ORIGINAL ARTICLE

SENSORY PERCEPTION EVALUATION OF SALTY TASTE IN HIPERTENSIVE PEOPLE

AVALIAÇÃO DA PERcepção SENSORIAL AO Gosto SALGADO EM PESSOAS HIPERTENSAS

EVALUACIÓN DE LA PERCEPCIÓN SENSORIAL AL GUSTO SALADO EN PERSONAS HIPERTENSAS

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ABSTRACT

Objective: to evaluate gustatory perception of salty taste in people with systemic arterial hypertension.

Method: this is a quantitative, descriptive and cross-sectional study of individuals diagnosed with arterial hypertension, characterizing the test group, and non-hypertensive individuals, defining the control group. This study was carried out in the second half of 2017. The whole mouth stimulus test for the salty taste was performed in order to evaluate the taste threshold. The Mann-Whitney test at 5% probability was used to compare unpaired mean data. The analyzes were studied in the Statistical Package for the Social Sciences, presenting the results in figure and table form. Results: it was observed that in the first and second sections, containing the lowest concentrations of NaCl, 0.09 g / L and 0.18 g / L, respectively, 54% of the control group was able to detect salty taste, higher than that of the test group (18.82%). Conclusion: it was observed that the taste threshold for salty taste was higher in hypertensive individuals when compared to normotensive individuals.

Descriptors: Chronic Disease; Palate; Food Behavior; Sensory Threshold; Threshold; Hypertension.

RESUMEN

Objetivo: evaluar una percepción gustativa al gusto salado en personas con hipertensión arterial sistémica.

Método: se trata de un estudio cuantitativo, descritivo y transversal, realizado con individuos diagnosticados con hipertensión arterial, caracterizando el grupo test, y con individuos no hipertensos, definiendo el grupo control. Se realizó este estudio en el segundo semestre de 2017. Se ejecutó la prueba de estímulo de la boca toda para evaluar el umbral gustativo. Se utilizó, para la comparación entre las medias de datos no pareados, el teste de Mann-Whitney a 5% de probabilidad. Se estudiaron los análisis en el Statistical Package for the Social Sciences, presentando los resultados en forma de figura y tabla. Resultados: se observó que, en la primera y segunda secciones, que contenían las menores concentraciones de NaCl, 0.09 g / L y 0.18 g / L, respectivamente, 54% del grupo control consiguió detectar el gosto salgado, resultado mucho mayor que el del grupo test (18.82%). Conclusión: notóse que el umbral gustativo para el gusto salado fue mayor en individuos hipertensos cuando comparados a los individuos normotensos.

Descritores: Doença Crônica; Paladar; Comportamento Alimentar; Limiar Sensorial; Limiar Gustativo; Hipertensão.

RESUMEN

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Descritores: Enfermedad Crónica; El Gusto; Comportamiento Alimenticio; Umbral Sensorial; Umbral Gustativo; Hipertensión.

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INTRODUCTION

Systemic arterial hypertension (SAH) is known to account for approximately 9.4 million deaths worldwide, according to data from the World Health Organization (WHO).\(^1\) Brazil was ranked in 2015 as the sixth country with higher occurrence of HAS-related deaths.\(^2\) According to the Brazilian Society of Cardiology \(^3\), hypertension is prevalent in about 36 million Brazilians and is present in more than 60% of the elderly. Several factors and conditions are listed as possible causes for hypertension: obesity; age; sex; sedentary habits, alcoholics and smokers; genetics; ethnicity and food choices.\(^7\)

In this sense, the role of food choices as a conditioning factor in health is highlighted, since healthy eating habits are directly related to the prevention of chronic non-communicable diseases (CNCDs).\(^4\) It is thus argued that the food choices process may be a risk factor for the development of CNCDs, since there is a direct relationship between preferences for foods rich in saturated fatty acids, trans fat, sugars and sodium and these diseases.\(^5\)

For this reason, research is conducted to relate dietary choices and the development of CNCDs. An association between health education and sodium consumption was evaluated as an example in a study carried out in Switzerland with workers, in which it was observed that the mean salt intake was higher in the hypertensive participants when compared to normotensive participants.\(^6\)

In a study carried out in Brazil with the urban population of Vitória (ES), after a study of salt intake and urinary sodium / potassium ratio, a high sodium intake was observed in the study population. It was also observed a high prevalence of hypertension at the study site, evidencing that high sodium intake is directly related to the development of hypertension.\(^7\)

In this way, it is related the process of food choices to health conditions, the need to know the determining factors of this process. It is scored, according to Estima et al.\(^8\), that the process of food choices encompasses psychological and sociocultural factors, especially biological, economic and food supply / availability. It is stated that age, sex, the media, as well as product-related information such as brand, price, label and health claim, can also determine food choices.

In this context, the role of sensorial aspects is highlighted, since they are considered as one of the main determinants in this process\(^9\). Sensory properties include the intrinsic aspects of food, such as taste, odor, taste, appearance, texture and others, which are evaluated by the senses, such as smell, taste, sight and touch.\(^10\)

It is observed, then, from the influence of the taste on the food choices that this sensorial sense allows, to the individual, to select the foods that they like to him; thus, the salty taste in food is a predictor of food choices. It is known that individuals with a high salty taste threshold, that is, a low gustatory sensitivity for this taste, tend to ingest a greater amount of salt in order to identify the taste in the food\(^11\), which may be responsible for the development or aggravation of SAH.\(^12,14\)

Due to the importance of the evaluation of the threshold index for taste as a diagnosis of gustatory conditions, several types of sensorial analyzes to evaluate the gustatory threshold, such as electrogustometry, impregnated disk and whole mouth stimulation, are identified.\(^15\)

It is pointed out that the whole mouth stimulation method, besides the low cost, has, as an advantage, the stimulation of a greater number of taste buds in the oral cavity, which allows the individual to discriminate the stimuli that are received. The threshold test is divided into sections; in each one, a solution of sodium chloride and two water samples are presented to the participants, and a different sample is required. The concentration of sodium chloride in each section is increased until the participant is able to differentiate the sodium chloride solution from the water samples. The detection threshold is defined as the minimum concentration that allows the participant to differentiate the sample containing the substance from samples containing only water.\(^15\)

The threshold index is used in studies to evaluate dietary choices and the relation to some health conditions,\(^15,24\) for example, in the evaluation of the taste threshold for sweet and the relation with Diabetes Mellitus type 2.\(^16\) the determination of gustatory threshold for sweet and salty alcoholics and non-alcoholics\(^17\) and the evaluation between the use of antidepressants and changes in gustatory sensitivity.\(^18\) Destacam-se os estudos que têm analisado a relação entre o índice límiar para salgado e a HAS.\(^15,22,24\)

It is observed, in studies, that hypertensive patients present a higher salivary threshold index than the normotensive ones.\(^15,24\) It is noticed in other studies, that hypertensive patients using antihypertensives had a

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lower sensitivity to salty taste compared to healthy subjects.\textsuperscript{22-23} It was also observed,\textsuperscript{24} that the threshold index for the detection and recognition of hypertensive patients is higher than those of their normotensive and normotensive relatives without family ties.

However, in spite of the number of published articles that deal with the evaluation of gustatory sensitivity comparing hypertensive and normotensive individuals, most of them have inconsistencies in the exclusion factors, constituting a bias for the results found. It is known that diseases such as Diabetes Mellitus type 2,\textsuperscript{16} upper airway obstruction,\textsuperscript{21} smoking habits\textsuperscript{11} and alcoholics\textsuperscript{17}, besides the use of antidepressant drugs\textsuperscript{18} and the age range\textsuperscript{20} may lead to alteration of gustatory sensitivity.

**OBJECTIVE**

- To evaluate gustatory perception of salty taste, in people with systemic arterial hypertension.

**METHOD**

This is a quantitative, descriptive and cross-sectional study, carried out in the second half of 2017, at the Basic Health Unit Sebastião Azevedo and at the campus of the State University of the Southwest of Bahia (UESB), in the municipality of Jequié, Bahia. It is reported that the study sample was non-random, composed of 150 individuals, aged between 18 and 60 years, of both sexes, which was divided into two groups: test group and control group.

Each group was composed of 75 individuals, and the group consisted of individuals with a diagnosis of SAH, attended at the Sebastião Azevedo Basic Health Unit, and the control group was composed of UESB students and staff not diagnosed with SAH.

Exclusion criteria included individuals of both groups: smokers, pregnant women, individuals with colds, febrile, who presented with some complication in the oral cavity, the use of dental prostheses or who had consumed alcoholic beverages in a minimum period of 96 hours before the tests were performed.

The sensitivity test was used to evaluate the gustatory sensitivity for the determination of the threshold index of detection to the salty taste, using the methodology described in the Brazilian standard\textsuperscript{23} and International Organization for Standartization\textsuperscript{26}.

The gustatory threshold was measured using the rapid detection method, where each subject performed six series of 3-AFC sensory tests (i.e. 3-Alternative Forced Choice). The concentrations of NaCl were increased in increasing concentrations in a continuous and monodic manner, respecting the following values: 0.09; 0.18; 0.36; 0.72; 1.5 and 3.0 g / NaCl, values also adopted by Silva et al.\textsuperscript{17}.

The samples were prepared and standardized in the UESB Food Technology Laboratory, with mineral water and NaCl, quantified using the analytical balance SHIMADZU AUW220D and then packed in plastic containers at room temperature and under the light.

For the statistical analysis, the equation for the determination of the threshold of each individual was applied to then, also, to apply another equation to obtain the average threshold of the two groups, calculating the geometric mean of the threshold values.

The Kolmogorov-Smirnov normality test was used to compare the mean threshold index between the test and control groups; then the unmatched data comparison test, Mann-Whitney, adopting the significance level of 5%. It is added that the analyzes were carried out in the software Statistical Package for the Social Sciences (SPSS), version 21, licensed.

The study was based on the ethical requirements of the study, according to the legal precepts contained in Resolution No. 466/2012 of the National Health Council. The research project was approved by the Ethics and Research Committee of the State University of the Southwest of Bahia (UESB) under the Certificate of Presentation for Ethical Appraisal (CAAE) n. 46718615.0.0000.0055 and the favorable opinion n. 1.251.287.

**RESULTS**

The study population was composed of 75 hypertensive volunteers, of whom 52% (n = 39) met the inclusion criteria and 48% (n = 36) were excluded (Table 1).
It was found that in the test group, 76% declared themselves female and 34% were male; the hypertensive population was composed of 34% of the individuals declared to be male and 76% of the female. The following characteristics were pointed out for the majority of the hypertensive ones: 55% declared themselves mulattoes; 64% did not have completed High School; 72% had a monthly income of less than three minimum wages and 61% had a predilection for salty foods. Among the favorite foods are rice and beans (36%), salads, fruits and vegetables (38%), meat (33%), pasta (18%), breads and cake (12%). It was noted that all patients used some medication regularly for the treatment of hypertension, and 42% used the combination of an angiotensin-enzyme inhibitor with a diuretic.

It is observed that the normotensive population was also composed of 75 individuals, who did not have a diagnosis of SAH and met the inclusion criteria. It was found that 65% were female and 35% male.

It is perceived that, in the first and second sections, the lowest concentrations of NaCl - 0.09 g/L and 0.18 g/L were observed in the first and second sections, L, respectively, that 54% of the control group was able to detect salty taste, a result much higher than that of the test group (18.82%) (Figure 1).

Table 1. Percentage of individuals who did not meet the inclusion criteria. Jequié (BA), Brazil, 2017.

<table>
<thead>
<tr>
<th>Exclusions</th>
<th>Hypertens (test group, n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>Flu</td>
<td>18</td>
</tr>
<tr>
<td>Sore throat</td>
<td>5</td>
</tr>
<tr>
<td>Diabetes</td>
<td>5</td>
</tr>
<tr>
<td>Use of dental prosthesis</td>
<td>4</td>
</tr>
<tr>
<td>Smoker</td>
<td>2</td>
</tr>
<tr>
<td>Lesions in the oral cavity</td>
<td>1</td>
</tr>
<tr>
<td>Use of alcoholic beverages</td>
<td>1</td>
</tr>
</tbody>
</table>

Individual detection thresholds were obtained by means of the geometric mean between the highest undetected concentration and the lowest concentration detected by hypertensive and normotensive individuals. It was verified, through the gustative sensitivity analysis, that the mean threshold of the test group was 1.09 ± 0.68 g/L, while that of the control group was 0.20 ± 0.08 g/L.

The Mann-Whitney test at 5% probability revealed that there is a statistically significant difference (p <0.05) between the mean threshold index for salty taste, when comparing the hypertensive group and the normotensive group, being that the test group has a higher threshold for the salty taste, which shows that this group needs a greater quantity of salt to be able to identify the salty taste in food. It should be noted that a significant statistical correlation between the gustatory threshold for salty and factors such as sex, income, skin color, schooling, medication used, taste and preference food were not observed.

**DISCUSSION**

In this study, we observed the difficulty of the hypertensive group in identifying the saline solution in the first sections, that is,
those with the lowest concentration of salt. It is thus demonstrated that hypertensives are less able to detect salty stimuli at low concentrations than normotensive ones, by means of the rapid detection method in a growing series of solutions presented, indicating a reduction of gustatory sensitivity to salty taste by test group.

It is pointed out in this context that the findings of this study are in agreement with those found in a study with 100 hypertensive patients, through the triangular-type whole-mouth stimulus method and with five sections of increasing NaCl concentration, which observed that hypertensive patients taking Captopril and Atenolol are less sensitive to salty stimuli than healthy people, noting also that sex and age are associated with reduced sensitivity by hypertensive individuals (p <0.05); however, the authors did not exclude alcoholics, people with Diabetes Mellitus, nor the elderly, and these groups present changes in gustatory sensitivity. 

However, it is observed in another study, with 84 hypertensive patients, by means of the whole-mouth stimulus method, with four sections of increasing concentration of NaCl, that hypertensive patients undergoing therapy with hypotensive drugs, such as converting enzyme inhibitors of agiotensin I, diuretics, calcium channel blockers and beta-blockers, are less sensitive to salty taste than normotensive ones (p <0.05). It should be noted, however, that the authors did not exclude patients with dental prostheses or alcoholics, knowing that these factors alter gustative sensitivity.  

This leads to a research bias, since it is not known if the loss of gustatory sensitivity is actually influenced by hypertension or other factors that were not excluded in the research, such as people with Diabetes Mellitus, alcoholics, users of dental prosthesis, etc. It is suggested, therefore, that a research with more concise exclusion factors may indicate the actual condition of gustatory sensitivity of hypertensive individuals. The importance of taste threshold values for salty in the hypertensive group found in this study is highlighted.

The results of this study show a statistically significant difference (p <0.05) between the mean threshold index for salty taste when comparing the hypertensive and normotensive groups. In a study by Olayemi et al., using the whole mouth stimulus method, hypertensive patients had a higher threshold for salty taste, noting that the detection threshold for hypertensive patients (1.167 g / L) was higher than their normotensive relatives. It was also reported that normotensive individuals with a family history of hypertension had a higher detection threshold (p <0.01) compared to normotensive controls.

It is emphasized that several authors report the reduction of taste sensitivity to salty taste, related to habits and attitudes, such as: the use of antihypertensives, the use of antidepressants, smoking habits and alcoholics, the obstruction of the pathways Diabetes mellitus type 2 and age.

In this perspective, among the studies that observed the loss of gustatory sensitivity to salty taste, those that used the same methodology of this research and exclusion factors similar to those used in this study stand out. In a survey with alcoholics, a mean saline taste threshold was found in 0.34 g / L salt; in a study with antidepressant users, threshold values of 0.53 g / L salt. It is pointed out that the values found by the authors mentioned above are lower than the result of this research, showing that, among alcoholics, users of antidepressive and hypertensive drugs, the latter are the most affected in terms of reduction of taste sensitivity to salty taste. It is noteworthy that this comparison was only possible in this study due to adjustments of the exclusion factors, which allowed the best comparison with the surveys of alcoholics and users of antidepressant drugs. It has been observed that the reduction of taste sensitivity to salty taste by hypertensive individuals may influence them in their food choices, since they tend to have difficulties in perceiving the salty taste in foods with small concentrations of sodium chloride, which leads them to ingest more salt in an attempt to perceive this taste. It should be noted that a higher intake of salt may lead to an increase in blood pressure, thus constituting a risk factor for the development of several pathologies, besides making antihypertensive therapy difficult.

It is also noted that this reduction of gustative sensitivity can make it difficult to control the consumption of salt in foods by hypertensive individuals, since they may perceive that they are ingesting little salt because they do not taste salty when, in fact, this lack of perception is linked to the reduction of sensitivity and not to the amount of salt in the food. It is important to note the importance of using the gustatory sensitivity test in the diagnosis and treatment of hypertension.
CONCLUSION

It was allowed by this study to identify that the taste threshold for salty taste is higher in hypertensive individuals (test group) when compared to normotensive individuals (control group). It is emphasized that the elevated taste threshold for the test group may interfere with the increase in NaCl consumption in order to improve food palatability.

Exacerbated NaCl consumption is associated with increased blood pressure levels, a fact that contributes directly to the pathophysiology of hypertension. Therefore, it is concluded that it is important to carry out food education activities in Basic Health Units in order to guide individuals on other ways to improve food palatability without the indiscriminate use of NaCl.

The importance of the development of new studies relating the reduction of gustative sensitivity with hypertensive individuals, as well as the mechanisms by which the reduction is given. As a limitation of this study, the size of the population is highlighted, suggesting that an expanded study with a larger population

REFERENCES


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