ASSESSMENT OF KNOWLEDGE, ATTITUDES, AND FRUIT AND VEGETABLE INTAKE AMONG ADULTS IN SURULERE, LAGOS STATE

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ABSTRACT: *Background: Adequate consumption of fruits and vegetables is essential for the prevention of non-communicable diseases (NCDs); however, intake remains suboptimal in many urban settings in Nigeria. Understanding knowledge, attitudes, and consumption practices is critical for designing effective nutrition interventions. Methods: A community-based cross-sectional study was conducted among adults aged 18 years and above in Surulere, Lagos State, using a pre-tested interviewer-administered questionnaire to assess socio-demographics, knowledge, attitudes, and fruit and vegetable intake. Knowledge and attitudes were scored, and data were analyzed with EPI INFO version 7 using chi-square tests at p < 0.05. Results: A total of 284 respondents participated, with a mean age of 34.79 ± 12.71 years. Most respondents demonstrated good knowledge of the health benefits of fruits and vegetables (81%) and had positive attitudes towards their consumption (96.5%). Awareness of specific benefits, such as prevention of cardiovascular diseases, diabetes, and cancers, was high. However, only 7.5% correctly identified the World Health Organization recommendation of consuming at least five servings daily, indicating a significant knowledge–practice gap. Knowledge was significantly associated with ethnicity, religion, and educational level, with higher knowledge observed among respondents with a tertiary education. Conclusion: Although knowledge and attitudes toward fruit and vegetable consumption among adults in Surulere are generally high, actual understanding of recommended intake levels and consumption practices remains inadequate. Targeted nutrition education and policy interventions addressing practical barriers to intake are needed to bridge the gap between awareness and practice and to support NCD prevention in urban Nigerian communities.*

INTRODUCTION

Fruits and vegetables are essential components of a healthy diet, providing a rich source of vitamins, minerals, dietary fiber, and bioactive phytochemicals necessary for the normal functioning of the human body (WHO, 2023). These micronutrients possess antioxidant and anti-inflammatory properties that play a significant role in the prevention of non-communicable diseases (NCDs), including cardiovascular diseases and cancers. Globally, inadequate consumption of fruits and vegetables is identified as one of the leading behavioral risk factors for morbidity and mortality. Low fruit intake alone contributes to over 2 million deaths and approximately 65 million disability-adjusted life years (DALYs) annually, while insufficient vegetable consumption accounts for about 1.5 million deaths and 34 million DALYs worldwide (Afshin et al., 2019). These adverse outcomes are disproportionately higher in low- and middle-income countries. In recognition of their public health importance, the World Health Organization recommends a minimum daily intake of 400 g of fruits and vegetables, equivalent to about five servings per day, to promote optimal health and reduce the risk of NCDs (WHO, 2023).

In Africa, the burden of NCDs has increased substantially over the past two decades. NCD-related deaths rose from 24% of all deaths in 2000 to 37% in 2019, representing a major public health challenge across the continent (WHO, 2022). Hypertension affects an estimated 25–48% of adults in many African populations, while nearly 10% are living with diabetes (Oladimeji et al., 2014). In Nigeria specifically, NCDs accounted for approximately 27% of total mortality in 2019 (WHO, 2023a). This epidemiological transition reflects changes in lifestyle and dietary patterns driven by rapid urbanization, economic development, and globalization.

Despite the wide availability of fruits and vegetables in many developing countries, including Nigeria, micronutrient deficiencies remain highly prevalent due to persistently low intake of these foods (Hart et al., 2005). Shifts toward westernized diets characterized by high consumption of refined carbohydrates, fats, and processed foods—associated with urbanization, industrialization, technological advancement, and globalization—have contributed to unhealthy dietary behaviors (Maiyaki & Garbati, 2014). In Nigeria's urban centers, these changes coexist with a rising burden of NCDs, underscoring the urgent need for effective dietary interventions.

Understanding the knowledge, attitudes, and consumption practices related to fruit and vegetable intake within specific communities is crucial for designing targeted and culturally appropriate nutrition interventions. By examining gaps between knowledge, attitude, and practice, this study aims to generate evidence that can inform nutrition education strategies and policy actions to promote adequate fruit and vegetable consumption as a cost-effective approach to NCD prevention among adults in an urban Nigerian setting. Fruits and vegetables are vital components of a healthy diet, providing a rich source of vitamins, minerals, dietary fibers, minerals, and phytochemicals (1). These micronutrients are needed for the normal functioning of the human body, and their antioxidant effect plays a role in preventing non-communicable diseases (NCD), including cardiovascular disease and cancer. Low consumption of fruits and vegetables ranks among the top five global health risks, contributing to more than 2 million deaths and 65 million Disability-Adjusted Life Years (DALYs) annually from insufficient fruit intake, and around 1.5 million deaths and 34 million DALYs from inadequate vegetable intake (2). These impacts are most pronounced in

low- and middle-income countries. This underlines the critical role of these foods in NCD prevention. Accordingly, the WHO recommends a minimum daily intake of 400 grams of fruits and vegetables (approximately five servings) for adults to promote health and reduce NCD risk (1).

In Africa, deaths caused by non-communicable diseases (NCDs) have been steadily increasing, accounting for 37% of all deaths in 2019, up from 24% in 2000 (3). This growing burden poses a serious threat to the health and lives of millions across the region, with more than one-third of deaths now attributable to these conditions. Hypertension is said to affect 25 to 48% of the adult population, while nearly 10% are diabetic (4). And it accounts for 27% of mortality in 2019 (5).

The high predominance of micronutrient deficiencies in the developing countries has been attributed to low levels of intake despite the availability of fruits and vegetables throughout the country (6). These low dietary intakes have been linked to advancing technology, economic development, urbanization, industrialization, and market globalization, which has led to rapid changes in diet and lifestyle (7). Given the high burden of NCDs and the low intake of fruits and vegetables in Nigeria's urban centers, it is important to understand the knowledge levels, attitudes, and consumption behaviors in specific communities. Such understanding can inform targeted interventions to improve diet quality. By identifying gaps between knowledge, attitude, and practice, the study aims to highlight areas for nutrition education and policy action to promote fruit and vegetable intake as a strategy for NCD prevention in this urban Nigerian context.

Study Design and Setting

This research was a community-based cross-sectional descriptive study conducted in Surulere Local Government Area (LGA) of Lagos State, Nigeria. Lagos State is located in southwestern Nigeria and is highly urbanized, with Lagos metropolis being one of the fastest-growing cities in Africa (African Cities Research Consortium [ACRC], 2021). Surulere LGA is an urban district on the Lagos mainland with a mix of residential, commercial, and institutional areas. According to the World Population Review, the population of Lagos State was estimated at over 17.4 million, and Surulere itself is densely populated (World Population Review, 2025).

Inclusion Criteria

Eligible participants were adults aged 18 years and above who had lived in Surulere Local Government Area for at least six months and provided informed consent to participate in the study. Individuals who were younger than 18 years, were not permanent residents, had lived in the community for less than six months, or had dietary restrictions that could influence their dietary practices were excluded from the study.

Sample Size Determination

The sample size was calculated using Daniel's formula for estimating proportions in cross-sectional studies (Daniel, 1999):

$$n = (Z^2 \times p \times (1 - p)) / d^2$$

where n is the required sample size, Z is the Z-score corresponding to the desired confidence level (1.96 for a 95% confidence interval), and p represents the expected prevalence, set at

15.9% based on the estimated prevalence of knowledge of fruits and vegetables from a previous study (Olatona et al., 2023). The calculated minimum sample size was 206, but it was increased by 10% to obtain 229 to make allowance for non-response.

Data Collection and Techniques

Data were collected using a pre-tested, interviewer-administered questionnaire adapted from a previous study (Olatona et al., 2018). The questionnaire consisted of four sections: Section A covered socio-demographic characteristics; Section B assessed respondents' knowledge of fruit and vegetable intake; Section C evaluated attitudes towards fruit and vegetable consumption; and Section D assessed the pattern of fruit and vegetable intake. The questionnaire was pre-tested among thirty residents of Yaba Local Government Area to identify and correct ambiguous items. Participants were informed about the purpose of the study, their right to withdraw, and the confidentiality of their responses. Questionnaires were administered by the principal researcher and four research assistants at the respondents' homes at a convenient time. Completed questionnaires were coded to ensure proper tracking and management.

Data Analysis and Scoring

Data were checked, coded, and analyzed using EPI INFO Version 7 (CDC, Atlanta, Georgia). Descriptive statistics were presented as frequency tables, and associations between variables were tested using Chi-square. Statistical significance was set at $p < 0.05$.

Knowledge of fruit and vegetable intake for the prevention of non-communicable diseases was assessed using ten questions, with correct answers scored as one point and incorrect or "not sure" responses scored zero. Total scores were classified as poor knowledge (0–5) or good knowledge (6–10). Attitude was assessed using ten questions, scored on a five-point scale ranging from 1 (extremely wrong attitude) to 5 (highly positive attitude), with higher scores indicating more favorable attitudes toward fruit and vegetable consumption.

Ethical Considerations

Ethical approval for the study was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital (LUTH), and a letter of introduction from the Head of Department was presented to the Local Government Area for access to the study population. Permission was also sought from the Medical Officer of Health. Verbal informed consent was obtained from all participants, who were informed of their right to withdraw at any time without coercion or incentives. Confidentiality was ensured by excluding names from the questionnaires and maintaining strict data privacy, in accordance with the Declaration of Helsinki.

Socio-demographic Characteristics of Respondents

A total of 284 respondents participated in the study, with a mean age of 34.79 ± 12.71 years. The largest proportion of respondents were aged 18–28 years (39.4%), followed by 29–39 years (30.5%), 40–50 years (19.0%), 51–61 years (6.8%), and 62–72 years (4.3%). Most respondents were males (62.3%) and the remainder females (37.7%). In terms of religion, the majority were Christians (58.7%), followed by Muslims (35.3%), practitioners of Traditional religion (5.0%), and others (1.1%).

The ethnic distribution showed that Yoruba constituted the largest group (54.2%), followed by Hausa (21.8%), Igbo (16.6%), and others (7.4%). Regarding marital status, 46.8% had never married, 46.1% were currently married, while 3.5% were divorced or separated and another 3.5% were widowed. Educationally, 47.9% had tertiary education, 35.7% had secondary education, 13.2% had primary education, and 3.2% had no formal education.

Monthly income distribution indicated that 30.6% earned less than ₦18,000, another 30.6% earned between ₦18,001–₦50,000, 24.7% earned ₦50,001–₦100,000, and 14.1% earned more than ₦150,000.

Knowledge of Fruits and Vegetables Intake for the Prevention of Non-Communicable Diseases

The knowledge of respondents regarding fruit and vegetable intake for the prevention of non-communicable diseases is summarized in **Table 2**. The majority of the respondents, 230 (81%), demonstrated good knowledge, while 54 (19%) had poor knowledge. Most respondents (96.8%) knew that fruits and vegetables are sources of nutrients, and 95.4% acknowledged that their consumption improves health. A small proportion (3.9%) believed that consumption worsens health, while 22.4% thought it has no effect on health.

Regarding specific health benefits, 77.4% reported that fruit and vegetable intake is associated with optimal gastrointestinal function, 70.8% linked it to the prevention of cancers, 79.0% to the prevention of heart diseases and stroke, and 69.6% to the prevention of diabetes. About 47.7% believed that cooking reduces the health effects of vegetables.

When asked about the number of portions required to stay healthy, only 7.5% correctly indicated five or more portions per day, 33.1% reported two portions, 30.6% reported one portion, 24.9% reported three portions, 3.6% reported four portions, and 0.4% indicated none.

Attitude of Respondents Towards Fruits and Vegetables Intake

The attitude of respondents towards the consumption of fruits and vegetables for the prevention of non-communicable diseases was generally good. Almost all respondents, 274 (96.5%), demonstrated a positive attitude, while only 10 (3.5%) had a poor attitude. The detailed responses to individual statements are summarized in **Table 3**.

Association Between Socio-demographics and Knowledge of Fruits and Vegetables Intake

The association between respondents' socio-demographic characteristics and their knowledge of fruit and vegetable intake for the prevention of non-communicable diseases is shown in **Table 4**. Knowledge was significantly associated with ethnicity, religion, and educational level. Yoruba respondents had the highest proportion of good knowledge (85.7%) compared to Hausa respondents (66.1%) (χ^2 = 16.642, df = 3, p = 0.0008). Similarly, Christians demonstrated the highest proportion of good knowledge (84.9%) relative to other religious groups (χ^2 = 8.615, df = 3, p = 0.0349). Educational level was also a significant determinant, with respondents having tertiary education showing the highest proportion of good knowledge (88.1%), while those with no formal education had the lowest (33.3%) (χ^2 = 20.520, df = 3, p = 0.0001).

DISCUSSION

This study assessed the knowledge, attitudes, and intake of fruits and vegetables among adults in Surulere, Lagos State, and explored the socio-demographic factors associated with these variables. The findings reveal a generally high level of knowledge and positive attitudes towards fruit and vegetable consumption, yet actual intake remains suboptimal, echoing trends observed in similar urban populations in Nigeria and other low- and middle-income countries (Olatona et al., 2018; Hart et al., 2005).

The majority of the respondents (81%) demonstrated good knowledge regarding the health benefits of fruits and vegetables, particularly in the prevention of non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, and certain cancers. This aligns with a study in an urban Nigerian setting, which reported high awareness levels but persistent gaps in translating knowledge into practice (Olatona et al., 2018; Banwat et al., 2015). The high awareness may be attributed to increased public health campaigns and the urban setting, where access to information is greater (WHO, 2023; Glasson et al., 2013).

Despite this, only a small proportion (7.5%) of the respondents correctly identified the WHO-recommended daily intake of at least five portions of fruits and vegetables (WHO, 2023). This knowledge-practice gap is consistent with global and regional literature, which highlights that awareness does not always result in adequate consumption (Afshin et al., 2019; Oyebode et al., 2014). Factors such as cost, availability, taste preferences, and cultural dietary patterns may contribute to this discrepancy (Hart et al., 2005; Odukoya et al.,2022).

Attitudes towards fruit and vegetable intake were overwhelmingly positive, with 96.5% of respondents expressing favorable views. Positive attitudes are crucial for behavior change, but as seen in this and other studies, they do not always translate into increased consumption (Olatona et al., 2018; Ifebajo et al., 2025; Oyebode et al., 2014). This suggests that interventions should not only focus on knowledge and attitude but also address practical barriers to consumption.

Socio-demographic factors such as ethnicity, religion, and educational level were significantly associated with knowledge of fruit and vegetable intake. Adults with tertiary education were more likely to demonstrate good knowledge compared with those with lower educational attainment. In a Lagos-based study, respondents with post-secondary education were over twice as likely to have adequate knowledge of recommended fruit and vegetable intake, while Yoruba respondents showed higher awareness than other ethnic groups (Olatona et al., 2018). These findings are consistent with earlier Nigerian adult population studies indicating that higher educational attainment and socio-cultural background are associated with better nutrition knowledge and healthier dietary practices, including higher fruit and vegetable consumption (Banwat et al., 2015).

The study's findings have important public health implications. While knowledge and attitudes are relatively high, targeted interventions are needed to bridge the gap between awareness and actual intake. Strategies could include nutrition education tailored to less-educated and minority groups, improving the affordability and accessibility of fruits and

vegetables, and culturally appropriate campaigns that address local dietary preferences (WHO, 2023; Afshin et al., 2019).

LIMITATIONS

The cross-sectional design of this study precludes causal inferences, and self-reported data may be subject to recall and social desirability biases. Additionally, the study was conducted in a single urban LGA, which may limit the generalizability of the findings to other settings.

CONCLUSION

This study demonstrates that adults in Surulere, Lagos State, generally possess good knowledge and positive attitudes toward fruit and vegetable consumption and its role in preventing non-communicable diseases. However, actual understanding of recommended intake levels and corresponding consumption practices remain inadequate, revealing a clear gap between knowledge and practice. Socio-demographic factors, particularly education, ethnicity, and religion, significantly influenced knowledge levels. These findings highlight the need for targeted, context-specific nutrition education and public health interventions that address practical barriers such as affordability, accessibility, and dietary habits to promote adequate fruit and vegetable intake and reduce the burden of NCDs in urban Nigerian communities.

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APPENDIX

Table 1. Socio-demographic characteristics of respondents (n = 284)

Variable	Category	Frequency (%)
	18–28	110 (39.4)
	29–39	85 (30.5)
	40–50	53 (19.0)
	51–61	19 (6.8)
	62–72	12 (4.3)
Age	Mean ± SD	34.79 ± 12.71
	Male	177 (62.3)
Sex	Female	107 (37.7)
	Christianity	166 (58.7)
	Islam	100 (35.3)
	Traditional	14 (5.0)
Religion	Others	3 (1.1)
	Igbo	47 (16.6)
	Hausa	62 (21.8)
	Yoruba	154 (54.2)
Ethnicity	Others	21 (7.4)
	Never married	133 (46.8)
	Currently married	131 (46.1)
	Divorced/Separated	10 (3.5)
Marital Status	Widowed	10 (3.5)
	Primary	37 (13.2)
	Secondary	100 (35.7)
	Tertiary	134 (47.9)
Educational status	No formal education	9 (3.2)
Monthly Income	<₦18,000	87 (30.6)

	₦18,001–₦50,000	87 (30.6)
	₦50,001–₦100,000	70 (24.7)
	>₦150,000	40 (14.1)

Table 2. Respondents' knowledge on fruit and vegetable intake for the prevention of non-communicable diseases (N = 284)

Variable	Frequency (%)
Fruits and vegetables are sources of nutrients	
Yes	275 (96.8)
No	2 (0.7)
Not sure	7 (2.5)
Consumption of fruits and vegetables improves health	
Yes	271 (95.4)
No	10 (3.5)
Not sure	3 (1.1)
Consumption of fruits and vegetables worsens health	
Yes	11 (3.9)
No	251 (88.7)
Not sure	21 (7.4)
Consumption of fruits and vegetables does not affect health	
Yes	63 (22.4)
No	200 (71.2)
Not sure	18 (6.4)
Consumption is associated with optimal gastrointestinal function	
Yes	216 (77.4)
No	7 (2.5)

Not sure	56 (20.1)
Consumption is associated with the prevention of cancers	
Yes	199 (70.8)
No	30 (10.7)
Not sure	52 (18.5)
Consumption is associated with the prevention of heart diseases and stroke	
Yes	222 (79.0)
No	22 (7.8)
Not sure	37 (13.2)
Consumption is associated with the prevention of diabetes	
Yes	195 (69.6)
No	29 (10.4)
Not sure	56 (20.0)
Cooking reduces the health effects of vegetables	
Yes	134 (47.7)
No	79 (28.1)
Not sure	68 (24.2)
The number of required portions of fruits and vegetables to stay healthy	
None	1 (0.4)
One	86 (30.6)
Two	93 (33.1)
Three	70 (24.9)
Four	10 (3.6)
Five or more	21 (7.5)

Table 3. Respondents' attitude towards fruit and vegetable intake (N = 284)

Variables	SD (%)	D (%)	N (%)	A (%)	SA (%)
I don't like eating fruits and vegetables	150 (53.4)	97 (34.5)	18 (6.4)	10 (3.6)	6 (2.1)
I prefer to eat carbohydrates like "swallow" or rice rather than fruits/vegetables.	48 (17.1)	76 (27.1)	47 (16.7)	86 (30.6)	24 (8.5)
Fruits/vegetables maintain healthy weight	17 (6.1)	21 (7.5)	14 (5.0)	119 (42.4)	110 (39.2)
Fruits/vegetables are too expensive	49 (17.6)	95 (34.0)	46 (16.5)	65 (23.3)	24 (8.6)
Fruits/vegetables can cure diseases	10 (3.6)	23 (8.2)	25 (9.0)	115 (41.2)	106 (38.0)
Fruits/vegetables cause disease	154 (55.2)	81 (29.0)	20 (7.2)	15 (5.4)	9 (3.2)
Fruits/vegetables can prevent diseases	7 (2.6)	11 (4.0)	26 (9.5)	107 (39.2)	122 (44.7)
Difficult to consume fruits/vegetables	91 (32.4)	141 (50.2)	21 (7.5)	21 (7.5)	7 (2.5)
Preparing vegetables is time-consuming	55 (19.7)	130 (46.6)	35 (12.5)	41 (14.7)	18 (6.5)
Difficult to get fruits/vegetables	80 (28.5)	151 (53.7)	26 (9.3)	13 (4.6)	11 (3.9)

Abbreviations: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), and Strongly Agree (SA).

Table 12. Association between socio-demographics and knowledge of fruits and vegetable intake

Variable	Good Knowledge, n (%)	Poor Knowledge, n (%)	Total, n (%)	χ²	df	p-value
Age (years)				*1.0631*	*4*	*0.9001*
18–28	*89 (80.9)*	*21 (19.1)*	*110 (100)*			
29–39	*68 (80.0)*	*17 (20.0)*	*85 (100)*			
40–50	*42 (79.3)*	*11 (20.8)*	*53 (100)*			
51–61	*15 (79.0)*	*4 (21.1)*	*19 (100)*			
62–72	*11 (91.7)*	*1 (8.3)*	*12 (100)*			

Sex				*0.788*	*1*	*0.3746*
Male	*140 (79.1)*	*37 (20.9)*	*177 (100)*			
Female	*90 (84.1)*	*17 (15.9)*	*107 (100)*			
Ethnicity				*16.642*	*3*	*0.0008*
Igbo	*36 (76.6)*	*11 (23.4)*	*47 (100)*			
Hausa	*41 (66.1)*	*21 (33.9)*	*62 (100)*			
Yoruba	*132 (85.7)*	*22 (14.3)*	*154 (100)*			
Others	*21 (100.0)*	*0 (0.0)*	*21 (100)*			
Religion				*8.615*	*3*	*0.0349*
Christianity	*141 (84.9)*	*25 (15.1)*	*166 (100)*			
Islam	*75 (75.0)*	*25 (25.0)*	*100 (100)*			
Traditional	*12 (85.7)*	*2 (14.3)*	*14 (100)*			
Others	*1 (33.3)*	*2 (66.7)*	*3 (100)*			
Marital Status				*0.835*	*3*	*0.8411*
Never married	*108 (81.2)*	*25 (18.8)*	*133 (100)*			
Currently married	*107 (81.7)*	*24 (18.3)*	*131 (100)*			
Divorced/Separated	*8 (80.0)*	*2 (20.0)*	*10 (100)*			
Widowed	*7 (70.0)*	*3 (30.0)*	*10 (100)*			
Educational Level				*20.52*	*3*	*0.0001*
Primary	*32 (86.5)*	*5 (13.5)*	*37 (100)*			
Secondary	*76 (76.0)*	*24 (24.0)*	*100 (100)*			
Tertiary	*118 (88.1)*	*16 (11.9)*	*134 (100)*			
No formal education	*3 (33.3)*	*6 (66.7)*	*9 (100)*			