

# Food Intake of Patients with Thyroid Nodules: a Brazilian Food Guides-Based Analysis

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*Consumo Alimentar de Pacientes com Nódulos Tireoidianos: uma Análise Baseada em Guias Alimentares Brasileiros*  
*Consumo de Alimentos de Pacientes con Nódulos Tiroideos: un Análisis Basado en las Guías Alimentarias Brasileña*

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## ABSTRACT

**Introduction:** The thyroid gland has the function of secreting hormones that play an important role in metabolism. Alterations in this function may bring complications to individuals, among them thyroid nodules. The prevalence of thyroid nodules is higher in white people, older adults, women, smokers, with accumulated body fat and larger waist circumference. **Objective:** The aim of this study was to compare dietary intake of patients with benign (BN) and malignant (MN) thyroid nodules. **Method:** A cross-sectional study was conducted with 62 patients. Dietary intake was assessed using 24-hour dietary recall, according to the 2006 and 2014 *Dietary Guidelines for the Brazilian Population*. Mean consumption of each food group was compared between patients with BN and MN by Student's *t*-test. **Results:** The sample consisted mostly of females with mean age of 43 years old. Based in the 2006 Guide, patients with BN and MN presented low consumption of fruits, vegetables, milk and dairy products, and high consumption of meat. Total caloric intake ( $p=0.03$ ) and of the group of sugars and sweets ( $p=0.03$ ) were higher among individuals with MN compared with BN. Considering the 2014 Guide, the highest caloric contribution for the diet was from minimally processed foods group. **Conclusion:** Patients with MN had higher energy intake of sugars and sweets. For all other food groups investigated, no significant difference between individuals with MN and BN was encountered.

**Key words:** thyroid nodule; thyroid neoplasms; eating; food guide.

## RESUMO

**Introdução:** A glândula tireoide tem a função de secretar hormônios que desempenham importante papel no metabolismo. Alterações nessa função podem trazer complicações aos indivíduos, entre elas, os nódulos tireoidianos. A prevalência desses nódulos é maior em pessoas brancas, idosas, mulheres, fumantes, com gordura corporal acumulada e maior circunferência da cintura. **Objetivo:** Comparar o consumo alimentar de pacientes com nódulos benignos (NB) ou malignos (NM) da tireoide. **Método:** Realizou-se um estudo transversal com 62 pacientes. O consumo alimentar foi avaliado utilizando recordatório alimentar de 24 horas, segundo as diretrizes das versões de 2006 e 2014 do *Guia Alimentar para a População Brasileira*. As médias de consumo de cada grupo alimentar foram comparadas entre os pacientes com NB e NM pelo teste *t* de Student. **Resultados:** A amostra foi composta predominantemente por mulheres com idade média de 43 anos. Considerando a versão de 2006 do *Guia Alimentar para a População Brasileira*, tanto os pacientes com NB quanto com NM apresentaram baixo consumo dos grupos das frutas, verduras e hortaliças, leite e derivados, e elevado consumo do grupo das carnes. O consumo calórico total ( $p=0,03$ ) e do grupo de açúcares e doces ( $p=0,03$ ) foi maior entre indivíduos com NM comparados com indivíduos com NB. Considerando a versão de 2014 do *Guia*, a maior contribuição calórica da dieta foi proveniente do grupo de alimentos minimamente processados. **Conclusão:** Pacientes com NM apresentam maior consumo calórico e de açúcares e doces. Para todos os outros grupos alimentares estudados, não houve diferença significativa entre os indivíduos com NM e NB. **Palavras-chave:** nódulo da glândula tireoide; neoplasias da glândula tireoide; ingestão de alimentos; guias alimentares.

## RESUMEN

**Introducción:** La glándula tiroidea se encarga de segregar hormonas que desempeñan un papel importante en el metabolismo. Los cambios en esta función pueden traer complicaciones a los individuos, entre ellas los nódulos tiroideos. La prevalencia de los nódulos tiroideos es mayor en personas de raza blanca, de edad avanzada, mujeres, fumadores, con grasa corporal acumulada y mayor perímetro de cintura. **Objetivo:** Comparar la ingesta dietética de pacientes con nódulos tiroideos benignos (NB) y malignos (NM). **Método:** Estudio transversal con 62 pacientes. La ingesta dietética se evaluó mediante el recuerdo dietético de 24 horas, de acuerdo con las directrices de las versiones de 2006 y 2014 de la *Guía Alimentaria para la Población Brasileña*. Se comparó el consumo medio de cada grupo de alimentos entre los pacientes con NB y NM mediante la prueba *t* de Student. **Resultados:** La muestra estuvo compuesta predominantemente por mujeres, y la edad media fue de 43 años. Teniendo en cuenta la *Guía* 2006, tanto los pacientes con NB como los que tenían NM tenían un bajo consumo de frutas, verduras, leche y productos lácteos, y un alto consumo de carne. La ingesta calórica total ( $p=0,03$ ) y del grupo de azúcares y dulces ( $p=0,03$ ) fue mayor entre los individuos con NM en comparación con los de NB. Teniendo en cuenta la *Guía* 2014, el mayor aporte calórico de la dieta procedía de los alimentos mínimamente procesados en los grupos. **Conclusión:** Los pacientes con NM tuvieron una mayor ingesta energética y consumo de azúcares y dulces. Para el resto de grupos de alimentos estudiados, no hubo diferencias significativas entre los individuos con NM y NB. **Palabras clave:** nódulo tiroideo; neoplasias de la tiroidea; ingestión de alimentos; guías alimentarias.

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## INTRODUCTION

The main function of the thyroid gland is the secretion of thyroid hormones, which plays an important role in the metabolism and activity of cells, with physiological effects on various target organs. Changes in the function of this gland may bring several complications to individuals<sup>1</sup>, among them the thyroid nodules (TN), which is characterized by any distinguishable lesion of the normal thyroid parenchyma, with abnormal growth of thyroid cells, and may be classified as benign or malignant<sup>2</sup>.

In each year of the triennium 2020-2022 it is estimated in Brazil more 1,830 new cases of thyroid cancer in men (1.72/100,000) and 11,950 cases in women (11.15/100,000), ranked 13<sup>th</sup> and 5<sup>th</sup> compared to other types of cancer. In Brazil's Northeast region, thyroid cancer is ranked 12<sup>th</sup> and 5<sup>th</sup> among cancer cases for men and women<sup>3</sup>. The increased incidence of thyroid nodules may be related to advances in diagnostic technology, such as ultrasound-guided fine needle aspiration (UGFNA)<sup>4</sup>.

Studies have shown higher prevalence of thyroid nodules in white individuals<sup>5</sup>, older adults, women<sup>6</sup>, with accumulated body fat and larger waist circumference and smokers<sup>6,7</sup>. In a specific study, dyslipidemic obese patients had low intake of selenium, a mineral playing an important role in the thyroid gland<sup>8</sup> and may increase the activities of thyroid hormones<sup>9</sup>. Furthermore, as a result of a systematic review, selenium is found in decreased levels in the serum and tissues of thyroid cancer patients<sup>10</sup>.

On the other hand, evidence points to lower prevalence of TN in individuals with higher intake of fish and seafood, fruits, and vegetables<sup>11,12</sup>, because it is evident that proper nutrition is an important factor in the prevention of several diseases, including cancer<sup>13</sup>. A diet with higher iodine intake is associated with direct and indirect findings suggesting an increase in thyroid autoimmunity<sup>14</sup>. Increased intake of nitrates, usually contaminants of industrialized products, may act as a disruptor of the thyroid function, decreasing iodine uptake in the thyroid and possibly contributing to local carcinogenesis<sup>15,16</sup>.

Although there is still no consensus on the influence of food on the prevalence of thyroid nodules, it is known that a healthy diet has a protective effect against noncommunicable diseases (NCDs). In this sense, the development of food guides aims to promote health, acknowledging the importance of good nutrition to maintain it, improving the nutritional status of the population, and consequently preventing diseases<sup>17</sup>.

The two versions of the Food Guide for the Brazilian Population were published in 2006<sup>17</sup> and 2014<sup>18</sup>. The first guide brings a quantitative analysis of food groups, while the second differs by bringing recommendations that promote

a qualitative analysis of intake. The 2006 guideline brought the recommended daily servings for each food group (cereals, tubers, and roots; fruits; vegetables and legumes; beans and oilseeds; milk and derivatives; meats and eggs; fats, oils and oil seeds and sugars and sweets) for a total caloric value - TCV of 2000kcal<sup>17</sup>.

The main topic addressed in the second edition of the guide (2014) was the degree of food processing: *in natura*, minimally processed, processed and ultraprocessed<sup>18</sup>. Additionally, the intake recommendations of the 2014 Guide were criticized by the population and the food industry, influencing the decisions of public health nutrition professionals and politicians<sup>19</sup>.

The study aims to compare the dietary intake of patients with benign (BN) and malignant (MN) thyroid nodules, considering different approaches of Brazilian nutritional public policies, according to the 2006 and 2014 versions of the Food Guides for the Brazilian Population<sup>17,18</sup>.

## METHOD

Cross-sectional quantitative approach study. Data collection was performed between 2015 and 2017 in a reference philanthropic hospital for patients with thyroid nodules, affiliated to Brazil's National Health System (SUS), in Fortaleza, Ceará (CE), Brazil.

The study population consisted of 62 patients with benign and malignant thyroid nodules who have been referred for partial or total thyroidectomy selected by convenience, therefore no specific checklist for observational studies was applied (Figure 1). The sample size was determined by the total number of thyroidectomies performed in 2015 (115 surgeries) and using the equation proposed by Bassan<sup>20</sup> for finite populations, with a confidence level of 95%.

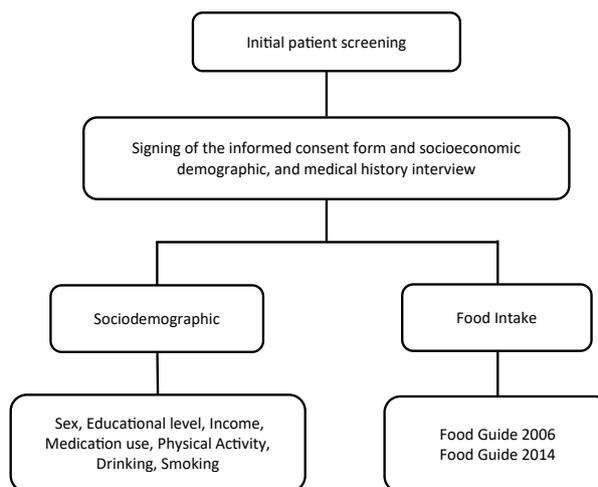


Figure 1. Flowchart of patient survey activities

The Institutional Review Board of “*Universidade Estadual do Ceará*”, CAAE 1.526.420, approved the study in compliance with Resolution 466/12 of the National Health Council (CNS)<sup>21</sup>. The study participants signed the Informed Consent Form (ICF) where the right to anonymity and to withdraw at any time without any harm to the patient were clearly stated.

The patients were interviewed and divided into two groups according to the baseline thyroid disease (BN, Benign Nodules and MN, Malignant Nodules).

Inclusion criteria were: age over 18 years and absence of infectious or non-communicable diseases. Patients with malabsorption syndromes, alcohol use, and mineral nutritional supplementation, which are conditions that may interfere with the absorption of some nutrients, as well as the extra supply of these nutrients, were not included.

The food intake was assessed based on three 24-hour dietary recall applied to the sample, referred to two working days and one weekend day. The first was applied on the day of collection and the other two by telephone.

To estimate food intake, the ingestion data were converted from home measures to grams based on the Table for Food Consumption Assessment in Home Measures<sup>22</sup>, and then entered into a spreadsheet to estimate the composition of foods based on the Brazilian Table of Food Composition (TACO)<sup>23</sup>.

The editions of 2006<sup>17</sup> and 2014<sup>18</sup> of the Food Guide for the Brazilian Population were utilized, and the short-title 2006 Guide and 2014 Guide as reference in the article. According to the 2006 Guide<sup>17</sup>, the foods investigated were divided into eight food groups, where the recommendation is individual 2000 kcal diet per day consisting of 6 servings of cereals, tubers, and roots; 3 servings of fruits; 3 servings of vegetables; 1 serving of beans and oilseeds; 3 servings of milk and dairy products; 1 serving of meat and eggs; 1 serving of fats, oils, and oil seeds, and 1 serving of sugars and sweets. Then, the consumption in number of daily servings of each food group for each individual was calculated based in the average of three days of 24-hour dietary recall<sup>17</sup>.

In the 2014 Guide<sup>18</sup> based evaluation of food consumption, the foods were classified according to the level of processing: *in natura*, minimally processed, processed foods, ultra-processed, and oils, fats, and sugars. This classification was carried out with information on the type of food processing as well as the ingredients on the labels of the industrialized products referred to in the recall, using scientific material to support the classification<sup>24</sup>. Using the average energy of each group in percentage, the data were applied to a spreadsheet based on TACO<sup>23</sup> to estimate the caloric contribution of each

group in the total caloric intake of each individual. At the end, the comparison of food intake between the two groups investigated was performed.

For statistical purposes, descriptive analysis with numerical variables presented as mean (standard deviation) and categorical variables as simple and percentage frequencies was performed. The normality of continuous variables was tested using Shapiro-Wilk. Student's t-test was used to compare means between the two groups investigated. For all tests, a 5% significance level was adopted. The data were processed in SPSS software version 20.0.

## RESULTS

The study population consisted of 62 patients, 32 from the BN group and 30 from the MN group. Females were predominant in both groups (90.5%) and mean age was 43 years (standard deviation - 11.67), with no difference between the groups. Table 1 shows the sociodemographic data of the group investigated.

The consumption of cereals, milk, vegetables, and fruits were below the recommended in both groups, with emphasis on vegetables and fruits, which were below 50% of the food guide recommendations. The groups beans, sugars and sweets, fats, and meats were above the recommended (Table 2). The high intake of the meat group (245% BN and 262% MN) and fats in both groups investigated (153% BN and 187% MN) stands out.

When comparing the portions of the food groups between both groups, the sugar group consumption was higher among individuals with MN (150%) than with those with BN (68%) ( $p=0.03$ ) (Table 2). The other groups had no significant difference between the groups.

The total caloric value of the diet was 1786.5 kcal for individuals with MN and 1535.8 kcal for those with BN, distributed as follows: 58.7% (MN) and 60.4% (BN) for the minimally processed food group, with no significant difference between them. The category of fats, oils and sugars showed an average contribution of approximately 11.8% for both groups (Table 3).

## DISCUSSION

The intake of cereals, milk, vegetables and fruits was low. There was also an above-recommended consumption of meats, fats, sugars and sweets by MN and BN patients. It is noteworthy the higher consumption of foods of the sugars and sweets group by MN patients, as well as a low intake of *in natura* foods. Nevertheless, both groups investigated had a high consumption of minimally processed foods.

**Table 1.** Distribution of participants according to groups and sociodemographic and clinical variables. Fortaleza-CE, 2015-2017

Variable	Classification	Group				Total		p-value
		Benign		Malignant		N	%	
		N	%	n	%			
Sex	Female	27	83.3	29	51.7	56	90.3	0.113 <sup>‡</sup>
	Male	5	48.2	1	16.6	6	9.6	
Educational level	IES	13	63.1	12	48.0	25	40.3	0.697 <sup>‡</sup>
	CES	3	42.8	4	57.1	7	11.2	
	ISS	1	50.0	1	50.0	2	3.2	
	CSS	12	52.0	7	36.8	19	30.6	
	IHE	0	0.0	2	100.0	2	3.2	
	UD	3	42.8	4	57.1	7	11.2	
	< 1 MW	3	100.0	0	0.0	3	4.8	
Income	1 to 2 MW	25	49.0	26	50.9	51	82.2	0.345 <sup>‡</sup>
	> 2 MW	4	50.0	4	50.0	8	12.9	
	Medication use	Yes	9	56.2	7	43.7	16	
No	23	50.0	23	50.0	46	74.1		
Physical activity	Yes	10	45.4	12	54.5	22	35.4	0.597 <sup>£</sup>
	No	22	55.0	18	45.0	40	64.5	
Drinking	Yes	4	100.0	0	0.0	4	6.4	0.114 <sup>‡</sup>
	No	28	48.2	30	51.7	58	93.5	
Smoking	Yes	1	100.0	0	0.0	1	1.6	1.000 <sup>‡</sup>
	No	31	50.8	30	49.1	61	98.3	

**Captions:** MW = minimum wage (R\$ 880.00); IES = incomplete elementary school; CES = complete elementary school; ISS = incomplete secondary school; CSS = complete secondary school; IHE = incomplete higher education; UD = university degree.

(‡) Incomplete Fisher's exact chi-square test.

(£) Pearson's chi-square test; p value considered significant below 5%.

**Table 2.** Comparison of consumption of food groups among individuals with malignant and benign thyroid nodules, values expressed in mean ± standard deviation. Fortaleza-CE, 2015-2017

Categories	Average Servings	MN Group (n)	BN Group (n)	Average servings (MN)	Average servings (BN)	% (MN)	% (BN)	p*
Cereals	5.0	30	32	5.2 ± 2	4.7 ± 2.3	86	79	0.424
Beans	1.2	30	32	1.2 ± 0.8	1.1 ± 0.8	115	114	0.943
Fats	1.7	30	32	1.9 ± 0.8	1.5 ± 0.7	187	153	0.071
Sugars and Sweets	1.1	30	32	1.5 ± 2	0.7 ± 0.5	150	68	0.028
Meats	2.5	30	32	2.6 ± 1.1	2.5 ± 1	262	245	0.551
Milk and dairy products	1.4	30	32	1.6 ± 1	1.3 ± 1.9	54	42	0.227
Vegetables	0.5	30	32	0.5 ± 0.6	0.5 ± 0.8	16	17	0.814
Fruits	1.1	30	32	1.2 ± 1.1	1 ± 0.8	40	33	0.430

**Captions:** BN = benign nodule; MN = malignant nodule; n = sample.

(\*) Student's t-test.

**Table 3.** Comparison of food consumption according to the level of food processing among individuals with benign and malignant thyroid nodules. Fortaleza-CE, 2015-2017

Categories	Average Servings	MN Group (n)	BN Group (n)	Average servings (MN)	Average servings (BN)	P*
In natura (%)	7.50 ± 5.8	30	32	6.7 ± 5.6	7.7 ± 6	0.534
Minimally Processed (%)	59.60 ± 11.9	30	32	58.7 ± 11.3	60.4 ± 12.5	0.583
Processed (%)	13.40 ± 8.0	30	32	13.5 ± 8.5	12.6 ± 7.6	0.671
Ultra-processed (%)	7.70 ± 6.5	30	32	8.4 ± 7.3	7.0 ± 5.6	0.400
Fats, oils and sugars (%)	11.80 ± 4.1	30	32	12.2 ± 4.3	11.4 ± 4	0.454
Total Caloric Intake (Kcal)	1657.1 ± 461.1	30	32	1786.5 ± 506.9	1535.8 ± 382.9	0.031

**Captions:** BN = benign nodule; MN = malignant nodule; n = sample.

(\*) Student's t-test.

Dietary habits can modify the risk of thyroid carcinoma. Diets with reduced intake of high carbohydrates-foods, salt, fat, and sugar and increased intake of cruciferous vegetables, milk and dairy products, and seafood may be protective against thyroid cancer<sup>25</sup>. The high glycemic index of refined cereals and high-sugar foods have been associated with thyroid cancer risk<sup>26</sup>.

The individuals investigated presented very low intake of foods belonging to the groups of vegetables, fruits, and milk. It is known that the consumption of these foods can act as a protective effect for several noncommunicable diseases. By associating the consumption of raw vegetables and fruits, a significant protective effect against the risk of developing thyroid cancer in patients with thyroid nodules was observed<sup>27</sup>.

The preference for sugars may be influenced by mechanisms that relate the central nervous system and endocrine system, because the intake of sugars causes negative feedback to satiety, which further stimulates its consumption<sup>27</sup>. In addition, it may be associated with other factors, such as price and advertising exposure campaigns that encourage consumption<sup>28</sup>.

The consumption of sugar and sugar-rich foods has also been related to increased risk of breast cancer in postmenopausal women<sup>29</sup>. Other authors have also found that the consumption of added sugar in juices correlated with an increased risk of developing thyroid cancer<sup>30</sup>.

A study<sup>31</sup> that evaluated obesity and the intake of carbohydrates and proteins as risk factors for thyroid cancer showed that high ingestion of carbohydrates and proteins was associated with increased susceptibility for developing thyroid cancer. Another study<sup>32</sup>, which analyzed the risk and protection factors for NCDs in the Brazilian population considering the recommendations of the 2006 Guide, noticed consumption of fruits and

vegetables below the recommended levels and that poor consumption of these food groups, along with sedentary lifestyle and smoking are related to increased risk of noncommunicable diseases.

In a study<sup>33</sup> that evaluated the association between macro-and micronutrients intake and the risk of developing thyroid cancer in Korean women, it was found that higher calcium intake was associated with lower incidence of thyroid cancer. In the present study, there was low consumption of milk and dairy products, which is the main sources of calcium in the diet.

Through a detailed analysis of 24-hour dietary recall data, it was observed that the consumption of the meat group was high in individuals with MN and BN, with predominance of red meat and chicken, in contrast to fish.

A systematic review conducted in the Asian population in 2008 found that consumption of red meat, processed meat, sugar, saturated fat, and refined carbohydrate was significantly associated with higher risk of colon cancer<sup>34</sup>. Choi and Kim<sup>12</sup> in a review study analyzed dietary factors and the risk of developing thyroid cancer in different ethnic groups and concluded that there are various dietary patterns and lifestyles, and that individuals are exposed to different environmental factors.

Minimally processed foods was the category with the highest caloric contribution for both BN and MN individuals, concurring with the 2014 Guide that recommends that *in natura* and minimally processed foods should be the base of the diet<sup>18</sup>.

The Consumer Expenditure Survey: 2017-2018<sup>35</sup> highlights that the *in natura* or minimally processed foods and processed culinary ingredients are the major contribution for the diet of the Brazilian population, indicating a predominance of food patterns based on fresh

foods and culinary preparations, which corroborates the findings of the present investigation.

According to the same source, there was no great caloric contribution from processed and ultra-processed foods, but among these foods there was a predominance of sugary drinks, such as soda, sandwich cookies, and canned fruit candies. Fiolet et al.<sup>36</sup> point out that sugary products and beverages have been correlated with the risk of several types of cancer such as breast and ovarian.

Furthermore, no differences were found between the categories of food processing levels in MN and BN patients. It is known that food choices are influenced by biological, genetic, physiological, psychological, and personality determinants, therefore a pattern cannot be established for both group of patients<sup>37</sup>.

Although further investigations are needed to confirm the evidences, the ultra-processed food group may be contributing for the development of malignant tumors in both groups. Since most of the foods consumed were processed/ultra-processed, defined as formulations of food substances often modified by chemical processes and assembled into ready-to-eat foods and beverages using flavorings, colorings, emulsifiers, and other cosmetic additives, making them highly profitable, intensely attractive, and intrinsically unhealthy, it would be beneficial for consumers of these products the use of harmless preservation methods, such as non-alcoholic fermentation<sup>38</sup>.

In contrast, reducing the consumption of ultra-processed foods would substantially improve the quality of the diet and help the population to obtain the essential nutrients recommended when associated with non-communicable diseases<sup>39</sup>.

The mean total caloric intake of 1653.17 kcal/day was similar to that found by other studies, in which higher caloric intake was also observed among patients with MN, which may contribute to increase until five times the risk of thyroid cancer<sup>33,40</sup>.

A survey evaluating the impact of ultra-processed food consumption on the micronutrient content in the diet of the Brazilian population showed an average caloric intake of 1866 kcal, of which 69.5% came from *in natura* and minimally processed foods, 9.0% from processed foods, and 21.5% from ultra-processed foods. The increased caloric contribution of ultra-processed food in the diet was inversely associated with the content of micronutrients: vitamins B<sub>12</sub>, D, E, niacin, pyridoxine, and the minerals copper, iron, phosphorus, magnesium, selenium, and zinc<sup>41</sup>.

The food guides for the Brazilian population are important tools guiding programs and practices of food and nutritional education. In the first edition the impact of healthy eating practices in the prevention of early deaths by malnutrition, infectious diseases, and

non-communicable diseases has been determined. Due to the changes of the Brazilian health scenario, the updated version included innovative nutrition policies and programs. The advances and limitations of the second edition are clear, being relevant to understanding the food guide, in addition to strategies for the implementation of socio-cultural and environmental recommendations<sup>42</sup>.

In addition to the cross-sectional design, which does not help to determine cause and effect, there are other study limitations such as the small size of the sample investigated, application of the 24-hour dietary recall before and after surgery, and memory bias of patients in the collection of food records. However, the study is relevant for investigating the consumption of patients with malignant and benign thyroid nodules, highlighting the relevance of the proposed dietary guides for maintaining healthy eating habits and generating important hypotheses for the development of epidemiological studies that investigate the relationship of food intake and thyroid cancer.

## CONCLUSION

The individuals with thyroid nodules (BN and MN) had a low intake of fruits, vegetables, milk and dairy products and a high intake of meats. The caloric intake came predominantly from unprocessed and minimally processed foods. The MN group had higher sugar and energy intake compared with the BN group. There was no difference in the level of food processing consumed by individuals with MN and BN. Although the findings do not ensure that a poor quantitative intake of food according to the 2006 Guide may favor the genesis of thyroid nodules, possibly they may uphold health promotion actions focused to the prevention of thyroid nodules.

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## CONTRIBUTIONS

Carla Soraya Costa Maia and Leylyanne Alexandre Freitas de Vasconcelos designed the study. Leylyanne Alexandre Freitas de Vasconcelos, Renata Carmo de Assis, Ana Bárbara Muniz Araújo and Thayane Maria Tomé de Sousa collected and analyzed the data and drafted the manuscript. Soraia Pinheiro Machado Arruda conducted the statistical analyzes. Carla Soraya Costa Maia and Soraia Pinheiro Machado Arruda Renata Carmo de Assis, Ana Bárbara Muniz Araújo, Ashley Brito Valentim and Thayane Maria Tomé de Sousa supported the data interpretation and drafting of the manuscript. All authors have approved the final version to be published.

**DECLARATION OF CONFLICT OF INTERESTS**

There is no conflict of interests to declare.

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