



ISSN: 2230-9926

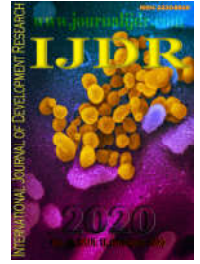
Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 10, Issue, 11, pp. 42475-42478, November, 2020

<https://doi.org/10.37118/ijdr.20524.11.2020>



RESEARCH ARTICLE

OPEN ACCESS

GUSTATORY THRESHOLDS FOR SWEET TASTE IN HYPERTENSIVE AND DIABETIC ELDERLY

Gabriela S. dos Santos^{1,*}, Alessandra S. Sales¹, Suziane de A. Brito¹, Lorena A. Nunes¹,
Claudio B. de Almeida² and Cezar A. Casotti¹,

¹Department of Health, southwest Bahia State University, Jequié, Bahia, Brazil

²Department of Education, Bahia State University, Guanambi, Bahia, Brazil

ARTICLE INFO

Article History:

Received 11th August, 2020

Received in revised form

19th September, 2020

Accepted 24th October, 2020

Published online 30th November, 2020

Key Words:

Taste Threshold.

Aging.

Health of the Elderly.

*Corresponding author:

Gabriela S. dos Santos

ABSTRACT

The present study seeks to identify the gustatory threshold for sweet taste in elderly people registered in a hypertensive and diabetic patient monitoring program. A transversal and analytic epidemiological study conducted with elderly people registered in the monitoring program for diabetic and hypertensive patients at a family health care unit in the municipality of Jequié-BA. House calls were performed to obtain socio-demographic information and carry out the gustatory threshold for sweet taste test. The analysis of the data was realized using the programs Excel and SPSS. The gustatory threshold of 50 elderly people with an average age of 67.80 years (DP=5.4) and 70% females, was evaluated. The median for gustatory threshold for sweet taste was 4.06g/L, being 3.55g/L in hypertensive patients, 3.53g/L in diabetics and 5.07g/L in patients both diabetic and hypertensive. The gustatory threshold for sweet taste for elderly people registered in the hypertension and diabetes monitoring program is high. Elderly people with hypertension and diabetes showed a higher gustatory threshold when compared with individuals with hypertension or diabetes in isolation.

Copyright © 2020, Gabriela S. dos Santos et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Gabriela S. dos Santos, Alessandra S. Sales, Suziane de A. Brito, Lorena A. Nunes, Claudio B. de Almeida and Cezar A. Casotti. "Gustatory thresholds for sweet taste in hypertensive and diabetic elderly", *International Journal of Development Research*, 10, (11), 42475-42478.

INTRODUCTION

In recent decades, Brazil has undergone demographic changes that modified the epidemiological scenario in terms of chronic degenerative diseases. There is a transition from a high birth-rate, high mortality scenario, to a different one with low mortality and low fertility resulting in increasing life expectancy and a consequently aging population (Lebrão, 2009). This scenario of population aging brings with it a high prevalence of arterial hypertension and diabetes mellitus, the chronic degenerative diseases that most affect the elderly population. Systemic arterial hypertension (SAH) is an important modifiable cardiovascular risk factor. Due to its high prevalence and its causal relationship with all the cardiovascular diseases, arterial hypertension is the main risk factor for mortality around the world, making it a significant public health concern (WHO, 2009). In terms of diabetes in elderly people, the most frequent form is type II Diabetes Mellitus (DM2).

Hyperglycemia, its main manifestation, leads to lesions in diverse organs and systems of the organism, mainly in the heart, eyes, kidneys and nervous system (Lazcano-Ortiz and Salazar-González, 2009). The aging process leads to progressive changes such as a reduction in functional capacity, changes in terms of taste such as poor sensitivity for primary tastes, changes in the metabolic processes of the organism and changes to bodily composition (Vitolo, 2008). There is also a reduction in the gustatory corpuscles present on the lingual papillae, thereby reducing the detection threshold and taste identification. In young people, this number corresponds to around 250 corpuscles for each papilla, while in the elderly, mainly above 70 years of age, this number drops to less than 100 (Paula et al., 2008). Advanced age hampers identification of the smell and taste of food. This is due to physiological modifications in the elderly (Griep et al., 2000). Gustatory deficiencies related to age, despite not being clearly explained, are considered a determining factor in the reduction of pleasure related to food, in alimentary monotony and in the reduction in food consumption by the elderly (Drewnowski, 1997).

Due to the large expansion of the elderly population and changes that occur in the physiology of the functioning of the organism, and highlighting the changes to gustatory sensibility noted here, it is important that studies into this question are developed that seek to understand the gustatory profile of elderly people. Therefore, the aim of the present study is to analyze the gustatory threshold for sweet taste in elderly people registered in the monitoring program for diabetic and hypertensive patients.

MATERIALS AND METHODS

A transversal and analytic epidemiological study analyzing a convenience sample of elderly people, with ages between 60 and 79 years, registered in the monitoring program for diabetic and hypertensive patients in a Family Health Care Unit in the city of Jequié-BA. The data was collected during the months of April and May 2017. Initially, a review was made of all the people registered in the monitoring program for hypertensive and diabetic patients and subsequently people between the ages of 60 and 79 years old were selected. Elderly people with an age above 79 years were excluded given that the application of the test with these elderly people can present limitations, in terms of understanding at the time of doing the test (Sachdev *et al.*, 2010; Methven *et al.*, 2012; Allen *et al.*, 2014). Elderly people with cognitive/auditory deficiencies and/or neurological diseases that impede the response of the individual to the questionnaire and the gustatory threshold test, and elderly people not located in their residence after three attempts on different days and times were also excluded. Based on the schedule of the monitoring program for hypertensive and diabetic patients, elderly people registered were identified. Following this, their address was obtained from their hospital records. Next, the location of the residence of the elderly patients in the USF catchment area was identified. From this information, house calls were conducted to obtain socio-demographic information and to realize the gustatory threshold for sweet taste test.

To perform the gustatory threshold test, sucrose solutions at a concentration of 0.5, 1.0, 2.0, 4.0 and 8.0 grams were used. The calculation of the weight of the substances was realized according to the volume and concentration of the solutions, following a geometric series established by the International Organization for Standardization (2002). An analytic scale, a Becker cup and glass funnel were used to weigh the substances. After being weighed, the substances were diluted in deionized water, according to the calculation of the concentrations and bottled in closed plastic flasks, in a dry location, without light at room temperature. At the time of applying the test at each tier of concentration, three cups were arranged, two containing deionized water and one containing the sucrose solution. These cups were codified with random letters and numbers to be able to identify the code when the elderly person indicated the cup where they experienced a difference in taste. A template was drawn up with the written codes and the code that corresponded to the cup with the solution was highlighted. The participant was asked to wet their mouth with the liquid in the cups, without needing to swallow. After repeating with the three cups, they indicated the one where they perceived a difference. The researcher then looked at the code and noted it down on the template. This procedure was realized for all the concentrations, always in an increasing order. In the tabulation, double digitation of the data was realized to avoid possible errors.

The analysis of the results was performed based on the qualitative classification. For “preserved gustatory perception” the solution was recognized at concentrations of 0.5 and 1.0 grams. “Light gustatory perception” was when it was recognized in 2 grams. “Moderate gustatory perception” was when it was recognized in 4 grams. “Seriously impaired gustatory perception” was when it was recognized in 8 grams and “without gustatory perception” was when there was no recognition at any concentration (Lopes *et al.*, 2015). Based on these classifications, the dependent variable was determined, being divided between “with gustatory change” or “without gustatory change”. The individual threshold was determined using the geometric median between the lowest detected concentration and the highest concentration that went undetected (Kennedy *et al.*, 2010). For the statistical analysis, the SPSS program, version 21.0, was used with descriptive analyses of the variables studied using the frequency distribution tables. The regression test and Pearson correlation were performed on the Excel program. The present study is part of the research project “Health Conditions and Life Styles in Elderly People” (CAAE: 10786212.3.0000.0055) and the participants signed a Free, Prior and Informed Consent (FPIC).

RESULTS

50 elderly people were assessed. Of these, 70% (n=35) were female, 72% (n=36) lived with someone else, 74% (37) had no schooling and 84% (42) declared themselves to be black. The average age was 67.80 (DP=5.4).

Table 1. Average gustatory threshold for sweet taste in relation to hypertension and diabetes

Diseases	Average threshold			
Hypertension	3.55g/L			
Diabetes	3.53g/L			
Hypertension + Diabetes	5.07g/L			

Independent variables	Gustatory change			
	With n=45	%	Without n=5	%
Sex				
Female	32	71.1	3	60.0
Male	13	28.9	2	40.0
Conjugal situation				
With partner	33	73.3	3	60.0
Without partner	12	26.7	2	40.0
Age bracket				
60 -69	29	64.4	2	40.0
70-79	16	35.6	3	60.0
Schooling				
Without schooling	33	73.3	4	80.0
With schooling	12	26.7	1	20.0
Skin color				
Not white	38	84.4	4	80.0
White	7	15.6	1	20.0
Diabetes				
Presence	20	44.4	3	60.0
Absence	25	55.6	2	40.0
Hypertension				
Presence	39	86.7	5	100
Absence	6	13.3	0	0

The average gustatory threshold for sweet taste amongst the elderly was 4.06g/L, being 4.19g/L in elderly men and 4.01g/L in elderly women. The prevalence of the occurrence of diabetes, hypertension and associated diabetes and hypertension was 12%, 54% and 34%, respectively. Among the elderly evaluated, 90% had taste changes.

Table 3. Percentage distribution of gustatory alterations

Classification of alteration	n	%
Acuity 5 10%		
Light gustatory perception	6	12%
Moderate gustatory perception	13	26%
Serious gustatory perception	13	26%
Without gustatory perception	13	26%

The other prevalences in relation to the variables studied are described in Table 2. Amongst the gustatory changes, the study found that only 10% of individuals possessed preserved gustatory acuity, managing to identify the sweet taste at smaller concentrations of 0.5 and 1 gram. The seriously impaired gustatory perception and without gustatory perception, were identified in 26% (n=13) of the elderly people, the other prevalences are presented (Table 3). From the regression test and Pearson correlation, considering the detection concentrations in relation to sex, age, number of diseases and number of medications, significant values were not observed, with values of $r^2 = 0.0007$; 0.0032 ; 0.0377 and 0.0006 , respectively. As a limitation of the study, the sample number, that was relatively small, could have interfered with the results of the analysis. Therefore, we suggest that the subsequent studies be conducted with larger sample sizes, to allow for a better distribution of results. Another limitation was that only a primary taste was tested instead of all five.

DISCUSSION

In the present study, a median gustatory threshold for sweet taste of 4.06g/L was observed in elderly people. Different age brackets have distinct taste perceptions. The level of taste perceived by children is different to that of adults, which can also differ from other groups of people (Negri *et al.*, 2012). In a study conducted with adults and the elderly in 2016, perception for sweet taste in adults in the majority of cases was 1.2g and in the elderly 4.8g, with the elderly needing two to four times more sugar than adults (Passos *et al.*, 2016). Within the elderly population, there are differences in terms of gustatory threshold. Studies show that there is a significant reduction in palatability with advancing age (Ahne *et al.*, 2000; Nordin *et al.*, 2007; Landis *et al.*, 2009). A study conducted in 2006 evaluating taste in two age brackets, one with less than 65 years of age and the other with more than 65 years, found that the perception of taste diminished according to increasing age (Simchen *et al.*, 2006). These changes resultant from aging can be related to the quantity of gustatory corpuscles on the tongue, given that with advancing age this quantity drops from 250 to less than 100 corpuscles (Paula *et al.*, 2008). Corpuscles are neuro-sensitive bodies in the epithelium of the papillae. They are very similar to each other, despite the various possible locations in the mouth cavity. Adults have around 3,000 to 10,000 while children have a little more. After the age of 45, many taste buds degenerate, becoming progressively less sensitive to taste sensations (Furquim, 2006). In terms of the average limit amongst men (4.19g/L) and women (4.01g/L), there was a similarity in terms of the degree of the threshold. This closeness of threshold of detection could explain the fact that no correlation between the sex variable and the threshold was observed. In a study carried out in RS in 2016 (Neumann *et al.*, 2016), there was also no association identified between the sex variable and the gustatory threshold, despite the realization of the chi-square test for analysis.

In terms of the median gustatory threshold for sweet taste amongst individuals who only possess hypertension or only have diabetes, it was found that these elderly people had a very close median. There was a greater difference however with those elderly people who possessed two associated pathologies. Based on this, it was seen that hypertensive and diabetic elderly people have high threshold indices when compared to individuals who are either hypertensive or diabetic. This can be explained given that both pathologies interfere in a synergistic manner in gustatory alterations and these concomitantly magnify the effects of the changes. A study carried out with diabetic and non-diabetic elderly people in 2016 (Dias *et al.*, 2016), found that elderly people with diabetes have a high threshold when compared with non-diabetics. The loss of gustatory perception in individuals with diabetes mellitus is related to hypo-salivation, xerostomia and a low production of gustatory proteins. Additionally, the deficiency or absence gustative interferes with salivation and the maturation of gustatory papillae provoking alterations in the perception of sweet taste (Negrato and Tarzia, 2010). In the elderly people analyzed, there was no correlation between age and the gustatory threshold for sweet taste. Although some studies indicate changes to sensibility with increasing age (Ahne *et al.*, 2000; Nordin *et al.*, 2007; Landis *et al.*, 2009), in the present study, no direct relationship between age and threshold for detection was observed. Despite no relationship being identified between these variables, it was found that the prevalence of gustatory alteration was higher between elderly people in the age bracket from 60 to 69 years of age (64.4%) in agreement with the literature that said that the alterations begin to occur from 60 years old (Yen, 2004). Another variable analyzed was the number of medications utilized by these elderly people that also showed no significant correlation. It is important to underline that the main cause of gustatory disturbances in the elderly is the result of poly-medication that can alter the signs for gustation and olfaction (Paula *et al.*, 2008). There are other factors however, that can affect this change.

These include the aging process, life and hygiene habits and the occurrence of chronic degenerative diseases such as diabetes mellitus and hypertension amongst others. The difficulty that elderly people have to detect sweet tastes predisposes them to sweeten their food more. In the absence of appropriate intervention, this situation over the long-term can lead, together with other factors, to complications for individuals who already have diabetes (Passos, 2010). The changes referent to taste in elderly people are part of the physiological process, related to aging itself. There are other factors however that can be related to the emergence of these changes. Therefore, it is concluded that elderly people with associated hypertension and diabetes have higher gustatory threshold indices when compared with the others. Given this physiological situation, which affects the majority of elderly people and having in mind the factors that are associated with changes of taste, it is necessary to develop further studies into the subject, as well as to provide strategies in health care services with the aim of minimizing aggravating factors that can result from these changes.

REFERENCES

- Ahne, G.*et al.* 2000. Assessment of gustatory function by means of tasting tablets. *Laryngoscope*.110(8), pp.1396-1401.

- Allen, V.J. *et al.* 2014. A new rapid detection threshold method for use with older adults: Reducing fatigue whilst maintaining accuracy. *Food Quality and Preference*.36, pp.104-110.
- Dias, V.R. *et al.* 2016. Avaliação da percepção sensorial ao gosto doce em pessoas com Diabetes Mellitus tipo 2. *Rev Rene*. 17(4), pp.483-489.
- Drewnowski, A. 1997. Taste preferences and food intake. *Annu Rev Nutr*. 17, pp. 237-253.
- Furquim, T.R.D.A. (2006) Relação entre o limiar gustativo ao doce e ao amargo e a cárie dentária em escolares da zona rural e urbana de Londrina, PR. Mestrado em odontologia. Universidade Norte do Paraná, Londrina (PR), Brasil.
- Griep, M.I. *et al.* 2000. Effects of flavor amplification of Quorn and yoghurt on food preference and consumption in relation to age, BMI and odour perception. *British J. Nutr*.83, pp.105-113.
- International Organization for Standardization. 2002. Sensory analysis. Methodology. General guidance for measuring odour, flavour and taste detection thresholds by a three-alternative forced-choice (3-AFC) procedure. In: ISO International Standard. N° 13301/International Organization for Standardization, Geneva: International Organization for Standardization. 27, p.1-5.
- Kennedy, O. *et al.* 2010. Investigating age-related changes in taste and affects on sensory perceptions of oral nutritional supplements. *Age and Ageing*.39(6), pp.733-738.
- Landis, B.N. *et al.* 2009. "Taste Strips": a rapid, lateralized, gustatory bedside identification test based on impregnated filter papers. *J Neurol*. 256(2), pp.242-248.
- Lazcano-Ortiz, M. & Salazar-González, B.C. 2009. Adaptación en pacientes com diabetes Mellitus tipo 2 según modelo de Roy. *Aquichan*. 9 (3), pp. 236-245.
- Lebrão, M.L. 2009. Epidemiologia do envelhecimento. *BIS, Bol. Inst. Saúde. (Impr.)*, 47, pp. 23-26.
- Lopes, A.C.F. *et al.* 2015. Prevalência de alterações gustativas em idosos em uso crônico de fármacos. *GeriatrGerontol Aging*.9(4), pp.132-137.
- Methven, L. *et al.* 2012. Ageing and taste. *Proceedings of the Nutrition Society*.71(4), pp.556-565.
- Negrato, C.A. & Tarzia, O. 2010. Buccal alterations in diabetes mellitus. *Diabetol Metab Syndr*.15(2:3), pp.1-11.
- Negri, R. *et al.* 2012. Taste perception and food choices. *J PediatrGastroenterol Nutr*. 54(5), pp.624-629.
- Neumann, L. *et al.* 2016. Taste sensitivity of adults and elderly persons. *Rev. bras. geriatr. Gerontol*. 19(5), pp.797-808.
- Nordin, *Et al.* 2007. Substance and tongue-region specific loss in basic taste-quality identification in elderly adults. *Eur Arch Otorhinolaryngol*.264(3), pp.285-289.
- Passos, D.R. 2010. Avaliação do paladar de idosos e sua relação com o estado nutricional. *Bacharelado em Nutrição. Faculdade de Medicina, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil*.
- Passos, J. G. *et al.* 2016. Avaliação da percepção gustativa em idosos para os gostos básicos, doce e salgado, em comparação a jovens adultos. *J. Health Sci. Inst*. 34(1), pp. 29-32.
- Paula, R.S. *et al.* 2008. Alterações gustativas no envelhecimento. *RevKairós*. 11(1), pp.217-235.
- Sachdev, P. S. *et al.* 2010. The Sydney Memory and Ageing Study (MAS): Methodology and baseline medical and neuropsychiatric characteristics of an elderly epidemiological non-demented cohort of Australians aged 70-90 years. *International Psychogeriatrics*.22(8), pp.1248-1264.
- Simchen, U. 2006. Odour and taste sensitivity is associated with body weight and extent of misreporting of body weight. *Eur J Clin Nutr*. 60(6), pp.698-705.
- Vitolo, M.R. 2008. *Nutrição da gestação ao envelhecimento*, Rubio, Rio de Janeiro.
- World Health Organization - WHO. 2009. *Global health risks: mortality and burden of disease attributable to selected major risks*. Geneva, 63p.
- Yen, P.K. 2004. Nutrition and sensory loss. *Geriatric Nursing*.25(2), pp.118-119.
