

## Original articles

# Voice- and swallowing-related symptoms after total thyroidectomy: evidence from a Brazilian national survey

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**ABSTRACT**

**Purpose:** to estimate the prevalence of voice- and swallowing-related symptoms in women submitted to total thyroidectomy.

**Methods:** a population-based, observational, cross-sectional, analytical study, based on a Brazilian national survey. A total of 252 women, aged 18 to 58 years, submitted to total thyroidectomy, residing in the five geographical regions of the country participated in the study. All of them answered the version of the Thyroidectomy-Related Voice Questionnaire translated and adapted into Brazilian Portuguese, besides questions on demographic and clinical issues. A descriptive analysis of the categorical and quantitative variables was conducted. The relationship between the total TVQ score and the independent variables was analyzed with the Mann-Whitney and Kruskal-Wallis tests. The significance level used was 5%.

**Results:** the most prevalent symptoms were, tired voice, after talking for a long time (50%), and dry mouth/thirst (43.3%). The voice-related symptoms were more prevalent than those related to swallowing. The total TVQ score was not related to age group ( $p=0.141$ ), profession ( $p=0.213$ ), region of residence ( $p=0.303$ ), time since surgery ( $p=0.955$ ), and radiotherapy/radioiodine therapy ( $p=0.666$ ).

**Conclusion:** Brazilian women submitted to total thyroidectomy have a high prevalence of voice- and swallowing-related symptoms, the former being predominant.

**Keywords:** Thyroidectomy; Dysphonia; Deglutition Disorders; Surveys and Questionnaires; Signs and Symptoms

## INTRODUCTION

Total thyroidectomy is the most performed endocrine surgery in the world<sup>1</sup> and the most indicated treatment for thyroid cancer<sup>2</sup>. In the United States, the incidence of this type of cancer increased from 7.1/100,000 inhabitants in 2000 to 17.6/100,000 in 2013<sup>3</sup>. In Brazil, the proportion of cases of thyroid cancer informed by the Hospital Cancer Records increased from 1.1% in 2000 to 11.0% in 2014<sup>4</sup>. Also, between 2008 and 2015, the money spent on thyroid cancer diagnosis and treatment in Brazil increased 120%, costing in this period approximately 230 million reais to the *Sistema Único de Saúde* (the Brazilian Public Healthcare System)<sup>5</sup>. Considering that the number of people submitted to total thyroidectomy is growing in Brazil, it is necessary to give attention to the morbidity conditions to which they are exposed.

Dysphonia and dysphagia are two of the most common sequelae of thyroidectomy. However, these conditions are diagnosed with instrumental examinations that demand time, money, and availability, which is not always possible due to the high demands of the services<sup>6,7</sup>. Self-reported questionnaires have been used as an alternative to overcome these limitations and screen the patients that need more specific examinations to confirm the diagnosis based on the identification of symptoms related to changes in voice and swallowing<sup>6,7</sup>.

The occurrence of voice symptoms after thyroidectomy ranges from 16%<sup>8</sup> to 36%<sup>9</sup>, while that of swallowing symptoms ranges from 20% to 58%<sup>10</sup>. Immediately after surgery, these proportions are even higher and may reach 69.2% and 80.8%, respectively<sup>11</sup>. The symptoms are possibly caused by laryngeal manipulation<sup>12</sup>, surgery time<sup>8,13</sup>, type of surgical technique used<sup>14</sup>, dissection of the cervical muscles<sup>13,15</sup>, orotracheal intubation, hematoma, stretching and fixing the cervical muscles, lesions in the superior and inferior laryngeal nerves<sup>15</sup>, besides the post-thyroidectomy syndrome, which occurs when there are complaints even in the absence of postoperative complications<sup>12,16</sup>.

The most common symptoms are reduced voice pitch, vocal fatigue, hoarseness, weak loudness, globus sensation, dry throat, and phlegm<sup>2,7,8,10-13,17-22</sup>. Although these are temporary complications with a progressive improvement<sup>23</sup>, there is evidence of persistence of the symptoms through time<sup>23,24</sup> in up to 50% of the patients<sup>2</sup>, with a significant impact on their quality of life<sup>10-12</sup>.

In Brazil, the results of previous studies that investigated post-thyroidectomy symptoms related to voice and swallowing do not agree. Also, they were conducted only in hospital services in the Southeast<sup>11,18,20</sup>, Northeast<sup>17,19</sup>, or South Regions<sup>21</sup> of Brazil, with questionnaires whose psychometric properties are unknown<sup>17-21</sup> or not specific to this population<sup>11</sup>. The Thyroidectomy-Related Voice Questionnaire (TVQ)<sup>6,25</sup> has been internationally used with this purpose<sup>6,7,23,25-29</sup> and already has a translated and transculturally adapted version in Brazilian Portuguese<sup>30</sup>.

Given this context, the prevalence of post-total thyroidectomy voice and swallowing symptoms in Brazil are noticeably unknown. Understanding the most prevalent symptoms with appropriate instruments can lead to a more assertive post-thyroidectomy care and help administer the cases in the short and long run. Hence, this study, based on an unprecedented national survey, aimed to estimate the prevalence of symptoms related to voice and swallowing in Brazilian women submitted to total thyroidectomy. A secondary objective was to analyze the relationship of demographic and clinical variables with the total Brazilian Portuguese TVQ score. The hypotheses were a high prevalence of post-total thyroidectomy voice and swallowing symptoms and a significant difference in the total TVQ scores, due to the demographic and clinical variables.

## METHODS

This is a population-based, observational, cross-sectional, analytical study with a quantitative approach, based on data from a national survey. It is an integral part of a larger study approved by the Human Research Ethics Committee of the Department of Health Sciences at the *Universidade Federal da Paraíba* (Federal University of Paraíba – UFPB), Brazil, under evaluation report no. 2.190.242, complying with the ethical aspects of Resolution 466/2012. All the volunteers filled out and signed the informed consent form (ICF).

## Participants

The sample size was calculated considering an estimated 45% outcome prevalence<sup>18</sup>, 99% confidence interval ( $z = 2.58$ ), 10% margin of error, and adding 20% due to possible losses. The calculation resulted in a minimum number of 198 individuals. At first, people of both sexes were included, aged 18 years or more, regardless of the interval between the thyroidectomy and the filling out of the form. For the analysis in this

study, the following exclusion criteria were defined: (1) being male; (2) being older than 59 years; (3) having a previous head and neck surgery, including partial thyroidectomy. Besides the small proportion of participants with these characteristics in the databank, these criteria were considered confounding factors. Thyroid diseases such as thyroid cancer are more common in females<sup>31</sup>, advanced age is a risk factor known for the post-thyroidectomy complications<sup>8</sup>, and the partial thyroidectomy, besides being less indicated, causes different functional sequelae from those of total thyroidectomy<sup>32</sup>. Based on the eligibility criteria, 104 people were excluded from the initial databank. Thus, 252 Brazilian women, mean age  $38.81 \pm 7.95$  years (amplitude, 20-58), who had been submitted to total thyroidectomy were included.

### Data collection

The data were collected with an online national survey. The form was made available in the free Google Forms service and its link was posted in digital social media at regular intervals throughout 5 weeks to reach residents of all five geographical regions of Brazil who had been submitted to thyroidectomy.

The form had three stages. In the first one, the participant read and filled out the ICF. Then, they answered questions on demographic and clinical aspects. Lastly, they answered the TVQ<sup>6,25</sup> version translated and adapted into Brazilian Portuguese<sup>30</sup>. The TVQ comprises 20 questions – 10 related to voice and 10, to swallowing. Each question has five possible answers according to the frequency of the symptom (never, almost never, sometimes, almost always, and always). They are distributed into a Likert-type scale with increasing values from 0 to 4. The total score, which can range from 0 to 80, is achieved by simply summing all the items – the higher the value, the worse the result<sup>30</sup>. The TVQ had not had its validation process concluded by the time the data were collected for this study; however, it was considered then the most consistent instrument and the one with the best psychometric properties for research.

### Data analysis

The categorical variables were presented in relative and absolute frequencies. The quantitative variables were analyzed with measures of central tendency and dispersion. The prevalence of each of the 20 items in the TVQ was separately analyzed. For the analysis, the age was dichotomized according to the median. As for the profession, due to the wide range of answers, the following categories were created: “higher-education professions”, “technical-level professions”, “elementary-level professions”, and “undisclosed profession”. The “almost always” and “always” answers in the TVQ indicated the presence of the symptom, while the other ones indicated its absence. The total TVQ score was compared between the categories of age group, profession, region of residence, radiotherapy/adjuvant radioiodine therapy, and time since surgery. The Shapiro-Wilk test indicated that the data did not have a normal distribution ( $p < 0.001$ ); therefore, the Mann-Whitney and Kruskal-Wallis nonparametric tests were used. The significance level was set at 5%.

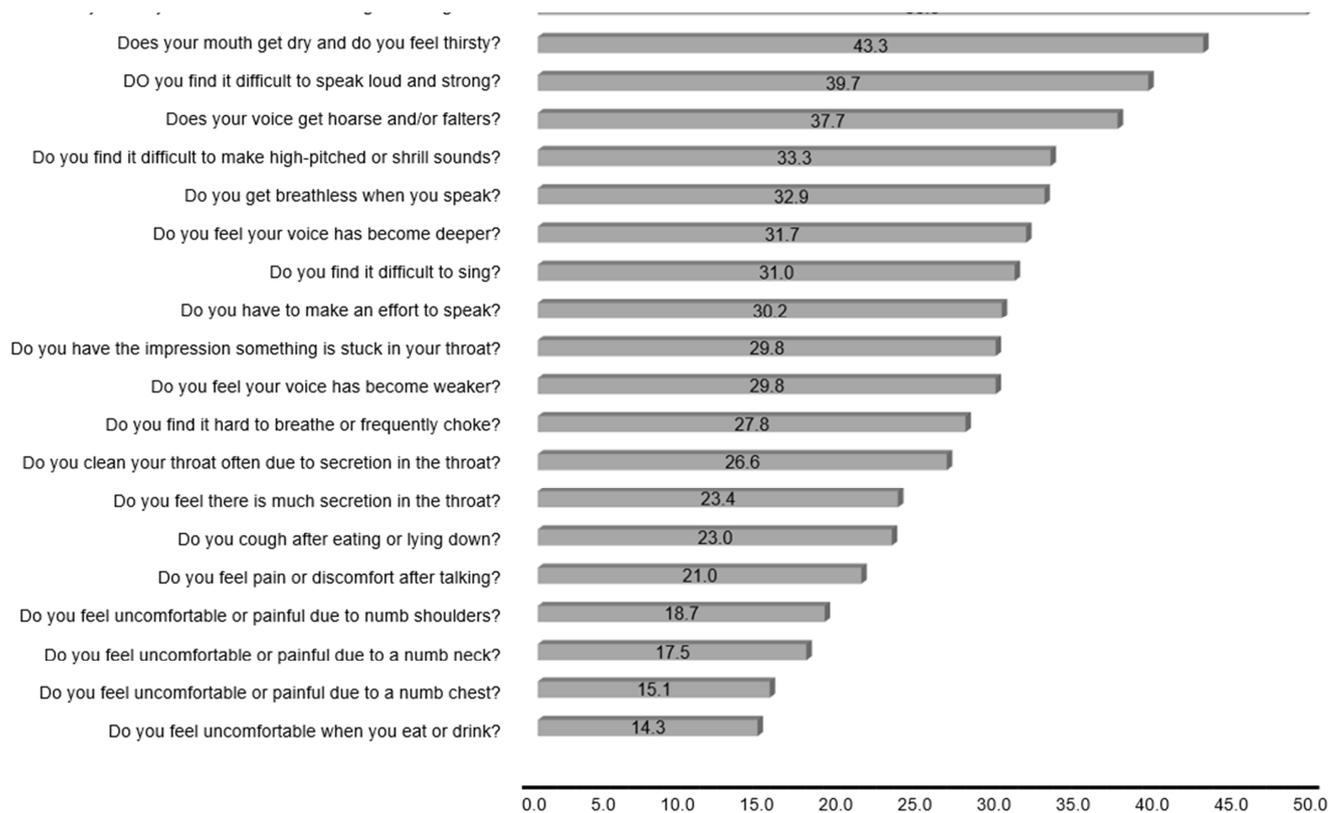
### RESULTS

The demographic and clinical data showed that the sample profile was made predominantly of women living in the Southeast Region of the country with a higher-education profession. Most of them had undergone total thyroidectomy more than 3 years before, and a little more than half of them was submitted to radiotherapy or adjuvant radioiodine therapy (Table 1).

It is observed in Figure 1 that the prevalence of post-thyroidectomy symptoms related to voice and swallowing ranged from 14.3% (discomfort to eat and drink) to 50% (tired voice after talking for a long time) – this last one was the most prevalent voice-related symptom. Dry mouth/thirst (43.3%) was the most prevalent swallowing-related symptoms. A higher prevalence of voice symptoms was noted, as eight out of the 10 most mentioned ones were voice-related.

**Table 1.** Distribution of Brazilian women submitted to total thyroidectomy, according to the demographic and clinical variables

Variables	Categories	n (%)
Age group	> 38 years	126 (50.0)
	38 years or less	126 (50.0)
Profession	Higher education	123 (48.8)
	Technical level	24 (9.5)
	Elementary level	81 (32.1)
	Undisclosed profession	24 (9.5)
Region of residence	Southeast	138 (54.8)
	Northeast	48 (19.0)
	South	37 (14.7)
	Midwest	22 (8.7)
	North	7 (2.8)
Time since surgery	Less than six months	16 (6.3)
	From six months to one year	31 (12.3)
	From one to three years	76 (30.2)
	More than three years	129 (51.2)
Radioiodine therapy or Radiotherapy	Yes	131 (52.0)
	No	121 (48.0)

**Figure 1.** Percentage distribution of the symptoms present in Brazilian women submitted to total thyroidectomy, according to the version of the Thyroidectomy-Related Voice Questionnaire translated and adapted to Brazilian Portuguese (sum of the “always” and “almost always” answers)

The total TVQ score proved to be independent of age group, profession, region of residence, time since

surgery, and radiotherapy/adjunct radioiodine therapy (Table 2).

**Table 2.** Measures of the total score of the version of the Thyroidectomy-Related Voice Questionnaire translated and adapted into Brazilian Portuguese between the categories of age group, profession, region of residence, time since surgery, and treatment with radiotherapy or radioiodine therapy

	Total score – TVQ					P value
	Median	Q25-Q75	Minimum-maximum	Mean	Standard deviation	
<b>Age group</b>						
> 38 years	27.50	12.00-50.25	0-77	30.97	21.73	0.141*
≤ 38 years	25.00	7.5-41.25	0-71	26.62	19.73	
<b>Profession</b>						
Higher education	24.00	8.00-41.00	0-76	26.41	19.91	0.213†
Technical level	20.50	7.25-47.0	2-67	25.79	20.77	
Elementary level	29.00	16.50-51.00	0-74	32.17	21.37	
Undisclosed profession	27.50	14.25-52.00	0-77	32.58	22.76	
<b>Region of residence</b>						
Southeast	28.50	14.50-48.75	0-77	31.01	20.79	0.303†
Northeast	19.00	7.25-34.25	0-76	23.69	19.83	
South	24.00	7.50-43.00	0-67	27.00	20.62	
Midwest	28.50	11.75-44.00	0-71	29.86	21.95	
North	26.00	3.00-55.00	0-59	26.29	24.75	
<b>Time since surgery</b>						
Six months	31.00	14.75-41.00	1-53	29.44	16.33	0.955†
From six months to one year	26.00	13.00-48.00	0-65	29.61	20.41	
From one to three years	24.00	9.25-44.00	0-77	29.14	21.95	
More than three years	26.00	8.00-44.50	0-74	28.31	20.96	
<b>Radiotherapy or Radioiodine therapy</b>						
Yes	26.00	9.00-43.00	0-76	28.08	20.24	0.666*
No	29.00	9.50-45.00	0-77	29.56	21.50	

$p < 0.05$ ; \* Mann-Whitney test; † Kruskal-Wallis test.

Captions: TVQ = Thyroidectomy-Related Voice Questionnaire (version translated and adapted into Brazilian Portuguese).

## DISCUSSION

This study showed a high prevalence of symptoms related to voice and swallowing in Brazilian women who had been submitted to total thyroidectomy, as well as a total TVQ score independent of age group, profession, region of residence, time since surgery, and radiotherapy/adjunct radioiodine therapy.

The demographic and clinical data showed that the sample profile was made predominantly of women living in the Southeast Region of the country and with higher-education professions. Most of them had undergone total thyroidectomy more than 3 years before, and a little more than half of them was submitted to radiotherapy or adjunct radioiodine therapy.

The decreasing order in the percentage distribution of respondents by geographical regions of residence was similar to the distribution of the number of cases of thyroid cancer observed in a hospital survey between 2000 and 2016<sup>4</sup> and to the distribution of the 57,872 total thyroidectomies performed in Brazil between 2014 and 2018, according to data from the Hospital Information System (SIH/SUS, in Portuguese) of the Brazilian Ministry of Health<sup>33</sup>. Hence, the relative distribution of this study's sample between the geographical regions of residence reflected the distribution observed in Brazil regarding the number of cases of thyroid cancer and thyroidectomies.

The predominance of women with higher-level professions is related to the higher schooling level

and greater self-care awareness, resulting in access to better diagnostic and assistance technologies – which proves to be a selection bias<sup>4</sup>. The proportion of little more than half of the participants with an interval greater than 3 years between the surgery and filling out the form shows these women's interest in reporting the symptoms even a long time after the surgery. The proportion of women submitted to radiotherapy/radioiodine therapy was already expected based on international guidelines<sup>34</sup>.

The most prevalent symptoms were related to voice, a result similar to other studies with people submitted to total thyroidectomy<sup>8,9,17</sup>. Such an occurrence may be related to the topographic nearness of the thyroid gland in relation to the laryngeal structures and peripheral innervations, which are exposed and manipulated during the surgical procedures<sup>15</sup>. Despite the concern with the possibility of vocal fold palsy due to iatrogenic lesion of the superior and/or inferior laryngeal nerve, most of the cases have complaints even in the absence of peripheral nervous lesions<sup>12</sup>. Considering that the voice expresses the person's identity, changes in its habitual standard may interfere with communication, socialization, and the maintenance of occupational activities, especially in the case of those who use their voice professionally. Therefore, it is understandable that voice impairments are among the greatest concerns of the people who will be or have been submitted to thyroidectomy<sup>18</sup>.

Of the various voice symptoms investigated with the TVQ, the most prevalent in Brazilian women who had been submitted to total thyroidectomy was vocal fatigue. This perception of a decrease in resistance is manifested in phonatory effort combined with an increase in vocal demand<sup>35</sup>. It may also be related to peripheral nervous lesions that have an impact on the activity of the intrinsic musculature of the larynx<sup>36</sup>. The observation of the other most prevalent voice symptoms in the population of this study reveals that they converge to the complaint of "tired voice after talking for a long time". These symptoms encompass the perception of difficulties associated with pitch, loudness, roughness, pneumophonic incoordination, and the vocal effort itself – i.e., conditions that, when present, need to be overcome with hyperfunctional compensations that lead to vocal fatigue<sup>37</sup>.

In general, the post-total thyroidectomy swallowing-related symptoms were less perceived than the voice symptoms – although dry mouth/thirst was the second most prevalent symptom. "Dry mouth" had already

been frequently mentioned by patients submitted to thyroidectomy in other Brazilian studies<sup>11,18-19</sup>, even in the preoperative period<sup>17,38</sup>. However, no clear explanations are found for such a symptom in these patients. One hypothesis is that the vocal demand<sup>17,38</sup> and/or inadequate hydration<sup>17,38,39</sup> is related to this symptom, as well as the hormonal deregulation characteristic of thyroid diseases<sup>40</sup>. Radiotherapy/radioiodine therapy is a possible explanation for this symptom, although the parallel analysis of the data to verify this hypothesis did not confirm it.

This study also showed that age, profession, region of residence, postoperative time, and radiotherapy/adjuvant radioiodine therapy are not aspects that interfere with the total TVQ score, whose median in all the categories was higher than 20 points. This result indicates, then, that the investigation of post-thyroidectomy voice and swallowing symptoms in Brazilian women must not be restricted to specific groups and must be independent of these variables.

Despite Brazil's continental size, great cultural diversity, and different realities of access to health services, this did not prove to be an aspect related to the result of the TVQ. It stood out that, even after three years since the surgery, their total TVQ score remained with a median similar to that of the group with a shorter postoperative period. This result ratifies the evidence of continuing symptoms even in the long run, as well as the need for better strategies to detect these morbidity conditions and more resolute therapeutic assistance. Thus, it is highlighted the importance of incorporating the investigation of the symptoms related to voice and swallowing in the routine of the assistance health team in all the regions of Brazil. The TVQ is the most promising option of an instrument for this purpose, and its translated and adapted version in Brazilian Portuguese must be used as soon as its validity and reliability evidence is obtained.

This study has some limitations. The cross-sectional design does not allow for direct cause and effect relationships; the characteristics related to the surgical procedure could not be collected, neither could the clinical aspects such as medications used and results of the biochemical and histopathological examinations, as there was no access to the participants' medical records; confounding variables (e.g., undergoing speech therapy after the surgery and having comorbidities such as laryngeal changes and gastroesophageal reflux) were not controlled and may have interfered with the results; the instrument used had only been

translated and adapted into Brazilian Portuguese at the time of collection and is still in the validation process. At the same time, this study is the first one in Brazil to evidence the prevalence of post-total thyroidectomy voice and swallowing symptoms in a national survey with a population-based sample, with results from an internationally used instrument.

## CONCLUSION

Symptoms related to voice and swallowing have a high prevalence in Brazilian women who had been submitted to total thyroidectomy. The two most prevalent symptoms are vocal fatigue and dry mouth/thirst. There is a predominance of voice symptoms followed by swallowing symptoms. There is no relationship between the total TVQ score in Brazilian Portuguese and the age group, profession, region of residence, time since surgery, and radiotherapy/ adjuvant radioiodine therapy.

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