

Nutrition knowledge and practice of dietary diversity among people living with HIV in a resource-limited setting: a multi-center study

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Abstract

Introduction: Adequate nutrition plays a major role in delaying disease progression and improving quality of life of people living with human immunodeficiency virus (PLHIV). Therefore, it is important to assess their nutrition knowledge and practice of dietary diversity, especially in resource-limited settings, where most HIV infections occur. Aim of the study was to assess the nutrition knowledge and dietary diversity practice of PLHIV in a resource-limited setting.

Material and methods: This was a health facility-based cross-sectional analytical study conducted at two tertiary HIV clinics in Enugu, Nigeria. Using a systematic random sampling technique, 370 adult HIV patients were recruited. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with good nutrition knowledge and high dietary diversity among respondents. *P*-value < 0.05 was considered statistically significant.

Results: Good nutrition knowledge was observed in 69.7% of the respondents, while 60.0% had high dietary diversity. In multivariate analysis, secondary educational level (AOR: 0.54; 95% CI: 0.29-0.97; *p* = 0.040) and earning a family monthly income of 31,000-60,000 (AOR: 2.12; 95% CI: 1.11-4.06; *p* = 0.024) were predictors of good nutrition knowledge. Number of children in a household (AOR: 2.09; 95% CI: 1.19-3.67) was predictive of high dietary diversity.

Conclusions: Educational level and family monthly income are predictors of nutrition knowledge, while number of children in a household is a predictor of dietary diversity. Nutrition education should be incorporated into HIV care program targeting those with low educational levels and low family monthly incomes for improvement of their nutrition knowledge.

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Key words: dietary diversity, nutrition, HIV, knowledge, practice.

Introduction

Human immunodeficiency virus (HIV) is a viral disease caused by a virus, which attacks cells that help the body fight infection, making a person more vulnerable to other infec-

tions and diseases [1]. It is a single-stranded RNA retrovirus of the lentivirus family, present in the blood and body fluids of infected individuals, which could be transmitted through sexual, parenteral, or vertical routes [1, 2]. In people living

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with HIV (PLHIV), the virus attacks the body's immune system, specifically CD4+ cells (often called 'T cells'), leaving the body susceptible to infections and other diseases [3]. It also affects nutritional status of those individuals, which could lead to poor immune function of the body [4].

Dietary diversity is referred to as the number of different food groups consumed over a reference period (usually 24 hours) [5]. It is widely recognized as a key dimension of diet quality, as consumption of food from a variety of groups has the potential of providing the daily nutrient requirement, especially among PLHIV [6]. Although consumption of a diversified diet cannot cure AIDS or prevent HIV infection, it can help to maintain and improve nutritional status of a HIV-positive person and delay the progression from HIV to AIDS-related diseases as well as sustain healthy levels of physical activity, support optimal quality of life, and optimize benefits of antiretroviral drugs [7-9].

Despite the benefits, diversification of diet is rarely practiced in poor-, low-, and middle-income countries across the globe [10]. Nutritional problems are common in those settings because low-quality monotonous diets are the norm that is predominantly based on grain or tuber-based (starchy) staples, and diets that lack vegetables, fruits, and animal sources [11, 12]. As most HIV infections occur in such settings, individuals have limited dietary quality and quantity, leading to inadequate intake of essential nutrients and energy required for a strong immune system [13]. These may predispose them to various opportunistic infections and further reduce the immune system in a vicious manner. To practice diversification of diet, PLHIV needs to have a good knowledge of nutrition. This was collaborated by Sapp [14], who noted that for individuals to adopt a rational approach towards a diversified diet, they need to have a high level of nutrition knowledge [14]. Having the right knowledge about nutrition will help PLHIV in selecting and consuming healthy foods geared towards improving their health, especially their immunity and preventing opportunistic diseases [15].

In resource-limited settings with the highest burden of HIV, if good nutrition knowledge and practice of dietary diversification do not exist among PLHIV, interventions may be needed to correct them. In order to determine the need for such an intervention, it is important to assess the basic nutritional knowledge and practice of dietary diversity among PLHIV. In Southeast of Nigeria, there are limited studies regarding nutrition knowledge and dietary diversity practice among people living with HIV. Therefore, the aim of this study was to assess the nutrition knowledge and dietary diversity practice among PLHIV in Enugu, Southeast Nigeria.

Material and methods

Study area

The study was conducted in HIV centers of the University of Nigeria Teaching Hospital (UNTH) and Enugu State University Teaching Hospital (ESUTH) in Enugu State, Nigeria. They serve as referral centers for people in Enugu

State and other states in Southeast Nigeria. Both tertiary hospitals are involved in the provision of HIV/AIDS prevention, treatment, and care services. Other services they render include prevention of mother-to-child transmission (PMTCT) of HIV, pediatric HIV care and treatment, tuberculosis/HIV care and treatment, laboratory infrastructure obtaining and supply, and human resource capacity building.

Study design

This was a cross-sectional, analytical study, which assessed the knowledge and practice of dietary diversity among people living with HIV in Southeast Nigeria.

Study population

The study population was adults accessing HIV care in the two tertiary hospitals in Enugu State viz 'HIV clinics' of UNTH and ESUTH.

Inclusion and exclusion criteria

HIV patients included in the study were those who provided informed consent, were above 18 years of age, and under antiretroviral therapy (ART) for at least 6 months prior to the study. Excluded from the study were pregnant or nursing mothers, patients with other chronic conditions, such as cancer, diabetes mellitus, thyroid disease, hypertension, and those who ate in a festive event a day before the questionnaire was administered. Consumption patterns can be atypical during festive periods, and would unlikely reflect a typical die [5].

Sample size determination

Minimum sample size was determined using a formula for calculating a single-population proportion [16]. Applying the formula, a total of 370 HIV patients were enrolled into the study.

Sampling technique

This entailed the use of simple random sampling by ballot to select the first person provided with questionnaire from the list of patients of the clinic attendance register on each clinic day. Then, systematic random sampling technique was used to select subsequent persons from the attendance register of ART clinic of both hospitals.

Study instruments and data collection

A pre-tested, semi-structured, interviewer-administered questionnaire developed by researchers was used for data collection. Section one assessed the socio-demographic characteristics of the respondents, while section two evaluated the practice of dietary diversity, which was adapted from the Food and Agriculture Organization (FAO) [8]. Nine food

groups consumed over 24 hours were used to determine individual dietary diversity score (IDDS), with score 1 meaning any of each food group was consumed, and score 0 meaning none of each food group was consumed over 24 hours. IDDS was assigned to each person based on the sum of 9 points (from 9 food groups), and then categorized into two groups. High dietary diversity was applied to any score ≥ 5 , whereas a score of < 5 was described as low dietary diversity.

Section three consisted of ten questions that were used to assess the nutrition knowledge of the respondents, and the tool was adapted from regional center for quality of healthcare (RCQHC) [6]. A score of 1 was awarded for a correct answer, while a wrong answer was scored 0. Nutrition knowledge was categorized as good knowledge for score > 6 and poor knowledge for any score ≤ 6 .

Data analysis

Data were analyzed using international business machine-statistical package social sciences (IBM-SPSS) version 25. Means and standard deviations of numeric variables were calculated, while frequencies and proportions were generated for categorical variables. Chi-square test was used to measure associations between categorical variables and nutrition knowledge. Logistic regression analysis was performed to determine predictors of good nutrition knowledge and dietary diversity for socio-demographic variables with a p -value < 0.2 in χ^2 analysis. Level of statistical significance was set at p -value < 0.05 for all cross-tabulations and inferential analysis; a 95% confidence interval was used in data presentation for regression model.

Ethical consideration

The study was conducted in compliance with ethical guidelines of health research ethics committee of the University of Nigeria Teaching Hospital, Enugu after obtaining ethical clearance (ethical clearance number: UNTH/CSA/329/VOL. 5). Permission to conduct the study was obtained from the management of UNTH and ESUTH HIV treatment centers. All respondents provided written informed consents after they had been properly informed about purpose of the study and assured of confidentiality of volunteered information.

Results

Socio-demographic characteristics

The socio-demographic characteristics of the respondents (Table 1) show that majority (73.8%) of the HIV patients were females. The age range of the respondents was between 20-70 years, with a mean age of 41.1 ± 10.5 years. Also, 49.7% of the respondents were married and 44.6% had secondary education, while 2.4% did not obtain any formal education. Majority of the participants were traders, earned family monthly income of $\leq 30,000$ naira, and

Table 1. Socio-demographic characteristics of the respondents ($N = 370$)

Variable	n (%)
Sex	
Female	273 (73.8)
Male	97 (26.2)
Age (years)	
20-29	53 (14.3)
30-39	120 (32.4)
40-49	120 (32.4)
≥ 50	77 (20.8)
Marital status	
Single	89 (24.1)
Married	184 (49.7)
Widowed	97 (26.2)
Highest level of education	
No formal education	9 (2.4)
Primary	89 (24.1)
Secondary	165 (44.6)
Tertiary	107 (28.9)
Occupation	
Civil servant	95 (25.7)
Trader	176 (47.6)
Artist	30 (8.1)
Farmer	27 (7.3)
Unemployed	42 (11.4)
Family monthly income (naira)	
$\leq 30,000$	171 (46.2)
31,000-60,000	110 (29.7)
$> 60,000$	89 (24.1)
Household size	
1-3	124 (33.5)
4-6	177 (47.8)
> 6	69 (18.6)
Number of living children	
0	108 (29.2)
1-2	92 (24.9)
> 2	170 (45.9)

had a household size of 4-6 with a number of living children above two.

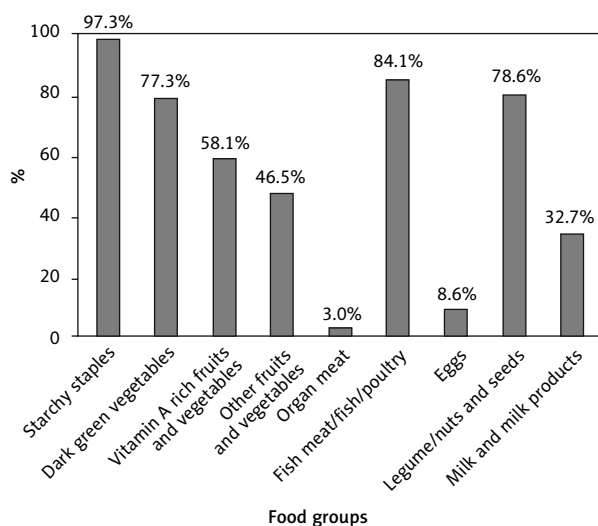
Nutrition knowledge of the respondents

Table 2 shows the nutrition knowledge of the respondents and their correct responses. Majority of the respon-

Table 2. Study participants' responses to nutrition knowledge-related questions

Variables	Correct responses (%)
A balanced diet covers all nutrient requirement	347 (93.8)
HIV/AIDS increases the nutrient requirement	235 (63.5)
PLWHA can easily get infected with other infections	277 (74.9)
Poor nutrition leads to poor ability to fight infection	343 (92.7)
PLWHA need to consume a variety of foods	328 (88.6)
PLWHA need to consume more energy-giving foods than uninfected	241 (65.1)
Every time I visit the clinic, my weight should be measured	353 (95.4)
PLWHA can build muscles	210 (56.8)
HIV symptoms cannot be managed only by a medicine	199 (53.8)
I should drink at least 8 glasses of water daily	168 (45.4)
Overall knowledge	
Good	258 (69.7)
Poor	112 (30.3)

PLWHA – people living with HIV/AIDS

**Figure 1.** Different food groups consumed by HIV clients during a 24 hours recall

dents knew that a balanced diet covers all nutrient requirements, poor nutrition leads to poor ability to fight infection, and every time they visit the clinic, their weight should be measured. However, only 45.4% of the patients knew they

should drink at least 8 glasses of water daily. The mean overall knowledge score of the respondents was 7.8 ± 1.5 . A greater proportion of the respondents (69.7%) had good knowledge, while 30.3% had poor knowledge.

Dietary diversity of HIV patients

Respondents, who consumed different food groups during a 24-hour recall are presented in Figure 1. The most consumed food group was starchy staples (97.3%), while the least consumed food groups were organ meat (3.0%) and eggs (8.6%). In the overall practice of dietary diversity, 60% of the respondents had high dietary diversity, with a mean dietary diversity score of 4.86 ± 1.30 .

Factors associated with nutrition knowledge and dietary diversity

Socio-demographic characteristics associated with nutrition knowledge are shown in Table 3. None of the variables showed significant association with nutrition knowledge at bivariate analysis. Table 4 showed that marital status ($\chi^2 = 12.596$; $p = 0.002$), family monthly income ($\chi^2 = 8.52$; $p = 0.014$), and number of children in a household ($\chi^2 = 11.346$; $p = 0.003$) were significantly associated with dietary diversity.

Predictors of nutrition knowledge and dietary diversity

Three socio-demographic variables associated with nutrition knowledge with $p < 0.2$ were further subjected to multivariate analysis (Table 5). Accomplishing at least a secondary school level (AOR: 0.536; 95% CI: 0.29-0.97) and earning a family income of 31,000-60,000 naira (AOR: 2.118; 95% CI: 1.11-4.06) were found as predictors of good nutrition knowledge. Also, three variables (marital status, family monthly income, and number of children) were found to be associated with dietary diversity, with a $p < 0.2$. Further analysis showed that having one to two children was the only predictor of high dietary diversity (AOR: 2.090; 95% CI: 1.19-3.67).

Discussion

Poor knowledge and practice of nutrition in the face of HIV infection can negatively affect treatment responses and outcomes, especially in resource-poor countries where people often consume a monotonous diet consisting mainly of starchy staples [17]. Nutritional assessment of people living with HIV can provide information on their adequacy of diet, their food habits, and dietary constraints. Furthermore, it can serve as a basis for evidence-based decision-making regarding the need for interventions, such as food support, nutrition education, and counselling [18].

Table 3. Socio-demographic factors associated with nutrition knowledge among HIV patients in Southeast Nigeria

Sociodemographic characteristics	Nutrition knowledge		Test statistics	
	Poor (%)	Good (%)	χ^2	p-value
Sex				
Female	78 (28.6)	195 (71.4)	1.424	0.233
Male	34 (35.1)	63 (64.9)		
Age				
20-29	16 (30.2)	37 (69.8)	0.976	0.807
30-39	33 (27.5)	87 (72.5)		
40-49	40 (33.3)	80 (66.7)		
≥ 50	23 (29.9)	54 (70.1)		
Marital status				
Single	27 (30.3)	62 (69.7)	0.527	0.768
Married	53 (28.8)	131 (71.2)		
Widowed	32 (33.0)	65 (67.0)		
Educational level				
Primary and below	32 (32.7)	66 (67.3)	3.415	0.181
Secondary	55 (33.3)	110 (66.7)		
Tertiary	25 (23.4)	82 (76.6)		
Occupation				
Employed	97 (29.6)	231 (70.4)	0.665	0.415
Unemployed	15 (35.7)	27 (64.3)		
Family monthly income (naira)				
≤ 30,000	54 (31.6)	117 (68.4)	3.795	0.150
31,000-60,000	26 (23.6)	84 (76.4)		
> 60,000	32 (36.0)	57 (64.0)		
Household size				
1-3	38 (30.6)	86 (69.4)	3.733	0.155
4-6	47 (26.6)	130 (73.4)		
> 6	27 (39.1)	42 (60.9)		
Number of living children				
0	34 (31.5)	74 (68.5)	1.018	0.601
1-2	24 (26.1)	68 (73.9)		
> 2	54 (31.8)	116 (68.2)		

This study showed that majority of the respondents were in the middle age group (range, 30-49 years), which corresponds to productive and economically active years. A greater proportion of them were females, married, and had secondary education as their highest level of education. Furthermore, majority of the patients earned a family monthly income of ≤ 30,000 naira, had a household size of 4-6, and had more than 2 children in a household.

Regarding overall nutrition knowledge, a good proportion of the respondents had a good nutrition knowledge and this compares favorably with some studies on nutritional knowledge of PLHIV [15, 19], but contrasts with others [20, 21]. Therefore, there appears to be an inconsistency in the find-

ings on nutritional knowledge of PLHIV. These differences may be related to the educational status of study population as good knowledge is expected from studies with higher proportions of participants having higher education. Notably, about three-quarter of our respondents had their highest level of education as secondary and above, indicating that they may have the capacity to acquire some knowledge on basic nutrition from other sources of information, such as newspapers, television, radio, magazines, etc. [22].

The study noted that a moderate proportion of the respondents had a good dietary diversity and this was in agreement with other researchers in Nigeria [22] and Kenya [23], but differed from studies done in Ethiopia [24, 25]. This dif-

Table 4. Socio-demographic factors associated with dietary diversity

Socio-demographic characteristics	Dietary diversity		Test statistics	
	Low (%)	High (%)	χ^2	<i>p</i> -value
Sex				
Female	113 (41.4)	160 (58.6)	0.841	0.359
Male	35 (36.1)	62 (63.9)		
Age				
20-29	25 (47.2)	28 (52.8)	2.177	0.537
30-39	43 (35.8)	77 (64.2)		
40-49	50 (41.7)	70 (58.3)		
≥ 50	30 (39.0)	47 (61.0)		
Marital status				
Single	49 (55.1)	40 (44.9)	12.596	0.002
Married	60 (32.6)	124 (67.4)		
Widowed	39 (40.2)	58 (59.8)		
Educational level				
Primary and below	40 (40.8)	58 (59.2)	0.054	0.973
Secondary	65 (39.4)	100 (60.6)		
Tertiary	43 (40.2)	64 (59.8)		
Occupation				
Employed	131 (39.9)	197 (60.1)	0.004	0.947
Unemployed	17 (40.5)	25 (59.5)		
Family monthly income (naira)				
≤ 30,000	81 (47.4)	90 (52.6)	8.524	0.014
31,000-60,000	41 (37.3)	69 (62.7)		
> 60,000	26 (29.2)	63 (70.8)		
Household size				
1-3	51 (41.1)	73 (58.9)	0.221	0.895
4-6	71 (40.1)	106 (59.9)		
> 6	26 (37.7)	43 (62.3)		
Number of living children				
0	53 (49.1)	55 (50.9)	11.346	0.003
1-2	24 (26.1)	68 (73.9)		
> 2	71 (41.8)	99 (58.2)		

ference in finding may be due to different study settings as the studies [24, 25] were conducted in primary health centers, while the present study was done in tertiary hospitals. In tertiary hospitals, when compared to primary health centers, there is a tendency for patients to have access to an informal form of nutrition education during counselling sessions by a higher cadre of healthcare workers, which may impact their nutrition knowledge and possibly result in good dietary practice [26]. In this study, the most consumed food group was starchy staples, which supports the long-held belief that most resource-poor, low-, and middle-income countries (LMIC) consume foods predominantly based on starchy staples [24-26], and underscores the need for nutritional re-

structuring away from starchy-based foods in these LMIC. It is worth to note that the findings of the present study and other research [17, 27] showed that the improvement in nutrition knowledge enhances the practice of high dietary diversity, which is associated with a high level of education. The least consumed food groups were organ meat and milk, which was similar to findings from other studies [24, 25]. This may be due to the cost of these food groups, as organ meats and milk are more expensive than starchy staples; hence, the consumption of them may vary depending on socioeconomic status of the respondents [28].

Interestingly, the level of education and family monthly income were the predictors of good nutrition knowledge

Table 5. Predictors of good nutritional knowledge and high dietary diversity among the respondents

Nutrition knowledge	AOR	Lower	Upper	p-value
Educational level				
Primary and below	0.551	0.280	1.083	0.084
Secondary	0.536	0.296	0.972	0.040
Tertiary	1.000	–	–	–
Family monthly income (naira)				
≤ 30,000	1.549	0.837	2.865	0.163
31,000-60,000	2.118	1.106	4.057	0.024
> 60,000	1.000	–	–	–
Household size				
1-3	1.250	0.645	2.422	0.509
4-6	1.601	0.879	2.915	0.124
> 6	1.000	–	–	–
Dietary diversity	AOR	Lower	Upper	p-value
Marital status				
Single	0.353	0.121	1.032	0.057
Married	1.180	0.660	2.109	0.577
Widowed	1.000	–	–	–
Family monthly income (naira)				
≤ 30,000	0.564	0.308	1.035	0.064
31,000-60,000	0.659	0.358	1.215	0.182
> 60,000	1.000	–	–	–
Number of living children				
0	2.045	0.763	5.484	0.155
1-2	2.090	1.191	3.668	0.010
> 2	1.000	–	–	–

among HIV patients. Those with a secondary level of education were 1.8 times less likely to have good nutrition knowledge compared to those with tertiary education. Also, those respondents, who earned a family monthly income of 31,000-60,000 naira were 2.1 times more likely to have good nutrition knowledge compared to their counterparts. This finding is in line with that of other researchers [20, 22]. This shows that as educational level and family monthly income increases, nutrition knowledge also improves. It also may imply that increasing educational attainment allows an individual to acquire more knowledge on basic nutrition from other sources of information [22]. Also, improvement in nutrition knowledge as family monthly income increases may be explained by the fact that low-income earners are faced with challenges of meeting up with family needs, and may not have the time and resources to acquire more nutrition knowledge, unlike those with increased family income who may be eager to improve their diet through the acquisition of more nutrition knowledge [27]. Furthermore, respondents who had one to two children in their households were 2 times more likely to have high dietary diversity com-

pared to those with more than two children. This may imply that a greater number of children in a household result in an increased demand for food, thus, leading to inadequate funds for diversification of diet [29].

Limitations of the study

One of the limitations of this study is recall bias because some of the patients may not fully recount the food groups consumed 24 hours earlier. Also, a 24-hour recall period did not indicate an individual's habitual diet. However, it provided an assessment of the diet at the population level, and can be used in target interventions and progress monitoring.

Conclusions

HIV individuals in Southeast Nigeria had a moderate level of good nutrition knowledge and practice of dietary diversity. Educational level and family monthly income were the predictors of nutrition knowledge, while the number of children in a household was the predictor of dietary diversity.

Therefore, nutrition education should be incorporated into HIV care program by healthcare providers, targeting those with low educational levels and low family monthly income to promote improvement in their nutrition knowledge. Moreover, food assistance program should be introduced and aimed at people living with HIV, who have many children to improve their diet quality.

We also recommend further studies on selective nutrition education among PLHIV with low educational and low income levels to assess their improvement on nutrition knowledge, health status, and quality of life.

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Conflict of interest

The authors declare no conflict of interest.

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