio-demographic and economic characteristics are presented in Table 1.

Table 1. Socio-demographic and economic characteristics of the respondents (N=150)

Variable	Category	Frequency	Percentage
Gender	Male	117	78.0
	Female	33	22.0
Age	Less than 18	51	34.0
	18 – 24	53	35.3
	25 – 34	36	24.0
	35 – 44	7	4.7
	45 and above	3	2.0
Ethnicity	Hausa	14	9.3
	Igbo	34	22.7
	Yoruba	76	50.7
	Others	26	17.3
Religion	Christianity	98	65.3
	Islam	52	34.7
Marital Status	Single	122	81.3
	Co-habiting	18	12.0
	Married	8	5.3
	Widowed	2	1.3
Income per Month (₦)	0 – 5,000	45	30.0
	5,001 – 10,000	18	12.0
	10,001 – 20,000	23	15.3
	20,001 – 50,000	27	18.0
	50,001 – 100,000	18	12.0
	100,000 and above	19	12.7
Educational level	Informal	2	1.3
	Primary	5	3.3
	Secondary	94	62.7
	Tertiary	49	32.7
	Total	150	100

₦ = Nigerian Naira. US$1 = ₦638.7 at the time of data collection

The mean DDS was 5.0; 10.0% had low DDS, 64.5%, medium, and 23.3%, high. As shown in Table 2, respondents had a high intake of starchy staples, while 51.3% did not eat dark green leafy vegetables and had low consumption of vitamin A-rich fruits and vegetables. However, the majority consumed other fruits and vegetables. Most did not consume organ meat, though meat and fish consumption were common. Over half did not consume eggs, while many ate legumes, nuts, and seeds, and about half did not consume milk or milk products. More than half ate meals outside the home during the previous day.

Table 2. Food Groups Consumed by the Respondents

Variable	Frequency	Percentage
Starchy staples	150	100
Dark green leafy vegetables	73	48.7
Other vitamin A-rich fruits and vegetables	45	30.0
Other fruits and vegetables	141	94.0
Organ meat	3	2.0
Meat and fish	130	86.7
Eggs	57	38.0
Legumes, nuts and seeds	103	68.7
Milk and milk products	52	34.7
Did you eat anything (meal or snacks) outside the home in the last 24hours?	86	57.3

Table 3 shows generally inconsistent meal patterns among the athletes, with frequent meal skipping, particularly breakfast, despite common snacking. While most preferred homemade meals, many still relied on cafeteria food. Hydration practices were mixed: although water consumption during training was common, many athletes waited until they felt thirsty, and a substantial number were unaware of the recommended daily fluid intake. Risk behaviours such as smoking were low, but about 1/3 consumed.

Table 3. Food consumption and hydration practices of 150 sample athletes

Variables	Frequency	Percentage
Number of meals per day?		
Once	6	4.0
Twice	73	48.7
Thrice	54	36.0
More than thrice	17	11.3
Do you take snacks in-between meals?		
Yes	117	78.0
No	33	22.0
What type of food do you take the most?		
Homemade food	101	67.3
Fast food	17	11.3
Food made outside home	32	21.4
Do you consume alcohol?		
Yes	48	32.0
No	102	68.0
Do you drink water between meals?		
Yes	127	84.7
No	23	15.3
Do you drink any water while performing any physical activity?		
Yes	108	72.0
No	42	27.3
Do you consume isotonic and/or energy drinks while performing physical activity?		
Yes	71	47.3
No	78	52.7
When you are thirsty, do you prefer to consume other beverages instead of water?		
Yes	74	49.3
No	76	50.7
Do you know what the daily water intake recommendation is?		
Yes	62	41.3
No	88	58.7
Total	**150**	**100**

Based only on BMI, 74% had a normal body weight, 23% were overweight, 1% obese, and 2% were underweight. However, as shown in Figure 1, based on waist circumference, while very few of the male respondents were at risk of overweight, a considerable number of females fell within the moderate risk group.

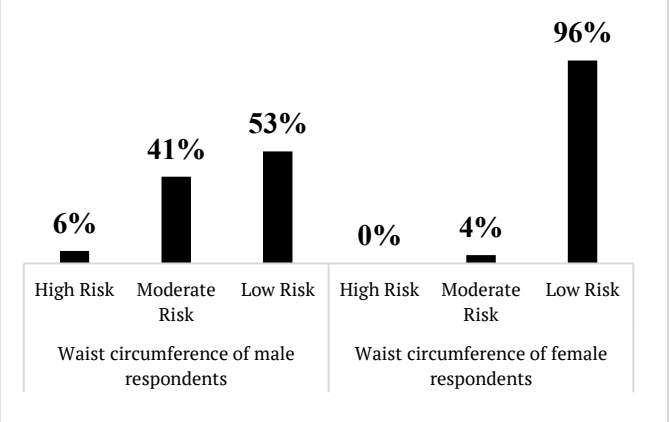


Figure 1. Waist Circumference of male and female respondents

Chi-square analysis revealed a statistically significant association between alcohol consumption and dietary diversity categories ($\chi^2 = 7.819$, $p = 0.020$), with a small-to-moderate effect size (Cramer's $V = 0.23$, $n = 150$). A trend analysis indicated that dietary diversity increased across categories of meals per day (linear-by-linear chi-square association/chi-square for trend, $p<0.05$). In addition, snacking between meals was significantly associated with dietary diversity ($\chi^2 = 12.278$, $p = 0.002$), with a moderate effect size (Cramer's $V = 0.29$). However, skipping meals was not significantly associated with dietary diversity ($\chi^2 = 3.929$, $p = 0.140$), with a small effect size (Cramer's $V = 0.16$) as presented in Table 4.

There was a positive association between age and Body Mass Index (BMI) with a chi-square value of 23.046 and a p-value of 0.027. However, relationships between BMI and major source of income and marital status were not statistically significant.

Table 4. Association between lifestyle practices and individual dietary diversity score of the respondents (N=150)

Variables	Individual dietary diversity score of the respondents				X^2	P-value
	</=3 (Low dietary diversity) F (%)	4-5 (Medium dietary diversity) F (%)	>/=6 (High dietary diversity) F (%)	Total N (%)		
Do you consume alcohol?					7.819	0.020
Yes	4 (8.3)	20 (41.7)	24 (50.0)	48 (100)		
No	8 (7.8)	66 (64.7)	28 (27.5)	102 (100)		
Do you skip any meals?					3.929	0.140
Yes	8 (7.7)	65 (62.5)	31 (29.8)	104 (100)		
No	4 (8.7)	21 (45.7)	21 (45.7)	46 (100)		
Number of meals per day?						
One	1 (16.7)	5 (83.3)	0 (0.0)	6 (100)	13.198	0.040
Two	9 (12.3)	45 (61.6)	19 (26.0)	73 (100)		
Three	2 (3.7)	28 (51.9)	24 (44.4)	54 (100)		
More than three	0 (0.0)	8 (47.1)	9 (52.9)	17 (100)		
Do you take snacks in-between meals?					12.278	0.002
Yes	8 (6.8)	60 (51.3)	49 (41.9)	117 (100)		
No	4 (12.1)	26 (78.8)	3 (9.1)	33 (100)		

Discussion

In this study Lagos State, Nigeria, most athletes reported generally favourable lifestyle behaviours (e.g., low smoking prevalence and a preference for homemade meals), alongside common meal-skipping and snacking patterns. These findings align with evidence from Ondo State, Nigeria, where athletes' lifestyle practices (including breakfast skipping and fluid-related behaviours) were also reported as prominent and linked to nutrition-related factors (Olaitan & Egbase, 2022). The similarity across Nigerian settings may reflect shared constraints such as training schedules, informal meal environments around training venues, and limited access to structured sports nutrition services.

The nutritional status profile observed among male athletes in this study was similar to that reported among male athletes in another Nigerian setting (Oladunni & Sanusi, 2013). A large proportion of the respondents in this study reported relaxing by sleeping when not training and preferring homemade food, which is consistent with the research conducted by Burns et al. (2022) among Australian athletes. In contrast to our findings and Burns et al.'s findings of adequate sleep, Chretien et al. (2023) reported that only 31.0% of athletes slept for eight hours or more per night.

We also found that the majority of respondents did not smoke or consume alcohol. They trained four to six days per week and for one to two hours daily. These results are similar to those found in Brazilian athletes (Rejaili et al., 2021). We found that the majority of respondents preferred drinking water, consistent with the findings of Rejaili et al. (2021), who reported that 85.63% of respondents preferred water. Slightly more than half of the respondents in this study consumed isotonic and/or energy drinks while performing physical activities, in contrast to the findings of Burns et al. (2022), who reported that only 20.0% of respondents consumed sports drinks during physical activities. Knowledge of daily water intake recommendations among respondents in this study was below average, aligning with Armstrong and Johnson (2018), who reported that only 45% of respondents knew the recommended daily water intake.

The dietary diversity score in this study was moderate, consistent with the findings of Tanui and Imungi (2017), who reported a mean dietary diversity score of 4.34 ± 0.45 among Kenyan athletes, based on a similar type of diet. Similar patterns of low intake of nutrient-dense foods including eggs and dark leafy vegetables have been reported in another Nigerian population, reinforcing that nutrition knowledge alone may not overcome access and affordability barriers (Ogunniyi & Okoye, 2025). This observed pattern can be attributed to athletes' lifestyles and the easy accessibility and affordability of these commonly consumed foods. The dominance of starchy staples and low consumption of micronutrient-rich foods such as vegetables and organ meats suggest a risk of nutrient imbalance. Meal skipping, particularly breakfast, remains prevalent and may compromise energy availability and athletic performance. Most athletes demonstrated good hydration habits, indicating awareness of fluid requirements during training. However, gaps in knowledge regarding recommended daily water intake and a heavy reliance on purchased meals highlight the need for targeted nutrition education. The observed normal mean BMI aligns with healthy athletic standards, yet significant associations between age and dietary diversity patterns indicate that BMI increases with age. Overall, while physical activity and hydration practices appear adequate, nutrition awareness and dietary quality among the athletes we interviewed require improvement.

Limitations and Potential Confounding

The observed associations may be influenced by confounding factors such as age, sex, socioeconomic status/income, nutrition knowledge, and training characteristics (e.g., sport type and training intensity), which can affect both lifestyle practices and dietary diversity. Because we used chi-square analyses, associations for ordinal variables simply indicate differences in cell counts, not any trend. Because analyses were primarily bivariate, residual confounding may remain. Furthermore, this study is cross-sectional, with exposure variables and outcomes measured at a single time point; therefore, temporal sequence cannot be established, and

causal inference is not possible. Future studies using longitudinal designs and multivariable modelling may better clarify directionality and reduce confounding.

Conclusions

This study assessed dietary diversity, lifestyle practices, hydration habits, and nutritional status among athletes in Lagos State, Nigeria. Meals were commonly obtained from cafeterias or food vendors, with frequent consumption of pastries and sugar-sweetened beverages, while fruit intake was relatively low. Lifestyle patterns included frequent meal skipping, particularly breakfast, as well as regular snacking between meals, and reported sleep duration of about eight hours. Hydration practices were largely favourable, with many athletes carrying water bottles and drinking during training, but awareness of the recommended daily water intake was limited, and alternative beverages were sometimes preferred. More than half reported consuming isotonic/energy drinks during physical activity. Most athletes had a normal BMI; waist circumference suggested low abdominal obesity risk among males, but only about half of females were in the low-risk category. Given the cross-sectional design, findings should be interpreted as associative rather than causal.

Author Contributions

FRS, EPJ, and AEO conceptualised the study. FRS and AEO drafted, edited the manuscript and designed the study tables and figures. FRS, EPJ, AEO, HMO, and OET reviewed and edited the manuscript. FRS facilitated access to the study population. All authors have read and approved the final version of the paper and its submission and have given consent for publication.

Declaration of Generative AI and AI-Assisted Technologies in Scientific Writing

Nothing to disclose.

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Data Availability Statement

All relevant data are available within the manuscript

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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