

## Nutrition Knowledge and Food Consumption in Households in the Uvira and Rizizi Health Zones, South Kivu, DR Congo

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### Abstract

The aim of this article was to describe the nutritional knowledge of women in charge of household food and household food consumption. A two-stage cross-sectional cluster sample of women (n=780) was carried out in the Uvira territory, examining knowledge of current dietary recommendations, nutrient sources, healthy food choices and diet diseases relationship. Weekly consumption frequency of seven food groups was assessed. The association between food consumption score and independent variables were tested with a 95% confidence interval. The overall nutrition knowledge score was low (45.1%); of its components, the least known was the use of food information to make dietary choices (49.1%); but women appeared to be familiar with current dietary recommendations (60.8%), the relationship between diet and disease (59.9%) and nutrient sources (56.3%). Significant differences were noticed between nutritional knowledge and socio-demographic characteristics such as city living (AOR = 2.42, 95% CI: 1.74-3.37) and female education (AOR = 1.62, 95% CI: 1.14-2.21). Fat and oil; roots and tubers and flesh-based foods were the most frequently consumed food groups. The food consumption score was, however, good, and was associated with nutrition knowledge (AOR = 2.1, 95% CI: 1.34-3.26); area of residence (AOR = 9.4, 95% CI: 5.80-15.30); knowledge of daily food choices (AOR = 1.7, 95 CI: 1. In this study, households had poor nutritional knowledge and adequate food consumption scores were associated with demographic variables. Nutritional education programs are required to raise awareness.

**Keywords:** Food consumption, Households, Nutritional knowledge, South Kivu, Uvira.

### Introduction

Malnutrition is characterized by deficiencies, excesses, or imbalances in the amount of energy and/or nutrients a person consumes [1]. Protein-energy malnutrition, or PEM, or a lack of certain micronutrients can both lead to malnutrition. In any event, it continues to be a significant burden in developing nations and is regarded as the most significant risk factor for disease and mortality, especially for the hundreds of millions of expectant mothers and young children who are affected [2]. Additionally, malnutrition or

overnutrition may develop when foods are not ingested in proportions that correspond to people's bodily demands [1].

Optimal cardiovascular function, muscle strength, pulmonary ventilation, infection prevention, wound healing, and psychological well-being are just a few of the benefits of proper diet [3].

By delivering the vitamins, minerals, and other micronutrients needed for optimum health, consuming a diversity of foods from across and within food categories is suggested to improve eating patterns [4]. The WHO states that among the factors that encourage people to

engage in unhealthy eating habits include a lack of basic understanding on nutrition and health, as well as the acquisition of false information [5]. Motivating people to adopt sustainable diets is the aim of nutritional counseling and education [6]. The major objective is to create a nutrition plan that would help one get the right nutrition they need to stay healthy, be physically fit, and live a healthy life [7].

Nutrition education is one of the measures specified in RD Congo so that people can be informed about nutrition, dietary choices, and eating patterns. Therefore, changes in eating habits are required to stop the rise in obesity and undernutrition. Giving people the tools they need to make wise decisions and take action is one of the suggested behavior change tactics [8]. Although evidence is mixed on the importance of nutrition education for altering dietary behavior, knowledge is acknowledged as one of the factors for changing eating behaviors [9, 10].

Nutritional education is a fundamental component of the minimal package of activities offered in mother and child health services during prenatal and pre-school counseling sessions under the primary health care policies in place across the nation. Mothers receive education on how to encourage healthy eating, dietary habits, and culinary skills [11]. The Democratic Republic of the Congo focuses its nutrition education efforts on women because they are the ones who buy, store, and prepare the majority of the household's food. In two health zones in the area of Uvira, this study sought to evaluate household food intake and understanding of nutrition.

## **Methods**

### **Type of Study**

This is a descriptive cross-sectional study focusing on the nutritional knowledge and food consumption within households in the Uvira and Ruzizi health zones.

### **Study Area**

Our study targeted Uvira (urban) and Ruzizi (rural) health zones in Uvira territory, in South Kivu province in the east of the Democratic Republic of the Congo. The Uvira health zone serves a population of approximately 365180 inhabitants (including 189893 women) in 21 health areas, and the Ruzizi health zone is inhabited by 194383 people, including 101079 women, in 18 health areas. Most of this population lives on agriculture, livestock, small-scale trade, and artisanal fishing, with the Catholic and Protestant churches as the dominant churches. The crops grown are cassava, rice, sweet potatoes, peanuts, and corn. In terms of dietary habits, cassava and corn remain staple foods. In general, agriculture occupies 80% of the population, while other activities such as livestock breeding, small-scale trade, and artisanal fishing cover 20% [12].

## **Sampling**

### **Study Population**

This study targeted women in charge of households in these two health areas.

### **Sample Size and Technique**

A two-stage cluster sampling was used given the distribution of the population in the health areas, which are made up of avenues and villages without the possibility of a nominative list of subjects. The first stage consisted of selecting clusters within these two health zones using ENA software. The sample size was calculated using the SCHWARTZ formula:  $n = (Z^2 \cdot p \cdot q \cdot d) / a^2$  [13]. With:  $Z$  = confidence coefficient (1.96)<sup>2</sup>;  $P$  = prevalence 50%;  $q$  = complement of probability, which is equal to  $(100-p) = 50\%$ ;  $d$  = cluster effect equal to 2 as well as a precision of 5%. The sample size calculation is:  $n = (1.96)^2 \times 50 \times 50 \times 2 / 25 = 768$ .

In order to interview the same number of women in each cluster, the cluster size was estimated at 768/30, or about 26; this finally increased the total sample to 780 women managers of households. During the selection

of 30 clusters, ten were selected from the Ruzizi health zone and 20 from the Uvira health zone; thus, based on cluster size, 260 respondents were from Ruzizi and 520 from Uvira.

### **Inclusion criteria**

The following criteria were set for participation in this study:

Be living in the Uvira or Ruzizi health zone for at least two years; to be a woman in charge of the household; to have participated in at least two Antenatal Care and/or preschool counselling sessions during her reproductive cycle.

Any woman who met these criteria but was unavailable or refused to participate in the survey was excluded from the study.

### **Study Variables**

#### **Variables**

Socio-demographic variables: health zone, health area, age, education, religion, marital status, occupation, household size

Variables related to nutritional knowledge include knowledge of nutritional recommendations, knowledge of nutrient-source foods, knowledge of healthy food choices, and knowledge of the relationship between diet and poor health.

Food consumption variables (food groups, weekly frequency of consumption)

### **Data Collection**

#### **Selection of Household**

From the center of the cluster (avenue in urban areas or sub-village in rural areas), a direction was chosen by spinning a bottle on the ground. The investigator then took the direction indicated by the neck of the bottle and counted the number of houses to the left and right until they reached the end of the survey cell. All houses were numbered with chalk. A number was drawn between 1 and the total number of houses in the direction using the random number table.

This number corresponded to the first house to be surveyed. The following houses were chosen in a sequence of steps to the right from the exit of the last house. The house chosen was the one whose front door was closest to the last house visited. In the household, data collection was done by indirect administration of the questionnaire, with the interviewer asking questions and recording the responses provided by the respondent as the interview progressed.

### **Data Analysis**

The collected data was entered and processed by MS Excel and SPSS software version 21.0.

Nutrition knowledge score: each respondent was asked to answer 33 questions divided into four subcategories: current dietary recommendations (10 questions), food sources related to nutrients (7 questions), the use of dietary information to make food choices (8 questions) and the relationship between diet and diseases (8 questions). Surveyed women had good nutrition knowledge scores when they get at least 50% of expected answers globally and for each subcategory.

Food consumption score is a composite indicator (standardized by WPF) calculated to reflect dietary diversity, frequency of consumption and the nutritional intake of food and related groups consumed by a household [14].

Calculation procedure: food items are grouped according to food groups and the frequencies of all surveyed in each group are summed. Any summed food frequency value over seven was recorded as seven. Generally, according to the World Food Program, each food group is assigned a weight reflecting its nutrient density [15]. Flesh food (meat, fish, poultry and liver), eggs are given a weight of 4; Beans, peas, groundnuts, and cashew nuts weight 3; grains a weight of 3; roots and tubers a weight of 2 ; fruits and vegetables a weight of 1 ; sugar, fats and oils weight 0.5 [14, 15, 16, 17].

For each household, the food consumption score was calculated by multiplying each food group's weekly frequency by its food group weight and then summing these scores into one composite score. The household score can have a maximum value of 112, which implies that each of the food groups was consumed every day for the last seven days [18]. Finally, we determined the household's food consumption status based on the following thresholds: 0-28: Poor; 28.5-42: Borderline; >42: Acceptable [19, 20].

This study assessed the association between nutrition knowledge, food consumption score and demographic variables. The strength of the association was determined using the crude odds ratio in the bivariate analysis and the adjusted odds ratio in logistic regression at the 95% confidence interval.

### Ethical Considerations

This study was carried out in strict compliance with ethics because the collection of data was conditioned by the ethical committee's authorization as well as a letter of

recommendation addressed to the head of the health zone authorizing this research in each area. Confidentiality and anonymity were also respected. Women participated freely after verbal consent and were allowed to decline the interview at any time.

### Expected Impact

The results of this study will not only allow health officials to improve nutrition education and dietary behavior but also serve as a reference for other researchers interested in this subject.

## Results

### Socio-demographic Characteristics of the Study Population

Out of the 780 women surveyed, around seventy percent lived in town, the majority (83,8%) were middle-aged (the mean age of 38.8 7.6 SD with the range of 26–54 years), half had a high level of education, and more than eighty percent lived in a marital union (Table 1).

**Table 1.** Socio-demographic Characteristics of the Participants South Kivu, DR Congo, 2021 (n = 780)

Characteristics	N	%
<b>Residence</b>		
Urban	520	66.7
Rural	260	33.3
<b>Age of respondents (years)</b>		
Middle-age (30 à 50)	654	83.8
Youth (25 à 29)	126	16.2
<b>Level of education of respondents</b>		
High (secondary and tertiary)	400	51.3
Weak (primary and None)	380	48.7
<b>Marital status</b>		
Marital union	660	84.6
Living elone (single, widow, divorced)	120	15.4

### Participants' Nutrition Knowledge

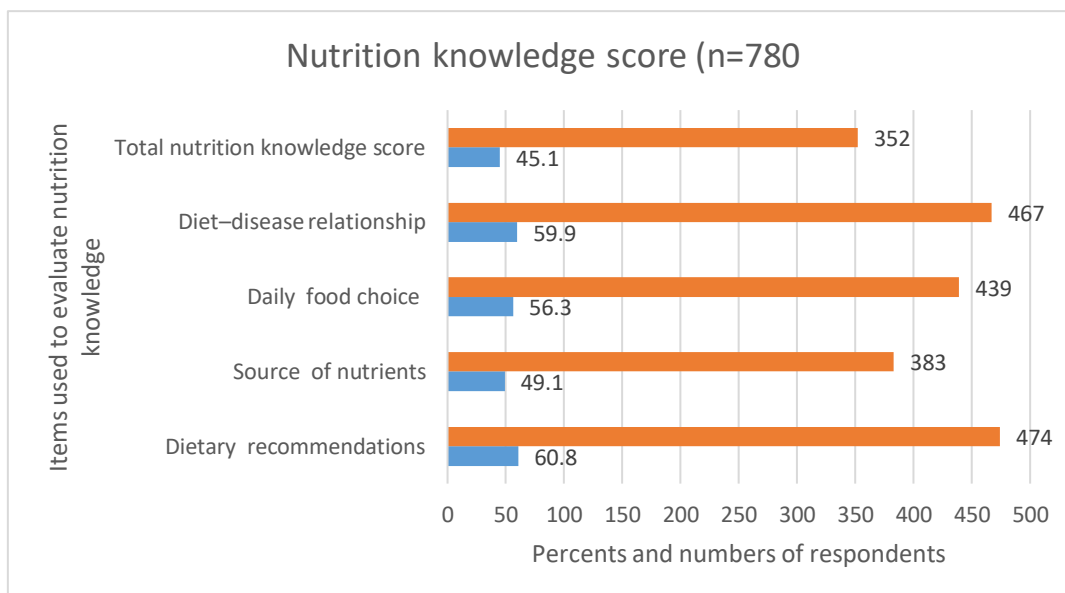
Figure 1 shows the correct response rate to general nutrition questions. Among all

respondents, 45.1% had a good score of nutrition knowledge. The results show that advice and diet-disease relationship scores were higher, while nutrient sources (food groups)

scores were less known by the surveyed population (Fig. 1).

### Factors Associated with the Nutrition Knowledge of the Households

Bivariate analysis showed an association between the nutrition knowledge of participants and women's residence area, marital status, and educational level, whereas age had no association with nutrition knowledge.



**Figure 1.** Nutrition Knowledge Scores among the Households, South Kivu, DR Congo 2021. (n = 780)

In Table 2, multivariate analysis showed that there was a significant association (p 0.05) between the residence area, educational status, marital status, and nutrition knowledge of the respondents. Urban households had 2.4 times more moderate knowledge than rural ones (AOR = 2.42; 95% CI: 1.74-3.37). Women who learned in high school and above had 1.6 times

the level of knowledge of those who studied less or were not educated (AOR = 1.62, 95% CI: 1.14-2.21). Living in a marital union decreases 0.39 times the likelihood of having a good level of nutrition knowledge compared to women living alone (AOR = 0.61; 95% CI: 0.41–0.92).

**Table 2.** Multivariable Logistic Regression Analyses Showed Factors Associated with Nutrition Knowledge Among the Households, South Kivu, DR Congo 2021. (n = 780)

Demographic characteristics	Nutrition Knowledge (n=780)		COR	p-valeur	AOR	p-value
	Moderate	Low				
	%	%				
<b>Residence area</b>						
Urban	52.5	47.5	2.53[1.83-3.52]	0.001	2.42[1.74-3.37]	0.003
Rural	30.4	69.6			1	
<b>Age</b>						
Middle-age	45.7	54.3	1.16[0.78-1.74]	0.45		
Youth	42.1	57.9				
<b>Level of education of respondents</b>						

High	50.3	49.8	1.53[1.14-2.06]	0.003	1.62[1.14-2.21]	0.002
Weak	39.7	60.3			1	
<b>Marital status</b>						
Marital union	43.5	56.5	0.65[0.43-0.98]	0.03	0.61[0.41-0.92]	0.001
Living alone	54.2	45.8			1	

## Dietary Diversity of the Households

### Weekly Groups of Food Consumption

The most eaten foods belong to the group of fat and oil unfortunately people in these two areas seem not to eat fruits and sugar. Urban

households eat significantly more fat and oil, condiments, roots and tubers while green dark vegetables are most eaten in rural areas. No significant difference was noticed between urban and rural households in the frequency of legume and nuts consumption (table 3).

**Table 3.** Different Food Groups Frequency of Weekly Consumption of Households in Uvira and Ruzizi Health Districts, South Kivu, DR Congo 2021. (n = 780)

Food groups	Both	RURAL (n=260)	URBAN (n=520)	p-value
	Means ± SD	Means ± SD	Means ± SD	
Cereal	3.41 ± 0.98	3.2 ± 1.2	3.5 ± 0.82	0.0001
Roots and Tubers	5.5 ± 0.98	4.6 ± 0.90	5.5 ± 0.68	0.0001
Legume and nuts	3.1 ± 1.02	2.9 ± 1.06	3.0 ± 0.84	0.07
Green dark vegetables	3.6 ± 0.90	4.0 ± 0.94	3.4 ± 0.81	0.0001
Fruits	0.7 ± 0.70	0.6 ± 0.49	0.8 ± 0.70	0.073
Meat, poultry and fish	4.8 ± 0.93	4.5 ± 0.84	4.9 ± 0.93	0.0001
Milk	0.7 ± 0.81	0.5 ± 0.5	0.9 ± 0.81	0.0001
Sugar	0.6 ± 0.79	0.5 ± 0.6	0.7 ± 0.9	0.087
Fat and oil	6.4 ± 0.73	6.0 ± 0.95	6.6 ± 0.49	0.0001
Condiments	5.5 ± 1.05	4.7 ± 0.82	5.9 ± 0.91	0.0001

## Household Food Consumption and Associated Factors

The bivariate analysis in Table 4 showed a significant statistical association between the weekly food consumption of the studied households and demographic characteristics such as nutrition knowledge, residence area, and age of participants, whereas educational and marital status showed no association. There was a statistically significant association between nutrition knowledge and dietary

diversity. The AOR (adjusted odds ratio) assessed between the two variables was 2.1 95% CI [1.37 - 3.17]. Also, a significant statistical association was found between household food consumption and the components of nutrition knowledge, such as knowledge of nutritional advice, food groups, food choice, and the relationship between diet and disease. Households living in town had a 9.4 times higher level of food consumption than the rural ones [AOR = 9.42, 95% CI: 5.80 -

15.30]. The fact of belonging to the middle-age group decreases 0.95 times the chance of having a high level of food consumption [AOR = 0.05, 95% CI: (0.007 - 0.35)]. The knowledge of food choice increased 1.73 times the chance

of accessing an acceptable level of food consumption [AOR = 1.73, 95% CI: 1.15 - 2.60]; those who knew the relationship "diet-disease had 2.28 times the chance of accessing a high level of food consumption (table 4)

**Table 4.** Association Between Household Food Consumption Score and Demographic Characteristics of Respondents, South Kivu, DR Congo 2021. (n = 780)

Independent variables	Food consumption (n=780)		COR	p-valeur	AOR	p-valeur
	High	Moderate				
	%	%				
<b>Nutrition knowledge</b>						
Moderate	89.8	10.2	2.1[1.37-3.17]	0.0005	2.1[1.34-3.26]	0.0002
Low	80.8	19.2	1.0		1.0	
<b>Residence area</b>						
Urban	94.4	5.6	8.8[5.48-14.24]	0.00001	9.4[5.80-15.30]	0.0002
Rural	65.8	34.2			1.0	
<b>Age</b>						
Middle-age	82.1	17.9	0.8[0.80-0.86]	0.00001	0.05[0.007-0.35]	0.0003
Youth	99.2	0.8			1.0	
<b>Level of education</b>						
High	86.5	13.5	1.3[0.98-1.96]	0.193	1.5[0.96-2.41]	0.095
Weak	83.2	16.8			1.0	
<b>Marital status</b>						
Marital union	85.5	14.5	1.3[0.77-2.26]	0.287	1.3[0.71-2.23]	0.312
Living alone	81.7	18.3			1.0	
<b>Dietary recommendations</b>						
Yes	87.6	12.4	1.7[1.11-2.54]	0.009	1.24[0.81-1.88]	0.081
No	80.7	19.3			1.0	
<b>Source of nutrients</b>						
Yes	79.1	20.9	0.4[0.26-0.62]	0.00001	0.43[0.28-0.67]	0.004
No	90.4	9.6			1.0	
<b>Daily food choice</b>						
Yes	87.5	12.5	1.6[1.05-2.39]	0.022	1.7[1.15-2.60]	0.031
No	81.5	18.5			1.0	
<b>Diet-disease relationship</b>						

Yes	89.1	10.9	2.2[1.47-3.37]	0.00006	2.3[1.51-3.43]	0.0012
No	78.6	21.4			1.0	

## Discussion

According to earlier research, a more diverse diet is closely correlated with factors including a sufficient calorie and protein consumption and the percentage of protein derived from animal sources (high-quality protein) [1]. Previous studies [11] shown a closer connection between unhealthy eating habits and the worldwide obesity epidemic. Because of this, it is crucial to recognize these tendencies, even though raising awareness of good eating practices seems to be a challenging task.

To study crucial aspects of the relationship between nutrition awareness and food consumption, two households in two health districts in the eastern Democratic Republic of the Congo were researched. This is consistent with past research that discovered a significant and favourable link between food intake and nutrition knowledge ratings [2]. Additionally, Sharma and associates found a high correlation between eating behaviors and nutritional knowledge [21].

The nutrition knowledge score was low (45.1%). This poll showed that the respondents' knowledge of nutrition and diet was really lacking. According to Bookari et al. [22], knowledge "may be the key determinant in beginning changes in eating behavior." Regarding nutrition-related topics, people were informed about current dietary recommendations (60.8%), food sources associated with nutrients (49.1%), using dietary information to make food selections (56.3%), and the link between diet and diseases (59.9%). Despite the poor overall rating for nutritional awareness, there is a distinction in the distribution of the pertinent factors. This outcome is consistent with past studies that successfully distinguished between different degrees of nutrition knowledge. [23]

Bidan et al.'s research suggests that education improves people's attitudes and average nutrition knowledge scores [21, 23, 24, 25]. Our study's findings showed that women with higher education levels knew 1.62 times more about moderate nutrition than women with lower education levels. In all age groups, there was a tendency for higher scores with advancing age. Younger women may be more educated, which may be the root of the problem.

In this study, urban households were more likely than rural ones to have high or moderate nutrition awareness scores. This may be due to the town's highly educated mothers. We also discovered a connection between the mother's education level and her knowledge of nutrition. The relevance of a mother's education has been demonstrated by studies, and one conducted in India indicated that 93% of educated women favored eating foods high in iron over the group of women with no education or little education [26]. Education encourages better nutrition outcomes by promoting the learning and use of information regarding the health effects of nutrients, according to multiple earlier research [26, 27].

This study found no significant relationship between women's marital status and nutrition expertise.

In this study, there was no connection at all between the women's ages and their knowledge of nutrition. Scalvedi et al. [28] revealed that senior respondents had significantly higher scores than the youngest in terms of total nutrition knowledge, despite Parmenter et al.'s [29] finding that middle-aged groups had superior knowledge than younger and older participants.

Compared to rural homes, urban families had 2.4 times more moderate knowledge. This may be because city living gives people access to



more information that raises their level of dietary awareness. The mother likely has a superior education in the city than in the country.

Middle-aged women are more likely to be becoming more aware of nutrition-related difficulties, such as diseases linked to diet, in addition to being more likely to seek out nutritional advice to ensure that their children are eating healthfully.

The average degree of dietary awareness is higher among young women than among women of middle age, however, according to certain studies [30].

By calculating the number of days consumed outside of reference over the course of the previous seven days, it is intended to keep track of any potential regularities in consumption habits. This measures the household's access to foods from the basic food groups that they typically include in their diet [31].

Households consumed fat and oil the most frequently according to this poll. Oils and fats are ingested frequently on a weekly basis, which is explained by the fact that these nutrients are also used for taste purposes in addition to providing energy. Urban households consumed significantly more meat, condiments, fat and oil compared to rural households. Even though they are not very nutrient-dense, condiments are frequently used because they enhance the flavor or aroma that the consumer wants.

They consume the least fruit, no matter where the homes are located. Because people do not consider these foods as purchases in low- or middle-income countries, fruit consumption is usually low. Some mothers won't purchase fruit until they have some cash left in their wallet. The low rate of fruit consumption can be related to consumer culture.

Every lady in the study group consumed cereals and root vegetables at least three times each week. It should be noted that the population in the research region, which is the primary area for cultivating cereal and tubers,

relies mostly on these foods for nutrition. The utilization of Kalundu Port as a transit hub continues to be very advantageous for commerce in rice and maize. Milk and other food options like fruits were available, but they were not as commonly consumed.

Women in many sections of the DR Congo are not accustomed to including fruits in their grocery shopping when they receive money to buy meals. Lack of knowledge about fruits' nutritional advantages is the root reason of assessed households' insufficient consumption of this group of foods. In contrast, Thimmayamma discovered that higher-income people in Hyderabad consumed more milk and fruits [33], whereas Bailey et al. discovered that low-income people rarely ate fresh fruits and vegetables [32].

Sharma et al. [21] showed that nutritional information predicts eating behavior for all food groups, with the exception of fruits and vegetables.

Despite subjects scoring high on food intake (84.9%) and low on nutrition knowledge (45.1%), there was a significant link between the two variables. Families were more likely to consume food at a reasonable amount if they had a moderate level of nutrition awareness. This outcome is consistent with past research, which revealed that women with better eating habits were more informed about nutrition [33, 35].

Nutrition education is one of the factors influencing food consumption and one of the most important factors influencing people's food choices, according to a study by Bradette-Laplante M. et al. The aim of this study was to investigate the relationships between scores on food consumption and particular nutrition knowledge domains.

Women's assessments of adequate food consumption and their understanding of current dietary recommendations were found to be unrelated.

Knowledge of food sources related to nutrients was inversely correlated with food

consumption score. Women with less education were more likely to be given positive feedback on their eating habits.

Our findings showed that knowing where nutrients come from was a reliable indicator of what foods should be consumed. This study discovered a correlation between a score on acceptable food consumption and knowledge of the relationship between nutrition and disease.

Women who lived in cities were more likely than those in rural areas to have high food consumption scores. Rural locations have a nine times lower chance than urban areas of receiving a food consumption score. This may be due to the existence of Tanganyika Lake, a potential source of fisheries, and Kalundu Port, which provides cereals and other imported goods.

It is believed that older people have more eating experience and hence make better food choices. We were unable to detect a significant difference in food consumption scores between middle-aged and younger women in this investigation, though. On the other hand, a Mauritius study indicated that, based on the dietary score, middle-aged women had a healthier diet than young women [31]. Education covers a broad spectrum of knowledge and skills in the area of nutrition.

More educated people may also be better able to use their knowledge to understand complex information on the links between diet and disease. However, these advantages could not be demonstrated by this study's investigation of food intake evaluations in relation to survey respondents' educational levels. Our research found no association between marital status and the food consumption score. Married people, however, had better eating habits than unmarried people, according to research [37].

### **Study Restrictions**

In cross-sectional descriptive research, respondents frequently experience memory and subjectivity problems. In this regard, when

conducting the survey, interviewers were instructed to support the respondents in shifting their thinking from thinking about the food categories consumed by the family to thinking more specifically about the food groups consumed by the entire household over the previous seven days.

It does not, however, provide information on the calibre of meals taken by specific family groups, such as children and pregnant or nursing mothers. A useful indicator of household food security is the food intake of the household as determined by the food consumption score. The cross-sectional data-based food consumption score does the same thing by ignoring seasonal variations in household consumption.

### **Conclusion**

The current analysis concentrated on the relationship between the food consumption score and the households' understanding of nutrition. While the respondents' score on food consumption was high, their knowledge of nutrition was low. There is a clear statistical association between the two variables. On the one hand, demographic factors and nutrition awareness were related to food intake. Nutrition and health education programs are necessary to raise knowledge of the nutritional importance in health and productivity by employing mass media and posters to change nutritional conceptions.

### **Conflicts of Interest**

No conflicts of interest have been reported by the authors.

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