ORIGINAL ARTICLE

PRELIMINARY CONTRIBUTIONS TO THE DEVELOPMENT OF FOOD AND NUTRITION LITERACY POLICIES FOR QUILOMBOLA COMMUNITIES

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Highlights: (1) The access dimension is the most frequently processed by diabetic quilombola individuals. (2) Four out of five dimensions are not being adequately processed by quilombola individuals. (3) The understanding dimension is more effectively processed by quilombola individuals with formal education.

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PRELIMINARY CONTRIBUTIONS TO THE DEVELOPMENT OF FOOD AND NUTRITION LITERACY POLICIES FOR QUILOMBOLA COMMUNITIES

ABSTRACT

This study aimed to preliminarily and independently assess the processing of the five dimensions of food and nutritional literacy among adult quilombola individuals with hypertension and/or diabetes in Bequimão, Maranhão, Brazil. A cross-sectional analysis was conducted with 115 quilombola participants ≥ 18 years who had hypertension and/or diabetes. The analysis was based on responses to a questionnaire developed by the researchers. Associations between variables were assessed using the chi-square or Fisher's exact test ($p < 0.05$). Most of the quilombola participants correctly process the access dimension. However, the remaining dimensions of food and nutrition literacy revealed inaccuracies or inadequacies. The access dimension was more frequently processed among individuals with some level of formal education ($p < 0.0001$), those younger than 60 years ($p = 0.040$), and those with diabetes mellitus ($p = 0.009$; $p = 0.025$; $p = 0.025$). In contrast, the understanding dimension was more frequently processed by participants with some level of formal education ($p = 0.032$). In these communities, the main factor compromising the proper processing of the application dimension is the limited local availability and commercialization of foods considered appropriate within quilombola territories. It is concluded that only the access dimension of food and nutrition literacy is adequately processed among the studied quilombola population. These findings highlight the need not only to train healthcare professionals to effectively communicate food and nutrition information but also to develop targeted policies that promote food and nutrition literacy and positively affect the quality of life of these populations.

Keywords: Black Population Health. Health Literacy. Health Knowledge, Attitudes, and Practice. Quilombola individuals. Hypertension. Diabetes mellitus.

INTRODUCTION

Hypertension and diabetes mellitus are noncommunicable chronic diseases (NCDs) that are more prevalent in the Black population in Brazil[1]. Within this context are quilombola communities—ethnic groups historically associated with rural, subsistence-based dietary practices. However, with the ongoing food and nutrition transition, a new dietary pattern has

emerged in these communities, characterized by increased intake of ultra-processed and easy-to-prepare foods. The consequences of this transition extend beyond dietary acculturation, contributing to increased prevalence rates and inadequate control of hypertension and diabetes mellitus[2].

Although the term health literacy (HL) still lacks a consensus translation in Brazil, the term *letramento em saúde* is the most widely used. The concept was defined by the European Health Literacy Survey Consortium (HLS-EU) as the knowledge, motivation, and skills required to access, understand, appraise, and apply health information, enabling appropriate decision making on healthcare, disease prevention, and health promotion, ultimately maintaining or improving quality of life over time[3].

While the European conceptual model emphasizes four competencies of HL, a recent World Health Organization (WHO) publication on the global prevention and control of NCDs introduced an additional dimension—memory—proposing that HL involves the processes of accessing, understanding, appraising, memorizing, and applying health-related information. The WHO also emphasizes that these processes, also referred as dimensions, are not consciously perceived as distinct stages by individuals and may overlap rather than occurring in the above mentioned sequence[4].

Considering the broad and multifaceted nature of HL, recent decades have seen a growing number of studies aimed at measuring food literacy (FL) and nutrition literacy (NL) across populations. Although these terms were often used interchangeably until a about decade ago, a systematic review by Krause et al. (2016) clarified conceptual definitions that provisionally outlined already established differences between them[5].

FL encompasses a wide range of skills and competencies required for adopting healthy and responsible eating behavior, including food purchasing and preparation skills, as well as critical reflection on factors influencing food choices and their broader societal impacts. NL, in contrast, is considered a subset of FL, focusing specifically on measuring the ability to understand basic nutrition information about fresh and processed foods in order to make appropriate health decisions[5].

More recently, the integrated concept of food and nutrition literacy (FNL)—in Brazilian Portuguese, *letramento alimentar e nutricional*—has been adopted, combining the two dimensions into a unified framework[6,7]. This integration is justified by the complementary nature of both literacies and the limitations of addressing them independently[7]. Accordingly, the present study adopts the term FNL, recognizing that their combined analysis contributes more effectively to theoretical advancements and supports the development of intervention policies aimed at improving HL among minority populations.

In Brazil, FL and NL are commonly assessed using two instruments originally developed in the United States and validated for the Brazilian population: the Nutrition Literacy Assessment Instrument (NLit-BR)[8] and the Nutritional Literacy Scale (NLS-BR)[9]. More recently, Brazilian-developed tools—such as the Nutrition Literacy among People with Diabetes (LND)[10] and the Adolescent Food Literacy (LAA)[11] instruments—have been created and validated, although their application remains limited.

It is worth noting that the focus on distinguishing disease- and age-related characteristics in the two Brazilian instruments mentioned above, does not represent a retrograde shift toward earlier theories of HL, when Australia, Europe, and North America were the primary regions producing research on the topic and once endorsed the view that HL is strongly associated with individual autonomy. In contrast, the underlying premises of contemporary research support that HL is, above all, a social practice, and that policies, infrastructures, and environments that shape and guide societies may act as barriers to or facilitators of health-related decision-making[4].

The target focus of FNL research on specific populations acknowledges its collective nature and helps identify and prioritize groups that are being “left behind”. “Leaving no one behind” is the guiding principle of the United Nations (UN) 2030 Agenda, which establishes the 17 Sustainable Development Goals (SDGs). It refers to groups or communities that are missing opportunities to prevent or control NCDs or to maintain, manage, or improve their health, resulting in poorer health status compared with other groups in society[4].

Quilombola communities exemplify such groups being “left behind”, as their living conditions are often largely unknown to the broader public. Access to the communities in

Bequimão is primarily via unpaved rural roads, which are often narrow and limit access for medium and large vehicles. These communities lack healthcare facilities. Medical care is provided either at Primary Health Care Units (PHCUs) located in rural areas serving quilombola communities, at healthcare facilities in the center of the municipality[12], or through monthly visits from the Family Health Strategy teams. Consequently, access to healthcare services is more limited and less frequent for these populations[13].

Historically, quilombola communities in Bequimão originated from enslaved individuals brought to western Maranhão in the 19th century to work on cotton, rice, and sugarcane plantations. Following the decline of these agricultural activities, these populations organized themselves and established quilombos in the region. Their descendants continue to inhabit these territories[12]. Currently, 11 communities have been officially recognized as quilombola territories by the Palmares Cultural Foundation: Ariquipá, Conceição, Juraraitá, Mafra, Marajá, Pericumã, Ramal de Quindíua, Rio Grande, Santa Rita, Sibéria, and Suassuí[14].

Given the need not only to measure but also to dissect FNL into its five component dimensions, as defined by the WHO, this study aimed to preliminarily and independently investigate the FNL access, understanding, appraisal, memorization, and application dimensions among adult quilombola individuals with hypertension and/or diabetes in Bequimão, Maranhão, Brazil. The findings are expected to contribute to the future development of national policies targeting quilombola populations affected by these conditions.

MATERIALS AND METHODS

This is a cross-sectional study with a household-based approach, whose population consisted of individuals with hypertension and/or diabetes residing in quilombola communities in Bequimão, Maranhão, Brazil. Data collection was conducted between June 21 and September 4, 2021. The study sample comprised 115 quilombola participants, a representative number determined through sample size calculation based on a total population of 158 individuals with hypertension and/or diabetes in the municipality, according to data provided by the Municipal Health Department in June 2021[13]. A 95% confidence level and a 5% margin of error were

used. Given the lack of prior data on the prevalence of nutrition knowledge regarding these diseases in the study population, an estimate of 50% was adopted, resulting in a minimum required sample size of 113 participants.

The inclusion criteria were quilombola individuals ≥ 18 years who voluntarily signed an Informed Consent Form (ICF) and had a minimum time since diagnosis of hypertension and/or diabetes mellitus of three months. The exclusion criteria were presence of Alzheimer's disease, hearing impairment, history of stroke, or pregnancy.

The exclusion of individuals with stroke is justified by the potential presence of cognitive and/or language impairments that could interfere with comprehension, communication, and responses to questions related to nutrition knowledge, especially given the interview-based nature of the instrument. Although such limitations are not present in all stroke cases[15], this decision aimed to ensure the sample homogeneity and data reliability.

Pregnant individuals were excluded due to the specific nutritional and physiological characteristics of pregnancy, including dietary modifications associated with symptoms such as nausea, heartburn, gastric fullness, constipation, weakness, syncope, edema, and oral changes. These factors could distinctly influence current dietary patterns and nutrition knowledge compared with other participants with hypertension and/or diabetes[16]. This approach was adopted to ensure methodological consistency and comparability across participants.

Data were collected through face-to-face interviews using a questionnaire developed by the researchers, which incorporated and adapted three questions from an instrument assessing nutrition knowledge in adults[17]. The questionnaire assessed socioeconomic and clinical characteristics, as well as the processing of the five dimensions of FNL: access, understanding, memory, appraisal, and application among quilombola individuals with hypertension and/or diabetes mellitus.

The following variables were collected: disease (hypertension, diabetes mellitus, or both); sex (female or male); age (19–59 years or ≥ 60 years); time since diagnosis (≤ 5 years or > 5 years); education level (illiterate, no formal education, or formal education); self-declared skin color, including locally defined categories (Black, *parda*, *negra*; Asian, White, and

Indigenous; *castanha, clara, escura, fula, and morena*); monthly household income (≤ 1 minimum wage, > 1–≤ 2, > 2–≤ 3, and > 3 – ≤ 4 minimum wages); household size (≤ 2, 3–6, or ≥ 7 persons); per capita monthly income (≤ ¼ minimum wage, > ¼–½, or > ½ minimum wage); receipt of government social benefits (no or yes); and socioeconomic class (C and D/E), determined using the Brazilian Economic Classification Criterion[18].

To assess the "access" dimension of FNL, participants were asked the following questions: "Can diet help control hypertension and diabetes?"; "Have you ever received dietary recommendations for the control of hypertension and/or diabetes through health services and programs?"; and "Have you ever received dietary guidance for the control of hypertension and/or diabetes from other sources?"

The understanding dimension was assessed using the following questions: "Does having a normal or above-normal body weight influence your blood pressure or blood glucose levels in any way?" and "Does the type of diet you follow influence the results of routine tests you have undergone, such as fasting blood glucose and total cholesterol?"

The memory dimension was assessed through the question: "In your opinion, which dietary practices are considered ideal for controlling hypertension and/or diabetes?" The appraisal dimension was assessed by asking: "In addition to health services and programs, were there other sources that provided you with dietary guidance for controlling hypertension and/or diabetes?" The application dimension was assessed with the question: "Which dietary practices do you follow to help control your hypertension and/or diabetes?"

To evaluate the processing of the five FNL dimensions by the quilombola participants, recommendations and guidelines from the Brazilian Society of Cardiology[19–22], the Brazilian Diabetes Society[23], and a scientific statement from the American Heart Association[24] were consulted to determine the alignment of participants' responses with current scientific evidence. Responses related to access and understanding were classified as correct or incorrect, while those related to memory, appraisal, and application were classified as adequate or inadequate. The North American organization was included in the consultation to complement food and nutrition information that was not available in national agency publications.

Additionally, the reasons preventing adequate processing of the application dimension were investigated using the question: “What are the reasons why your actual dietary practices for controlling hypertension and/or diabetes differ from what you consider ideal?”

The collected data were entered into and organized in a Microsoft Excel® spreadsheet and subsequently exported to the Stata® software version 14.0 for statistical analysis. Descriptive analyses were performed to characterize the sample. The memory, appraisal, and application dimensions were presented as absolute (n) and relative (%) frequencies.

Measures of central tendency (mean or median) and dispersion (standard deviation or interquartile range) were used for the access and understanding dimensions, according to data distribution. Associations between categorical variables were assessed using the Pearson’s chi-square test. Fisher’s exact test was applied when the expected frequencies in at least one cell of the contingency table were < 5. Statistical significance was set at 5% ($p < 0.05$).

The chi-square and Fisher’s exact tests were used to explore associations between socioeconomic variables and sex, as well as between the access and understanding dimensions of FNL and clinical and demographic variables, contributing to the identification of factors influencing FNL processing among quilombola individuals with hypertension and/or diabetes mellitus.

The study was approved by the Research Ethics Committee of the University Hospital of the Federal University of Maranhão (approval no. 3,801,055). Participants were informed about the study objectives, procedures, and data confidentiality and signed a written ICF. For participants without formal education, informed consent was documented by signature or thumbprint of the dominant hand to confirm their agreement to participate in the study.

RESULTS

According to the data collected, most participants were female (65.22%) and older (76.52%); had some level of formal education (68.70%), self-identified as Black/*parda*/*negra* (64.35%), and had hypertension (65.22%). Nearly all participants belonged to socioeconomic

classes D and E (97.39%). A statistically significant difference between sexes was observed for per capita monthly income (p = 0.021), indicating that quilombola women with hypertension and/or diabetes have lower per capita monthly income compared to men (Table 1).

Table 1. Socioeconomic characteristics of quilombola participants with hypertension and/or diabetes, according to sex. Bequimão, Maranhão, Brazil, 2021.

Variable	Total		Sex				p-value[2]
			Female n = 75 (65.22%)		Male n = 40 (34.78%)		
	n	%	n	%	n	%	
Disease							0.470
Arterial hypertension	75	65.22	48	64.00	27	67.50	
Diabetes mellitus	11	9.57	09	12.00	02	5.00	
Hypertension and diabetes mellitus	29	25.22	18	24.00	11	27.50	
Age (years)							0.269
19–59	27	23.48	20	26.67	07	17.50	
≥ 60	88	76.52	55	73.33	33	82.50	
Time since diagnosis of hypertension (years)							0.699
≤ 5	43	37.39	29	38.67	14	35.00	
> 5	72	62.61	46	61.33	26	65.00	
Time since diagnosis of diabetes mellitus (years)							0.590
≤ 5	95	82.61	63	84.00	32	80.00	95
> 5	95	82.61	63	84.00	32	80.00	
	20	17.39	12	16.00	08	20.00	
Education level							
Illiterate/no formal education							0.840
Formal education	36	31.30	23	30.67	13	32.50	
	79	68.70	52	69.33	27	67.50	
Skin color							
Black/*Parda/Negra*							0.921
Asian, White, Indigenous	74	64.35	49	65.33	25	62.50	
Other (*castanha, clara, escura, fula* and *morena*)	04	03.48	03	4.00	01	2.50	
Not informed	35	30.43	22	29.33	13	32.50	
	02	01.74	01	01.33	01	02.50	
Monthly household income[1]							
≤ 1 minimum wage							0.817
> 1 to ≤ 2 minimum wages	57	49.57	37	49.33	20	50.00	
> 2 to ≤ 3 minimum wages	40	34.78	27	36.00	13	32.50	
> 3 to ≤ 4 minimum wages	17	14.78	10	13.33	07	17.50	
	01	0.87	01	1.33	-	-	

Household size							
≤ 2 people							0.450
≥ 3 to ≤ 6 people	54	46.96	32	42.67	22	55.00	
≥ 7 people	54	46.96	38	50.67	16	40.00	
	07	6.09	05	6.67	02	5.00	
***Per capita* monthly income[1]**							
≤ 1/4 minimum wage (≤ BRL 275)							0.021
> 1/4 minimum wage to 1/2 minimum wage (> BRL 275–550)	28	24.35	22	29.33	06	15.00	
> 1/2 minimum wage (> BRL 550)	38	33.04	28	37.77	10	25.00	
	49	42.61	25	33.33	24	60.00	
Government social benefits							
No							0.287
Yes	79	68.70	49	65.33	30	75.00	
	36	31.30	26	34.67	10	25.00	
Socioeconomic class							
C							0.957
D/E	03	2.61	02	2.67	01	2.50	
Total	112	97.39	73	97.33	39	97.50	

Source: Prepared by the authors, 2021.
[1] Minimum wage in effect in 2021 (BRL 1,100.00).
[2] Chi-square or Fisher's exact test ($p < 0.05$).

Regarding the findings related to the FNL in the studied population, adequate performance was identified in the access dimension. Proper processing of this FNL dimension was evidenced by the predominance of participants who understood that diet can help control the investigated diseases (77.39%), those who had already received dietary recommendations through health services and programs (72.17%), and those who had accessed dietary information from sources outside the health sector (60.87%) (Table 2).

The statistical differences also revealed that quilombola individuals with diabetes showed the highest level of processing in the FNL access dimension, as they were more likely to understand that diet contributes do disease control ($p = 0.009$). Likewise, those with both diabetes mellitus and hypertension were the most assisted by health services and programs ($p = 0.025$) and were also the most likely to have received food and nutrition information from sources outside the health sector ($p = 0.001$). The FNL access dimension was also better processed by quilombola individuals younger than 60 years ($p = 0.040$) and by those with some level of formal education ($p < 0.0001$) (Table 2).

However, with regard to the FNL understanding dimension, inadequate processing was identified among the quilombola participants. Although 71.30% of participants recognized that body weight influences blood pressure and blood glucose levels, only slightly more than half of the studied population (53.04%) understood that diet patterns affect routine laboratory test results. Notably, still regarding this latter finding, a considerable proportion of participants (39.13%) responded “do not know/unsure”. Both aspects were better understood by individuals with some level of formal education, with the association between body weight, blood pressure, and blood glucose showing a p-value < 0.0001, and the relationship between diet and routine laboratory tests showing a $p = 0.032$ (Table 2).

Table 2. Analysis of the FNL access and understanding dimensions among quilombola individuals with hypertension and/or diabetes mellitus, according to disease, age, and education level. Bequimão, Maranhão, Brazil, 2021.

Primary HL dimension analyzed	FNL variables	Total		Disease						p-value[6]	Age				p-value[6]	Education level				p-value[6]
				HTN[1]		DM[2]		HTN and DM[2]			30–59		≥60			I[3]/NFE[4]		FE[5]		
		n	%	n	%	n	%	n	%		n	%	n	%		n	%	n	%	
	Can diet help control hypertension and diabetes?									0.009					0.060					0.180
	No	05	4.35	02	2.67	-	-	03	10.34		-	-	05	5.68		03	8.33	02	2.53	
	Helps control hypertension only	-	-	-	-	-	-	-	-		-	-	-	-		-	-	-	-	
	Helps control diabetes only	01	0.87	-	-	01	9.09	-	-		01	3.70	-	-		-	-	01	1.27	
	Helps control both	89	77.39	56	74.67	10	90.91	23	79.31		24	88.89	65	73.86		24	66.67	65	82.28	
Access	Do not know/unsure	20	17.39	17	22.67	-	-	03	10.34		02	7.41	18	20.45		09	25.00	11	13.92	
	Have you ever received dietary recommendations for the control of hypertension and/or diabetes through health services and programs?									0.025					0.811					0.374
Access	No	32	27.83	27	36.00	02	18.18	03	10.34		08	29.63	24	27.27		12	33.33	20	25.32	
	Yes	83	72.17	48	64.00	09	81.82	26	89.66		19	70.37	64	72.73		24	66.67	59	74.68	
	Have you received dietary guidance for the control of hypertension and/or diabetes from other sources?									0.001					0.040					<0.0001
Access	No	45	39.13	39	52.00	02	18.18	04	13.79		06	22.22	39	44.32		24	66.67	21	26.58	
	Yes	70	60.87	36	48.00	09	81.82	25	86.21		21	77.78	49	55.68		12	33.33	58	73.42	

	Does having a normal or above-normal body weight influence your blood pressure or blood glucose levels in any way?									0.587					0.107					<0.0001
	No	11	9.57	07	9.33	2	18.18	2	6.90		02	7.41	09	10.23		05	13.89	06	7.59	
	Influences blood pressure only	-	-	-	-	-	-	-	-		-	-	-	-		-	-	-	-	
	Influences blood glucose levels only	01	0.87	01	1.33	-	-	-	-		-	-	01	1.14		01	2.78	-	-	
	Influences both	82	71.30	50	66.67	08	72.73	24	82.76		24	88.89	58	65.91		15	41.67	67	84.81	
Understanding	Do not know/unsure	21	18.26	17	22.67	01	9.09	03	10.34		01	3.70	20	22.73		15	41.67	06	7.59	
	Does the type of diet you follow influence the results of routine tests you have undergone, such as fasting blood glucose and total cholesterol?									0.443					0.735					0.032
	No	07	6.09	04	5.33	01	9.09	02	6.90		02	7.41	05	5.68		01	2.78	06	7.59	
	Yes	61	53.04	35	46.67	07	63.64	19	65.52		16	59.26	45	51.14		14	38.89	47	59.49	
Understanding	Yes, but not all of the tests mentioned	02	1.74	01	1.33	-	-	01	3.45		-	-	02	2.27		-	-	02	2.53	
	Do not know/unsure	45	39.13	35	46.67	03	27.27	07	24.14		09	33.33	36	40.91		21	58.33	24	30.38	

Source: Prepared by the authors, 2021.
[1] Hypertension
[2] Diabetes mellitus
[3] Illiterate
[4] No formal education
[5] Some formal education
[6] Chi-square or Fisher's exact test ($p < 0.05$)

It was also observed that the FNL dimensions of memory, application, and appraisal were inadequately processed by the participants when related to food and nutrition information on sources of caffeine and protein. This inadequate processing was evidenced by the lower proportion of food and nutrition information that were correctly retrieved from memory (45.45% and 60.00%, respectively), appropriately applied (50.00% and 64.44%, respectively), and appraised as reliable, relevant, and applicable within their own social context (0% and 35.00%, respectively) (Table 3).

Table 3. Analysis of the FNL memory, application, and appraisal dimensions among quilombola individuals with hypertension and/or diabetes mellitus, based on food sources relevant to both conditions. Bequimão, Maranhão, Brazil, 2021.

Primary HL dimension analyzed	Nutrition knowledge variables	Dietary sources of sodium		Dietary sources of fat		Dietary sources of fiber		Dietary sources of protein		Dietary sources of caffeine		Dietary sources of carbohydrate and table sugar		Other dietary sources	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Memory	**Nutrition information memorized**														
	Adequate	55	98.21	74	100.00	55	100.00	33	60.00	05	45.45	57	96.61	-	-
	Inadequate	01	1.78	-	-	-	-	22	40.00	06	54.54	02	3.38	-	-
Application	**Nutrition information adopted**														
	Adequate	52	98.11	70	100.00	40	100.00	29	64.44	05	50.00	49	96.07	06[1]	75.00[1]
	Inadequate	01	1.88	-	-	-	-	16	35.55	05	50.00	02	3.92	02[2]	25.00[2]
Appraisal	**Nutrition information obtained from sources outside health services and programs**														
	Adequate	09	90.00	22	95.65	19	90.47	07	35.00	-	-	22	95.65	03[1]	60.00[1]
	Inadequate	01	1.00	01	4.34	02	9.52	13	65.00	03	100.00	01	4.34	02[2]	40.00[2]

Source: Prepared by the authors, 2021.

[1] Information about the intake of calories, wine, and foods that are sources of vitamin C, folate, and calcium.

[2] Information about the intake of calories, animal protein, and frozen foods.

A total of 41 quilombola individuals (35.65%) reported being unable to fully apply the FNL information they have. The reasons identified as barriers to adherence to dietary routines that would better meet their cardiometabolic needs are presented in Table 4. Among the reported justifications, the most prominent were the limited availability of foods considered appropriate near quilombola communities (46.31%), taste of foods (whether perceived as pleasant or not) (36.52%), and insufficient financial resources to purchase foods considered appropriate (9.75%) (Table 4).

Table 4. Factors associated with inadequate processing of the FNL application dimension among quilombola individuals with hypertension and/or diabetes mellitus. Bequimão, Maranhão, Brazil, 2021.

Factor identified	Total	
	n	%
Retail outlets selling fruits and vegetables are located in areas distant from quilombola communities	12	29.26
Beef (which should be consumed less frequently) is more readily available in local markets than fish and chicken	05	12.19
There are limited financial resources to purchase fruits and vegetables	04	9.75
Cassava flour is widely consumed due to its pleasant taste	03	7.31
High-salt foods, such as salted shrimp, are widely consumed due to their pleasant taste	03	7.31
Whole foods are not consumed (or are consumed infrequently) because their taste is not considered pleasant	03	7.31
Fried foods are consumed due to their pleasant taste	02	4.87
Beef (which should be eliminated from the diet) is considered more satiating than cassava flour porridge	01	2.43
Beef is widely consumed due to its pleasant taste	01	2.43
Pork is widely consumed due to its pleasant taste	01	2.43
Fruits and vegetables are not consumed (or are consumed infrequently) because their taste is not considered pleasant	01	2.43
Eggs are sold in markets located in areas distant from quilombola communities	01	2.43
Beans are not consumed (or are consumed infrequently) because their taste is not considered pleasant	01	2.43
Milk, which should be consumed with coffee, causes gastrointestinal discomfort	01	2.43
Retail outlets selling substitutes for rice are located in areas distant from quilombola communities	01	2.43
Participants report being negligent with regard to purchasing fruits and vegetables	01	2.43
Total	**41**	**100.00**

Source: Prepared by the authors, 2021.

DISCUSSION

The study, conducted on the western coast of Maranhão[25]—the Brazilian state with the highest proportion of quilombola individuals in its resident population[26]—provides relevant insights into which FNL dimensions are inadequately processed in the quilombola communities studied. These findings help delineate specific characteristics that may inform the planning of FNL-oriented policies for these populations. In the communities analyzed, no inaccuracy was found in the access dimension. Individuals with diabetes, those younger than 60 years, and those with some level of formal education demonstrated better performance in this FNL dimension. In contrast, the understanding dimension was found to be deficient, particularly among individuals with no formal education.

Additionally, the dimensions of memory, application, and appraisal, when related to dietary sources of caffeine and proteins, were also inadequately processed. When the application of FNL proved unfeasible, this was primarily due to three factors related to foods considered appropriate by quilombola individuals: limited commercial availability near their communities, often unpleasant taste, and costs exceeding their purchasing capacity.

The predominance of individuals self-identifying as Black/*pardo/negro* in this study reflects a broader trend across Brazil toward greater recognition and affirmation of Black identity. Comparisons between the 2012 and 2021 demographic censuses show a decrease in individuals identifying as White (from 46.3% to 43.0%) and an increase in those identifying as Black (from 7.4% to 9.1%) and *pardo* (from 45.6% to 47.0%)[27].

Nearly all quilombola individuals with hypertension and/or diabetes in the studied municipality—most of whom were older adults—belonged to socioeconomic classes D or E. This finding is consistent with previous research conducted among quilombola students between six and 19 years in communities located 40 km from the urban center of Cachoeira, Bahia, Brazil, where 65.2% of participants also belonged to these lower socioeconomic strata[28].

A prior study involving older quilombola individuals in Bequimão reported that 98.1% belonged to socioeconomic classes D or E and identified a high prevalence of cardiovascular

risk (52.7%), measured by waist-to-hip ratio. This risk was particularly pronounced among women, especially those over 70 years of age[29].

The association observed in the present study between quilombola women with hypertension and/or diabetes and lower per capita income, combined with findings from the aforementioned study, suggests that elevated cardiovascular risk in these communities is likely concentrated among individuals with lower income. This relationship has been widely documented in prospective studies and systematic reviews, demonstrating that low income, limited formal education, and residence in socioeconomically disadvantaged areas are associated with increased blood pressure levels and cardiovascular risk[22].

The adequate processing of the access dimension of FNL may reflect improvements in access to medical appointments in Brazil, which increased from 71.2% in 2013 to 76.2% in 2019 in the northeast region[30]. Despite the provision of healthcare through the Family Health Strategy, quilombola communities often lack PHCUs within their territories. A bill (No. 1296/2019) proposes the implementation of PHCU in quilombola communities to ensure equitable, high-quality access to healthcare services within the Brazilian Unified Health System (SUS), although it has not yet been approved[31].

Furthermore, the finding that individuals with diabetes exhibited greater engagement with the access dimension compared with those with diabetes or with both conditions aligns with national data. The 2019 National Health Survey showed that individuals with diabetes reported higher rates than hypertensive individuals in receiving medical advice on maintaining a healthy diet (94.9% vs. 87.2%) and adequate body weight (92.1% vs. 84.4%)[30].

The WHO emphasizes that ensuring high-quality healthcare delivery to individuals, families, and communities requires that health information providers have the skills and competencies needed to address the cultural specificities of different minority groups, including quilombola, Indigenous, refugee, and migrant populations[4]. Importantly, adequate processing of the access dimension does not guarantee that other FNL dimensions will be properly processed by recipients.

A study conducted in rural Santa Bárbara do Pará, Pará, Brazil, identified low adherence to recommended diets among individuals with hypertension (21.42%), diabetes (30%), and both

conditions (45.45%)[32]. It is noteworthy that individuals with diabetes again demonstrated higher levels of FNL than those with hypertension. Notably, when the data collector inquired about prior diagnoses, some participants with hypertension expressed relief at not having diabetes mellitus. The scientific literature still lacks studies confirming whether common perceptions regard diabetes mellitus as a more severe condition than hypertension. This perception could explain the greater attention given by individuals with diabetes to dietary recommendations provided by health professionals, as well as their higher adherence to prescribed dietary plans.

The present findings corroborate this pattern, showing that even with adequate access, understanding dietary and nutritional information remains insufficient, particularly among individuals without formal education. Education, along with income, race, and sex, is a key social determinant of HL. Illiteracy may undermine individual's confidence in asking health-related questions, thereby impairing both interpretation and the ability to draw secondary inferences, such as recognizing that body weight influences blood pressure and that blood glucose levels and dietary patterns affect routine laboratory test results[33].

Weight loss of ≥ 5% can reduce blood pressure, LDL cholesterol, and serum triglyceride levels[22], as well as improve glycemic control[23]. Among individuals with diabetes mellitus who are overweight or obese, improvements in glycemic and lipid profiles are typically observed with weight reductions of at least 5–10%[34].

The relationship between dietary patterns and favorable metabolic outcomes in hypertension and diabetes can be illustrated by the benefits of soluble fibers (e.g., from fruits), which improve glycemic control and lipid metabolism, as well as polyunsaturated and monounsaturated fats, which reduce the risk of coronary disease by 25% and 15%, respectively[23].

According to the Brazilian Food Composition Table, sources of polyunsaturated fats include babassu oil and the fish species *manjuba* (*Anchoviella* spp.) and sardine (*Sardinella* spp.), whereas monounsaturated fats are found in foods such as *corimbatá* (*Prochilodus* spp.), beef and pork ribs, egg yolk, *macaúba* palm fruit (*Acrocomia aculeata*), palm oil (*dendê* oil), and cashew nuts[35].

The inadequate processing of the memory, appraisal, and application dimensions related to caffeine and protein intake highlights existing gaps in HL among the quilombola individuals studied and reflects an ineffective level of FNL that may compromise quality of life among individuals with hypertension and/or diabetes.

Regarding the influence of coffee intake on blood pressure or the risk of cardiovascular diseases, the International Society of Hypertension states that moderate intake is safe. Similarly, the European Society of Hypertension and the European Society of Cardiology report that coffee intake is associated with cardiovascular benefits. In turn, the American College of Cardiology, the American Heart Association, and the American Society of Hypertension acknowledge that, although coffee intake in patients with hypertension is associated with acute increases in blood pressure, long-term intake is not associated with increased blood pressure or a higher risk of cardiovascular diseases[36].

With regard to recommendations from Brazil, the Brazilian Hypertension Guidelines recommend that coffee intake should not exceed low to moderate amounts (≤ 200 mg of caffeine), corresponding to approximately two 150 mL cups of filtered ground coffee, given that this beverage contains about 235 mg of caffeine per 355 mL[19].

Regarding protein intake, the American Heart Association recommends food sources such as plant-bases proteins; low-fat or fat-free dairy products; fish; seafood; and lean, unprocessed cuts of meat and poultry[24]. Overall, evidence suggests that, on average, Black individuals consume more red meat than white meat, particularly processed varieties. Black populations are also less likely to consume unprocessed beef and more likely to derive fat intake from processed meat consumed at lunch and from fried preparations. Even among Black individuals who follow more plant-based dietary patterns, intake of total and processed red meat remains above evidence-based recommendations and is higher than that observed in comparable White populations[37].

The most frequently cited barrier to the application of memorized and appraised nutritional knowledge—the distance to stores offering foods considered appropriate—indicates that these communities are situated within food deserts. Among the various definitions attributed to this concept, food deserts are generally understood as urban or rural areas with

limited immediate access to fresh, healthy, and affordable foods. According to the study Mapping Food Deserts in Brazil, in 12 of the 21 Brazilian capitals analyzed, the areas with the lowest availability of establishments offering healthy food are those where household heads have the lowest income, contributing to the inability of poorer populations to use diet as a means of promoting health[38].

Recognizing the geography of food deserts provides a simplified way of understanding that HL is a social rather than an individual practice; therefore, its effective implementation requires an approach that encompasses society as a whole, as well as the associated risk factors and health determinants. It should be emphasized that HL policies must be designed to encompass health and social care systems, educational systems (for both children and health professionals), and workplaces, thereby improving the quality, access, and reach of information and services aimed at the prevention or control of NCDs[4].

To illustrate the scarcity of FNL among quilombola populations and, more broadly, Black populations in Brazil and worldwide, a search using the term "food and nutrition literacy" identified only one literature review focusing on countries in the Middle East and North Africa (MENA) region. This review found not only an absence of studies originating from African countries but also a lack of substantial representation of countries within the region conducting research on the topic[7].

Similarly, only one study on FL involving a Black population was identified. Among other objectives, this study examined the FL of students who used food pantries at a historically Black university in the United States. The findings indicated that only 37% or fewer of pantry users considered health and nutrition aspects when making food-related decisions, such as preparing healthy meals, choosing nutritionally balanced options, and reading nutrition information before purchasing food. In addition, limited skills in food preparation and meal planning were also reported in this study[39].

Related terms that do not fully encompass the concept of FNL, such as food knowledge (*conhecimento alimentar*) or nutrition knowledge (*conhecimento nutricional*), were also not identified in searches combined with the term quilombola, which itself was only registered as

a descriptor in the Health Sciences Descriptors/Medical Subject Headings (DeCS/MeSH) database in early 2022[40].

A notable limitation of the present study is its cross-sectional design and the use of a convenience sample from a single municipality, which limits the generalizability of findings to other quilombola populations. Nevertheless, a key strength of this research lies in its novelty, as one of the first studies to investigate quilombola populations, highlighting the dimensions of FNL that are deficient. Recent changes in the Brazilian Demographic Census, which now allows quilombola communities to be identified separately from other Black populations, gaining visibility in official statistics, represent an important step toward developing targeted policies to promote FNL in these communities.

CONCLUSION

Among the quilombola individuals with hypertension and diabetes included in this study, the FNL access dimension was satisfactorily processed. However, the remaining four FNL dimensions showed inadequate processing. These findings highlight the need for improved training of healthcare professionals to ensure the effective communication of food and nutrition information to these populations. Notably, individuals with no formal education demonstrated a lower capacity to correctly process the understanding dimension of FNL.

Nevertheless, as HL is a social practice, improving professional training alone will not be sufficient to enhance FNL in these communities. Government agencies, the private sector, and policymakers must respond to the needs of quilombola communities and collaborate to create supportive environments that facilitate FNL. Although each FNL dimension was analyzed separately in this study, this approach contributes to the development of targeted strategic frameworks to guide the development of FNL policies for these Brazilian populations, ultimately helping to reduce food and nutrition misinformation within quilombola communities nationwide.

REFERENCES

1. Brasil. Ministério da Saúde (MS). Política Nacional de Saúde Integral da População Negra: uma política para o SUS. Brasília: MS [internet]. 2017 [citado 10 abr. 2025]. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/politica_nacional_saude_populacao_negra_3d.pdf

2. Afonso LFC, Corrêa NAF, Silva HP. Segurança Alimentar e Nutricional em Comunidades Quilombolas no Brasil: um balanço da literatura indexada. Segur Aliment Nutr 2020; 27:1-13.

3. World Health Organization (WHO). Health literacy The solid facts. Geneva: WHO [internet]. 2013 [citado 20 abr. 2025]. Disponível em: https://www.who.int/europe/publications/i/item/9789289000154.

4. World Health Organization (WHO). Health literacy development for the prevention and control of noncommunicable diseases: volume 2. a globally relevant perspective. *Geneva: WHO [internet]*. *2022* [citado 20 abr. 2025]. Disponível em: https://iris.who.int/handle/10665/364204.

5. Krause C, Sommerhalder K, Beer-Borst S, Abel T. Just a subtle difference? Findings from a systematic review on definitions of nutrition literacy and food literacy. Health Promot Int 2018; 33(3):378-389.

6. Silva P. Food and Nutrition Literacy: Exploring the Divide between Research and Practice. Foods 2023; 12(14): 1-18.

7. Mohsen, H.; Sacre, Y.; Hanna-Wakim, L.; Hoteit, M. Nutrition and Food Literacy in the MENA Region: A Review to Inform Nutrition Research and Policy Makers. Int. J. Environ. Res. Public Health 2022; 19(16): 1-25.

8. Sarkis LBDS, Teruel-Camargo J, Gibbs HD, Nakano EY, Ginani VC, de Aguiar AS, et al. The Nutrition Literacy Assessment Instrument for Brazilians, NLit-Br: An Exploratory Cross-Cultural Validity Study. Nutrients. 2022; 14(22):1-10.

9. Zanella CP, Sampaio HAC, Lima JWO, Moreira TMM. Adaptação cultural e evidências de validade de conteúdo da Nutritional Literacy Scale versão brasileira. Rev Bras Enferm 2022; 75(6):1-6.

10. Eleutério TP, Pereira EJ, Farias PKS, Hott KPS, de Paula FMT, Martins AMEBL. Elaboração e verificação da validade e confiabilidade de um instrumento de letramento em nutrição entre pessoas com diabetes. Cad. Saúde Colet. 2018; 26(3): 298-307.

11. Farias PKS, Sales MSM, Barbosa ACM, Monteiro PA, Soares PDF, Soares LJF, et al. Desenvolvimento da validade de conteúdo e confiabilidade de um instrumento de avaliação do letramento alimentar de adolescentes. Research, Society and Development 2021; 10(16): 1-13.

12. Jesus PP, Lourenço CB, Funo ICSA. Comunidades remanescentes de quilombos de Bequimão, MA: caracterização socioeconômica e ambiental. Revisão de Carolina Batista e Silva Coelho; Romulo Fernando Lemos Gomes. São Luís: Núcleo de Maricultura do Instituto Federal do Maranhão-NUMAR, 2020.

13. Secretaria Municipal de Saúde (SEMUS). Número de hipertensos e diabéticos das comunidades de Ariquipá, Conceição, Juraraitá, Mafra, Marajá, Pericumã, Ramal de Quindíua, Rio Grande, Santa Rita, Sassuy e Sibéria e informações sobre as visitas do Estratégia de Saúde da Família [dados não publicados]. Bequimão (Maranhão): SEMUS, 2021.

14. Fundação Cultural Palmares (FCP) [internet]. Certificação Quilombola. [citado 20 abr. 2025]. Disponível em: https://www.gov.br/palmares/pt-br/departamentos/protecao-preservacao-e-articulacao/certificacao-quilombola.

15. Brasil. Ministério da Saúde. Acidente Vascular Cerebral (AVC). [citado 20 abr. 2025]. Disponível em: https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/a/avc.

16. Brasil. Ministério da Saúde. Guia alimentar: hábitos saudáveis podem evitar complicações durante a gravidez. [citado 20 abr. 2025]. Disponível em: https://www.gov.br/saude/pt-br/assuntos/noticias/2022/julho/guia-alimentar-habitos-saudaveis-podem-evitar-complicacoes-durante-a-gravidez.

17. Guadagnin, SC. Elaboração e Validação de Questionário de Conhecimentos em Nutrição para Adultos [dissertação]. Brasília: Universidade de Brasília; 2010.

18. Associação Brasileira de Empresas de Pesquisa (ABEP). Critério de Classificação Econômica Brasil. Alterações na aplicação do Critério Brasil, válidas a partir de 01/06/2021. [internet]. 2021 [citado 20 abr. 2025]. Disponível em: http://www.abep.org/criterio-brasil.

19. Barroso WKS, Rodrigues CIS, Bortolotto LA, Mota-Gomes MA, Brandão AA, Feitosa ADM et al. Diretrizes Brasileiras de Hipertensão Arterial – 2020. Arq Bras Cardiol 2021; 116(3):516-658.

20. Faludi AA, Izar MCO, Saraiva JFK, Chacra APM, Bianco HT, Afiune Neto A et al. Atualização da Diretriz Brasileira de Dislipidemias e Prevenção da Aterosclerose – 2017. Arq Bras Cardiol 2017; 109(2):1-76.

21. Izar MCO, Lottenberg AM, Giraldez VZR, Santos Filho RD, Machado RM, Bertolami A et al. Posicionamento sobre o Consumo de Gorduras e Saúde Cardiovascular – 2021. Arq Bras Cardiol 2021; 116(1):160-212.

22. Précoma DB, Oliverira GMM, Simão AF, Dutra OP, Coelho OR, Izar MCO et al. Atualização da Diretriz de Prevenção Cardiovascular da Sociedade Brasileira de Cardiologia – 2019. Arq Bras Cardiol 2019; 113(4):787-891.

23. Sociedade Brasileira de Diabetes (SBD). Diretrizes da Sociedade Brasileira de Diabetes – Edição 2024. SBD [internet]. 2024 [citado 14 abr. 2025]. Disponível em: https://diretriz.diabetes.org.br/.

24. Lichtenstein AH, Appel LJ, Vadiveloo M, Hu FB, Kris-Etherton PM, Rebholz CM et al. Dietary Guidance to Improve Cardiovascular Health: A Scientific Statement From the American Heart Association. Circulation 2021; 144(23): 472-487.

25. Instituto Brasileiro de Geografia e Estatística (IBGE). Cidades@. Conheça cidades e estados do Brasil. Disponível em: https://cidades.ibge.gov.br/.

26. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2022: quilombolas: primeiros resultados do universo. Rio de Janeiro: IBGE [internet]. 2022 [citado 16 abr. 2025]. Disponível em: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2102016

27. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostra de Domicílios Contínua: características gerais dos moradores: 2020-2021. Rio de Janeiro: IBGE [internet]. 2022 [citado 20 abr. 2025]. Disponível em: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2101957.

27. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional de Saúde: 2019: informações sobre domicílios, acesso e utilização dos serviços de saúde: Brasil, grandes regiões e unidades da federação. Rio de Janeiro: IBGE [internet]. 2020 [citado 20 abr. 2025]. Disponível em: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2101748.

28. Lima JAS, de Jesus VS, Coelho NJ, Alvarado JCN, de Camargo CL, Whitaker COM. Perfil socioeconômico e demográfico de crianças e adolescentes quilombolas da Bahia. Bras Enferm Ped. 2022; 22.

29. SILVA TC, Martins Neto C, Carvalho CA, Almeida PC, Rodrigues LS, Oliveira BLCA. Risco nutricional e cardiovascular em idosos quilombolas. Cien Saude Colet 2022; 27(1): 219-230.

30. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde: 2019: percepção do estado de saúde, estilos de vida, doenças crônicas e saúde bucal: Brasil e grandes regiões. Rio de Janeiro: IBGE [internet]. 2020 [citado 20 abr. 2025]. Disponível em: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2101764.

31. Brasil. Projeto de Lei nº 1296 de 2019. Apresentado em 31 de maio de 2019. 2022 [citado 25 abr. 2025]. Disponível em: https://www2.camara.leg.br/a-camara/programas-institucionais/experiencias-presenciais/parlamentojovem/edicoes-anteriores/projetos-edicoes-anteriores-2011-2019/2019/PL-1296-rackel_silva_resende-GO.pdf.

32. da Costa ML, Moaraes RB, Vaz DWN, dos Santos GA, Duarte RCC, Santos Junior JAB, et al. Avaliação dos pacientes com Diabetes e Hipertensão em uma Estratégia de Saúde da Família localizada na zona rural do interior do Estado do Pará. Research, Society and Development 2021; 10(3): 1-8.

33. Martins AMEBL, Sampaio HAC, Diogo ATS, Lima PXV, Mesquita LGM, Souto CA, et al. História do Letramento em Saúde: uma revisão narrativa. Revista Unimontes Científica 2022; 24(2): 1–23.

34. Garber AJ, Abrahamson MJ, Barzilay JI, Blonde L, Bloomgarden ZT, Bush MA et al. Consensus Statement by The American Association of Clinical Endocrinologists and American College of Endocrinology on the Comprehensive Type 2 Diabetes Management Algorithm – 2018 Executive Summary. Endocr Pract 2018; 24(1): 91-120.

35. Tabela brasileira de composição de alimentos (TACO). Campinas: Núcleo de Estudos e pesquisas em Alimentação (NEPA)/UNICAMP, 4ª edição revisada e ampliada, 2011. 161 p. [internet]. 2011 [citado 22 abr. 2025]. Disponível em: https://www.cfn.org.br/wp-content/uploads/2017/03/taco_4_edicao_ampliada_e_revisada.pdf.

36. Surma S, Oparil S. Coffee and Arterial Hypertension. Curr Hypertens Rep 2021; 23(7): 38.

37. Allen TS, Bhatia HS, Wood AC, Momin SR, Allison MA. State-of-the-Art Review: Evidence on Red Meat Consumption and Hypertension Outcomes. American Journal of Hypertension 2022; 35(8): 679-687.

38. Oliveira ES, Jesus AP, Martinez RA. Disponibilidade de acesso a alimentos saudáveis nos municípios da microrregião Ilhéus-Itabuna do Estado da Bahia (Brasil). Finisterra 2021; 56(118): 111-129.

39. Yuan Y, Jomaa L, O'Briant J, Powell K. Food Literacy and Mental Health Among College Students Using Campus Food Pantry Services in a Historically Black Institution in the United States. Current Developments in Nutrition 2024; 8(2).

40. DeCS/MeSH. Descritores em Ciências da Saúde. Descritor em português "Quilombolas" [Internet]. BIREME/OPAS/OMS, 2022. [citado 14 abr. 2025]. Disponível em: https://decs.bvsalud.org/ths/resource/?id=59907&filter=ths_termall&q=quilombolas.

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PRELIMINARY CONTRIBUTIONS TO THE DEVELOPMENT OF FOOD AND NUTRITION LITERACY POLICIES FOR QUILOMBOLA COMMUNITIES

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