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# Evaluation of the Dietary Pattern of Rural Residents in the South of the State of Minas Gerais, Brazil

*Original Research Article*

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## ABSTRACT

**Objective:** We tried to learn about the eating habits and their possible consequences on the health of rural residents in the state of Minas Gerais, Brazil in view of the importance of knowing dietary habits in the face of globalization and the risk of developing chronic non-communicable diseases (NCDs).

**Methods:** For this, 1344 people were stratified and interviewed between January 2015 and November 2019, individuals aged 18 years or over, working or residing in the rural area of the micro-region studied were included. Epidemiological, anthropometric and clinical data and assessment of dietary pattern were collected. A survey built and validated by Vigitel was used, and the interviewees received scores referring to food consumption in recent weeks. Thus, they were divided into 3 groups, according to their score, with the highest scoring tertile classified as "adequate", the medium tertile as "intermediate" and the lowest as "inadequate".

**Results:** As a result, most interviewees were men (62.7%), overweight (54.03%), between 44.1 years old, and the average educational level of 6.64 years. Women had higher averages of schooling time and higher values of BMI and waist circumference when compared to males. In addition, a higher percentage of women fit the high dietary pattern when compared to men. Most respondents (54.03%) were classified as overweight, followed by normal weight (41.8%) and underweight (4.06%) when assessing BMI. Older age and level of education varied and were associated to a better quality of diet. It is remarkable that the eating habits of the rural population are increasingly like those in urban areas. Even with better food quality, women have worse anthropometric indices than men. Even though food consumption has changed, it does not appear in the habits of older people.

**Conclusion:** However, it is concluded that public policies that promote healthy eating for rural residents are needed.

*Keywords: Food; life habit; chronic diseases; rural area.*

## 1. INTRODUCTION

The Brazilian diet has been suffering several influences in recent years due to globalization, little time to prepare food, purchase ease, among other factors. The current diet is featured by the combination of a traditional diet mainly represented by rice and beans and ultra-

processed foods, which are rich in calories, fat, sodium and sugar, and low in micronutrients [1]. These dietary changes have been inducing the appearance of chronic non-communicable diseases (NCDs) such as dyslipidemia, diabetes, metabolic syndrome and cardiovascular diseases.

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Little research is done to know the eating habits of rural residents. The few studies show that the food consumption of farming families in recent years has undergone considerable changes, affecting their traditional eating habits. They reveal that industrialized foods such as soft drinks, biscuits and pasta, meat and sausages, and reduced consumption of pulses, fruits and vegetables may be taking place [2]. So, NCDs may be increasing among rural residents.

Family farming, predominant in the southern region of the state of Minas Gerais, Brazil, was featured by producing food for subsistence [3]. Currently, this scenario has been changing through the expansion of monoculture, mainly coffee. This issue, added to the barriers to access goods, low income, low education, great distances, and the difficulty to access public transportation, commerce and health services may also be modifying the quality of this population's diet [2].

Given the importance of knowing the current eating habits of rural population in the face of globalization and the risk of developing NCDs, this study aimed to know the eating habits and their possible consequences on the health of residents of rural areas in the south of the state of Minas Gerais Brazil.

## 2. MATERIALS AND METHODS

This is a cross-sectional population-based study with an evaluative nature. The Unified Health System (SUS) in Brazil adopted regionalization as a strategy to extend the health service to a larger portion of the population and, through public data, a sample calculation was made. This region had a population of 66,266 rural residents of working age, 28,837 women, between 18 and 60 years old, and 37,429 men, between 18 and 65 years old. The population study was randomly sampled from this universe, adopting a margin maximum error rate of 3%.

Thus, the calculated sample size was 1,344 people. The sample size in each sector was determined proportionally to the number of population living in a rural area of working age per municipality. The drawing of each sampling unit (interview) within each municipality was carried out randomly, based on the list of rural communities, obtained from the Municipal Finance and Planning Departments.

Inclusion criteria was: age equal to or higher than 18 years old, being a worker or living in the rural area of the micro-region studied. Exclusion

criteria was: patients who have a chronic non-communicable disease that compromised the answer to the questions, workers who were not found and pregnant women. All were informed about the research and its objectives and signed the Informed Consent Form. The interview was conducted in person by a previously trained investigator. Data collecting took place between January 2015 and November 2019.

Epidemiological variables such as age, education and sex, lifestyle, smoking, alcohol consumption, anthropometric measurements and self-reported clinical signs and symptoms were evaluated. The instrument used to survey epidemiological and clinical data of rural workers was obtained according to SILVÉRIO, et al., 2017 and, to assess the dietary features of the population of this study, the validated Vigitel survey was used [4].

The measurement of abdominal circumference (AC) was performed in compliance with the Technical Standard of the Food and Nutritional Surveillance System - SISVAN [5]. The classification was performed according to the WHO, considering an increased risk for metabolic disease, when WC equal to or higher than 94 cm (men) and 80 cm (women); and super increased risk for WC equal to or higher than 102 cm in men and 88 cm in women.

The recalled weight and height data were used to calculate the Body Mass Index (BMI). Nutritional status was assessed according to the classification of the World Health Organization [5] for individuals under 60 years old being considered: underweight (BMI<18.5kg/m<sup>2</sup>), eutrophic (BMI 18.5kg/m<sup>2</sup> - 24.9kg/m<sup>2</sup>), Excess weight (BMI> 25 kg/m<sup>2</sup>). Those aged 60 years old or more were classified according to Lipschitz, as directed by the Ministry of Health (Ministry of Health, 2011): underweight (BMI<22kg/m<sup>2</sup>), eutrophic (BMI 22kg/m<sup>2</sup> - 27kg/m<sup>2</sup>) and overweight weight (BMI>27kg/m<sup>2</sup>). To make the interpretation of the data easy and to achieve the research objective, the Overweight and obesity categories were grouped into a category called Overweight.

### 2.1 Assessment of Healthy Eating Marker Questions

A healthy eating score was created by our team of researchers including all variables, beans, fruits, raw vegetables, cooked vegetables, milk and soda, at four weekly frequency levels, as described in Tables

1 and 2. The score for each item ranged between 0.1 and 0.8 points, as shown in the tables below.

**Table 1. Healthy food consumption in the last 7 days**

<b>Foods/ Drinks</b>	<b>Não comi</b>	<b>1 day</b>	<b>2 days</b>	<b>3 days</b>	<b>4 days</b>	<b>5 days</b>	<b>6 days</b>	<b>7 days</b>
Raw sallad (lettuce, tomato, carrot...)	0,1 pts	0,2 pts	0,3 pts	0,4 pts	0,5 pts	0,6 Pts	0,7 pts	0,8 pts
Vegetables cooking	0,1 pt	0,2 pts	0,3 pts	0,4 pts	0,5 pts	0,6 pts	0,7 pts	0,8 pts
Fruits	0,1 pts	0,2 pts	0,3 pts	0,4 pts	0,5 pts	0,6 pts	0,7 pts	0,8 pts
Beans	0,1 pt	0,2 pts	0,3 pts	0,4 pts	0,5 pts	0,6 pts	0,7 pts	0,8 pts
Milk or yoghurt	0,1 pt	0,2 pts	0,3 pts	0,4 pts	0,5 pts	0,6 pts	0,7 pts	0,8 pts

Source: The author

**Table 2. Consumption of unhealthy foods in the last 7 days**

<b>Foods/ Drinks</b>	<b>Não comi</b>	<b>1 day</b>	<b>2 days</b>	<b>3 days</b>	<b>4 days</b>	<b>5 days</b>	<b>6 days</b>	<b>7 days</b>
Fried or tortilla chips and fried snacks	0,8 pts	0,7 pts	0,6 pts	0,5 pts	0,4 Pts	0,3 Pts	0,2 pts	0,1 pts
Burger and sausages	0,8 pts	0,7 pts	0,6 Pts	0,5 pts	0,4 Pts	0,3 pts	0,2 pts	0,1 pts
Biscuits, snacks or savory snacks	0,8 pts	0,7 pts	0,6 Pts	0,5 pts	0,4 Pts	0,3 pts	0,2 pts	0,1 pts
Cookies, sweet or stuffed biscuits, sweets, candies and chocolates	0,8 pts	0,7 pts	0,6 Pts	0,5 pts	0,4 Pts	0,3 pts	0,2 pts	0,1 pts
Soda	0,8 pts	0,7 pts	0,6 Pts	0,5 pts	0,4 Pts	0,3 Pts	0,2 pts	0,1 pts

Pts: points

Source: The author

The final score was calculated from the average between the sum of the scores in each table (healthy and unhealthy) ranging from 0 to 4 points.

Thus, we divided the interviewees into 3 groups, according to their score. The dietary pattern was classified according to the groups, with the tertile with the highest score being classified as "suitable", the middle tertile as "intermediate" and the lowest "inadequate".

## 2.2 Statistical Analysis

Descriptive statistical analysis was performed for quantitative variables. Association between categorical variables and qualitative variables was performed using the chi-square test and between quantitative variables using the Kruskal-Wallis test. Assessments were performed using Minitab® 18.1 statistical software.

## 3. RESULTS AND DISCUSSION

Alfenas Health Region, consisting of 26 towns, was the study setting where 1344 subjects were sampled, and socioeconomic data, nutrition, anthropometric and clinical assessments were analyzed.

Family farming was predominant in 74.3% of the reports. As for socioeconomic aspects, most interviewees reported living in the Rural Area. Most interviewees were men (62.7%), the average age was 44.1 years old (SD=16.4), and average education level was 6.64 years (SD=3.92). In addition, the average abdominal circumference was 90.63 and the average BMI was 26.21 kg/m<sup>2</sup> (Table 3). An abdominal circumference of 21 interviewees was not performed. It is remarkable that women had higher average of schooling time and higher values of BMI and AC when compared to males.

Most interviewees (54.03%) were classified as overweight, followed by eutrophic (41.8%) and underweight (4.06%) when assessing the BMI.

To know the eating habits, the research participants were interviewed and the losses and refusals in relation to the answers to the questionnaire totaled 30 people, thus, the eligible sample for this variable totaled 1314 people.

To assess the type of food consumption of the study population, the survey constructed and

validated by VIGITEL [5] was used, with the results shown in Table 4. It is noted that a higher percentage of women fit the high dietary pattern (40.81% in relation to the total number of women), when compared to men (30.82% in relation to the total number of men). In addition, women mostly fit the high and medium dietary pattern, while men fit the medium and low diet pattern. When food consumption was compared with gender, it was observed that there was a significant difference ( $p < 0.001$ ).

**Table 3. Mean anthropometric data in relation to sex.**

	Woman (N= 492)	Man (N= 831)	Total (N= 1323)
Average Abdominal Circumference (cm)	91,13± 15,5	90,50± 11,28	90,63± 12,93
Average Body Mass Index (kg/m <sup>2</sup> )	27,61± 6,56	25,38± 4,14	26,21± 5,29

Source: The Autor.

**Table 4. Classification of dietary pattern distributed by sex**

Food Patern	Woman (N= 490)	Man (N= 824)	Total (N= 1314)
<b>Hight</b> n	200	254	454
%	40,81	30,82	34,55
<b>Medium</b> n	167	300	467
%	34,08	36,4	35,54
<b>Low</b> n	123	270	393
%	25,1	32,7	29,9
<b>p-value<sup>1</sup></b>	0,0001		

<sup>1</sup> p-value for chi-square test.

Source: The Autor.

Among some important cardiovascular risk factors to relate the variable eating habits, were asked about hypertension, smoking and alcohol consumption (Table 5).

As for arterial hypertension, 27.15% reported having a previous diagnosis. Regarding the consumption of alcoholic beverages, 38.73% reported social drinking and smoking, itself, was reported by 31.8%.

When compared to the dietary score, smoking did not interfere with the quality of the diet ( $p = 0.988$ ). However, when comparing food consumption with alcohol consumption, there was a statistical difference ( $p < 0.001$ ). Social drinkers were 38.72% and most fit the medium and low score of the diet. While "non-alcoholic" mostly fit the high score of the diet demonstrating, so the food quality of non-alcoholic is significantly better. In addition, most alcoholic (58.83%) was overweight.

The presence of arterial hypertension did not seem to interfere in the quality of the diet when the tabulated statistical analysis and the chi-square test were performed ( $p = 0.077$ ) (Table 5).

Age was directly associated with better diet quality; older individuals were more likely to fall into the upper tertile. Furthermore, the level of education was also significantly associated to a better quality of food ( $p = 0.014$ ). Those who have more than 6 years of schooling end up falling into the tertile of high dietary standards.

Waist circumference, itself, was a variable that was not significantly related to diet quality (Table 6).

When we analyzed the BMI, 54 individuals fit the classification underweight, 546 eutrophic, 706 as overweight. An anthropometric assessment of 38 interviewees was not performed. Thus, among underweight individuals, the majority (37.04%) fell into the tertile of better diet quality. hen we

analyzed the eutrophic individuals, 37.91% had a diet in the middle tertile. In addition, the majority (37.96%) of overweight individuals were

classified as having worse diet quality. The relations above, which relate BMI to diet quality, were statistically significant ( $p = 0.027$ ) (Table 7).

**Table 5. Proportion of the sample (n=1314) rural residents in the south of Minas Gerais with presence/absence of cardiovascular risk factors in relation to dietary pattern**

Cardiovascular Risk Factors	Dietary Pattern (%)			p-value <sup>1</sup>
	High	Medium	Low	
Arterial Hypertension				
Presence	28.92	29.03	22.90	Ns
Absence	71.08	70.97	77.10	
Alcohol Consumption				
Presence	31.50	42.61	42.49	0.0001
Absence	68.50	57.39	57.51	
Smoker				
Presence	32.16	31.81	31.69	Ns
Absence	67.84	68.19	68.31	

<sup>1</sup>p-value for chi-square test.  
Source: The Autor.

**Table 6. Age, educational level and waist circumference of rural residents in the south of Minas Gerais in relation to dietary pattern**

	Dietary Pattern			p-value <sup>1</sup>
	High	Medium	Low	
Age (Years)	45	44	41	0.001
Level of education (Years)	6	5	5	0.014
Waist circumference (cm)	91	90	90	Ns

<sup>1</sup>p-value for Kruskal-Wallis test.  
Source: The Autor.

**Table 7. Proportion of the sample (n=1306) of rural residents in the south of Minas Gerais in relation to dietary pattern and BMI classification**

BMI classification	Dietary Pattern (%)		
	High	Medium	Low
Underweight	37.04	29.63	33.33
Eutrophic	32.60	37.91	29.49
Overweight	27.62	34.42	37.96
p-value <sup>1</sup>	0.027		

<sup>1</sup>p-value for chi-square test.  
Source: The Autor.

The objective of this work was to know the eating habits and their possible consequences on the health of residents of the rural area in the south of the state of Minas Gerais, Brazil. For that, data from health indicators and a global assessment of the population were related, which is being assisted by the Plantando e Harvesting Health Project, an extension project of José do Rosário Vellano University, aimed at taking care of rural workers. The importance of this research in the southern region of Minas Gerais is based on the fact that agriculture is a traditional and widely

distributed economic activity, with the state of Minas Gerais being the largest coffee producing state in Brazil, accounting for about 50% of national production and for 2/3 of total Arabica coffee production [6]. Thus, knowing the food profile of these residents of rural areas makes us understand the changes in diet in recent years with globalization.

To assess the type of food consumption of the study population, the survey constructed and validated by Vigitel [4] was used. This survey

was chosen due to its ease of application and understanding by the population.

Food choices are influenced both by biological factors and by social, cultural and economic factors, with an emphasis, on the last case, on family income and food prices. Thus, feeding is described as a complex process [7]. Recent surveys show that the food consumption of farming families in recent years has passing through changes and their traditional eating habits have been affected [8], as demonstrated in our study. We noticed that most of the interviewees lived in rural areas and practiced family farming and it is even remarkable that their eating habits are increasingly closer to urban habits.

In the present study, it was found that women have higher BMI and AC values than men, despite of better dietary pattern. According to the World Health Organization [9] women are more obese than men. The causality of obesity is multifactorial, encompassing genetic aspects, hormonal factors and lifestyle [9]. Some studies demonstrate that the reproductive and gynecological background (pregnancies, age at menarche, menopause, use of contraceptives) can result in excessive weight gain at this stage of life, justifying high values of BMI and AC in women [10,11]. Furthermore, studies demonstrate that the prevalence of female obesity has been showing a rapid and progressive increase in the last decades all over the world [12].

Westenhoefer [13] found that women are more concerned about food choices than men, in the search for weight control, health beliefs and higher nutritional knowledge of foods, which may explain the higher prevalence of some healthy behaviors when compared to men. The exploration of the components of female food consumption habits highlighted the centrality of the body to this habit and when data agrees on theory, showed the distinction between nutrition and food and the strategies used by women to combine control of intake of food and the pleasure of eating. Data from *Vigitel Brasil 2018* [14] showed that in Brazil, the regular consumption of fruits and vegetables was 33.9%, being lower among men (27.7%) than among women (39.2%).

In the present study, it was found that men have a worse diet than women. There are some reasons that lead this conclusion to be

recognized by several other studies, such as the difficulty in recognizing their own health needs, denying the possibility of getting ill, which comes from the cultural issue of male invulnerability [15]. Other specific reasons for this population are the difficulty in preserving food, spending the whole day on the fields, thus not being able to diversify their diet.

When we mention the health of rural workers, rural populations have historically faced care models and fragmentation of actions proposed by public health policies that are not fixed in the practice of these services [15].

The high consumption of sugar, saturated fats and salt is present, presenting themselves as risk factors for the development of diabetes mellitus and/or arterial hypertension and, respectively, the increased risk of cardiovascular diseases [16]. In the present study, most subjects were classified as overweight, which is worrying, since obesity is a public health problem due to its relation to the incidence of non-communicable chronic diseases (cardiovascular diseases, diabetes, diseases respiratory) and cancer [17].

In addition, underweight was prevalent at 4.06% and they fit into the worst quality tertile of the diet. The association between low weight and macro and micronutrient deficiencies are considered a major public health problem, as they cause various health problems for individuals, since these nutrients play an important role in the maintenance of vital organic functions, such as growth, reproduction, antioxidant function and immune function [18].

Hypertension was seen as a major factor for increased cardiovascular risk, with 27.15% of the study population previously diagnosed with the disease. Based on a study from 2013 [19], the prevalence of AH was higher in the urban area, 27.1%, when compared to the rural area, 19.8%.

We can also justify this fact to the resident of rural areas having better food when compared to urban areas, due to less access to restaurants, fast foods and industrialized products. In addition, they have more natural subsidies due to the fact that many have family farming [19].

Alcohol dependence results in physical and clinical weakness. The feeling of weakness leads to an increase in the consumption of sugars and fats in order to alleviate the desire to drink alcohol, which can lead to weight gain, favoring the development of chronic diseases. Ethanol

metabolism also leads to an increase in triglycerides and a decrease in lipid beta oxidation leading to weight gain. Thus, many alcoholics are overweight, obese and even waist circumference above the expected standards [20,21]. The drinkers, who corresponded to 38.73% of the sample, fit mainly in the middle and low tertile of the diet. Non-drinkers, on the other hand, fell into the high and medium tertile. Thus, it can be noticed that, as expected, drinkers have worse eating habits than those who are not drinkers. Therefore, the poor dietary pattern associated to the metabolism related to alcohol use leads to weight gain and increases the development of NCDs. Our study also showed that most alcoholics (58.83%) were overweight, as expected. What configures alcoholism as a public health problem.

The habit of consuming more and more industrialized products is a hallmark of modernity. However, even though food consumption has changed, it does not seem to interfere in such a significant way in the habits of older people. The result can be related to the time when they created their habits, when there was a smaller amount of processed, ultra-processed and fast food. Our study showed that older individuals have a better quality of food. Furthermore, several recent studies show that this is also happening in urban areas. Another factor that can influence this finding is the higher number of health problems that come with age, resulting in better guidance and better care about food consumption for an extension of life and survival. Furthermore, those with the worst eating habits are at risk of developing comorbidities, so the group in question also increases [1].

Some studies relate low education with excess weight [22,23], justifying that a limited level of understanding could affect the adoption of healthier lifestyles and the prevention of weight gain. What was also proved in our study, we noticed that those who have more than 6 years of schooling end up fitting into the tertile of high dietary pattern when compared to those with less than 5 years of schooling.

The primary health care (PHC) services must be available for each new problem or new episode of the same health problem (gateway), therefore, providing continuous care to the population in its coverage area (longitudinality), offering promotion actions, prevention, cure and rehabilitation appropriate to their context and referrals only to cases that transcend the possibilities of PHC, in a biopsychosocial

approach to the health-disease process (completeness) centralizing the information and all the care the patient receives (care coordination), with cultural competence and in a family- and community-oriented way – the relation between the world of work and the health-disease process [24]. Therefore, the minimization of risks through educational guidelines for workers in the communities they assist should be the focus of units in rural areas. Thus, the PHC as a whole must know the eating habits of rural residents so that Primary Health Care is carried out comprehensively and guided by a factor as important as food.

The main explanatory hypothesis for not detecting such a frequent health problem in a high-risk population that has access to Primary Care services is that although the Health Units are available to this population, they do not even have any essential attributes of Primary Care to play its role to the population, aiming at health promotion and prevention. In order to detect the health problem of an enrolled population, it is necessary for the PHC to know their habits. Knowing their eating habits directly shows the health problems that can happen to these people.

#### **4. CONCLUSION**

Thus, it is concluded that there is a need for public policies implemented by the PHC that promote the maintenance of low consumption of ultra-processed foods and increase the consumption of fresh foods. The nutritional transition appears more advanced in younger adults. With the progression of this type of food, chronic non-communicable diseases are becoming more prevalent in the rural population, leading to more comorbidities in rural life.

#### **CONSENT**

All authors declare that 'written informed consent was obtained from the patients for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

#### **ETHICAL APPROVAL**

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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