



Salty Taste Threshold in Hypertensive Patients Taking Certain Types of Anti-Hypertensive Medication Compare to Healthy Individuals

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Abstract

Background: Hypertension is a chronic medical condition in which blood pressure in the arteries is elevated which affect multiple organs. Taste alteration is an oral complication caused by antihypertensive drugs which were used to treat hypertension.

Patients and methods: A single blind case control study was carried out along five successive months (December 2013-April 2014), the study was done on two hundred patients; hundred hypertensive patients who were visiting raparin hospital in Chamchamal and hundred healthy individuals who were visiting shahid peshraw clinic, taste thresholds were detected by using five different concentrations of sodium chloride solution. Each individual was given (3cc) of lowest concentration of sodium chloride solution to rinse the mouth for 30 seconds, the concentration in which the individual was able to recognize the salty taste was recorded. The data were analyzed using Mann-witny U test.

Results: Hypertensive patients showed a significantly higher tasting ability for salt in concentrations (0.1, 0.32) ($p=0.001$) than the non-hypertensive individuals. There was statistically significant difference between age and salty taste disturbance in both hypertensive ($P<0.05$) and healthy individual ($P<0.05$), as well as there was statistically significant difference between sex and taste disturbance in hypertensive patients ($P<0.05$).

Conclusions: Salty taste threshold was decreased in hypertensive patients using certain types of antihypertensive drugs compared with non-hypertensive individuals, which may result in an increase preference for salt.

Keywords: Hypertensive patients; Taste disturbance; Blood pressure

Introduction

Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is elevated. Normal blood pressure at rest is within the range of 100–140 mmHg systolic and 60–90 mmHg diastolic. High blood pressure is said to be present if it is often at or above 140/90 mmHg [1]. Antihypertensive therapy is used to treat hypertension and to prevent the complications of high blood pressure, such as stroke and myocardial infarction. Among the most important and most widely used drugs are thiazide diuretics, calcium channel blockers, angiotensin converting enzyme inhibitors, angiotensin II receptor antagonists, and beta-blockers [2].

Oral complications due to adverse effect of antihypertensive drugs include xerostomia, alteration of taste [3], gingival hyperplasia, and lichenoid reaction [4]. Taste is the sensory impression of food or other substances on the tongue and is one of the five traditional senses. Taste is the sensation produced when a substance in the mouth reacts chemically with taste receptor cells located on taste buds. Taste, along with smell (olfaction) and trigeminal nerve stimulation (registering texture, pain, and temperature), determines flavors of food or other substances [5]. Some researchers evaluated the change in taste perception in hypertensive patients because of adverse effect of antihypertensive drugs that cause xerostomia and taste disturbance [3].

This study was designed to assess the differences between hypertensive patients and healthy individuals in detection of salty taste threshold.

Patients and Methods

This study was carried out along five successive months (December 2013-April 2014). Hundred healthy individuals were obtained from

shahid peshraw clinic in Chamchamal who were visiting for periodic dental check-up, as well as hundred hypertensive patients were obtained from raparin hospital in which their blood pressure were matching with those of the controls. This study was approved by the committee of ethics at research of the University of Sulaimani as well as agreement was obtained from the raparin and shahid peshraw health center. The patients were selected on a volunteer basis.

A detail history was obtained from all patients and factors which alter the taste sensation were excluded from the study which include type 2 DM and other systemic diseases, medications except for hypertension, and smoking and alcohol drinker; while patients included in the study were those with a history of hypertension for at least 5 years, and on antihypertensive medications such as captopril and atenolol as well as patients agreement were obtained. The substance used for salty taste threshold was: salty taste (sodium chloride), for salty tastant five concentrations were prepared depend on Darmstadt company: Merck, Germany (Table 1). The amount of each solute per gram was prepared which dissolved in one liter of distal water, the concentration was measured by molarities (mole per liter), the moles of each solute were prepared by calculating the amount of moles in one liter of water [6].

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The solution was prepared by pharmacologist in five different concentrations (5 bottles) using distilled water, during the study the solutions were kept at room temperature [7] (Table 2).

Before starting the procedure the patients were asked not to eat or drink any things except water at least one hour before the threshold measurement, the procedure was carried out in the morning between 9 AM to 11 AM, and the entire procedure was explained to each patient.

The taste sensitivity for each solution was carried out as a whole mouth taste method, in this method each individual was given (3cc) of lowest concentration of the solution by disposable plastic syringe to rinse the mouth and taste it for 30 seconds, if the patient was able to recognize this solution then the number of the bottle was recorded, if she/he was unable to recognize it then tasted successive higher concentration until a definite taste was identified. The number of the bottle was recorded for concentration in which the individual was able to recognize the taste, tap water was used in between to rinse the tongue to remove the effect of the previous solution, rinsing of the mouth was repeated till the patient said that no taste of the previously tasted concentration lingers on, the actual threshold concentration was determined and then test tube number was noted [8].

The statistical analysis was performed using SPSS (Statistical Package for Social Sciences) program version 19, comparison was done using Student T test and Mann-Whitney U test. Statistical significance was set at $P < 0.05$.

Result

This study included 100 healthy individuals; of which (25) were males and (75) were females, and 100 hypertensive individuals; of which (38) were males and (62) were females. The mean age of both groups was 54 ± 12 and mean duration of the disease was 7 ± 2 (Table 3).

It was observed that at (concentration 1) none of hypertensive patients were able to recognize salty taste, while seventeen (17%) of healthy individuals were able to recognize it correctly; as well as at (concentration 2) only eight (8%) of hypertensive patients were able to recognize salty taste correctly while forty four non hypertensive patients were able to recognize it correctly, for higher (concentration 3,4) ninety two percent of hypertensive patients and thirty nine percent of non-

Solution	1	2	3	4	5
Sodium chloride	0.01g	0.032g	0.1g	0.32g	1g
m= molar mass Molar mass of sodium chloride (NaCl) = 58.44g/mol					

Table 1: Amount of solute per gram which dissolved in one liter of water.

Solution	1	2	3	4	5
Sodium chloride	0.01	0.032	0.1	0.32	1

Table 2: Concentration of solution of sodium chloride, according to the molarities.

Age groups	Sex		Total %
	Male [%]	Female [%]	
34-45 years	—	5	5
46-55 years	[6]	[30]	[36]
56-65 years	[8]	[19]	[27]
66-75 years	[24]	[8]	[32]
Total	[38]	[62]	[100]

Table 3: Distribution of age and sex in hypertensive patients according to our sample.

hypertensive patients were able to recognize salty taste correctly, over all, majority of non-hypertensive patients were able to identify tastant material at (concentration 2) while majority of hypertensive patients were able to identify tastant material at (concentration 3). There was statistically significant difference to salty taste response between hypertensive patients and non-hypertensive individuals; hypertensive patients were less sensitive than non-hypertensive individuals for salty taste ($p < 0.05$) (Table 4).

There was statistically significant difference between sex and taste disturbance in hypertensive individuals; females were more salty taste disturbance than males; but there was no statistically significant difference between sex and taste disturbance in healthy individuals (Table 5).

There was statistically significant difference between age and altered taste sensation in both hypertensive and healthy individuals. Older ages were more salty taste disturbance than younger ages. The majority of healthy patients aged less than 50 years were able to identify the tastant materials at (concentration 2) (Table 6).

Discussion

This study was conducted to compare the taste detection threshold between hypertensive patients using certain type of antihypertensive drug and healthy individuals.

The result shows that there was a significant difference between hypertensive individuals and healthy individuals in salty taste

Groups	Solution (Sodium chloride)				P value*
	1 %	2 %	3 %	4 %	
Non hypertensive	17	44	38	1	< 0.001
Hypertensive	0	8	63	29	

Table 4: Taste sensation to salt in hypertensive and control group.

Sex	Solution (Sodium chloride)				P value*
	1 %	2 %	3 %	4 %	
Hypertensive individuals					0.004
Male	—	—	22 57.89	16 42.10	
Female	—	8 12.90	4 166.12	13 20.96	
Healthy individuals					0.343
Male	5 20	10 40	9 36	1 4	
Female	12 16	34 45.33	29 38.66	—	

Table 5: Relation between sex and taste response among hypertensive individual and among healthy individuals.

Age groups	Solution (Sodium chloride)				P value*
	1 %	2 %	3 %	4 %	
Hypertensive individuals					0.018
less than 50 years	—	4 18.18	15 68.18	3 13.63	
more than 50 years	—	4 5.12	48 61.53	26 33.33	
Healthy individuals					0.009
less than 50 years	10 15.87	35 55.55	18 28.57	—	
more than 50 years	7 18.91	9 24.32	20 54.05	1 2.70	

Table 6: Relation between age and taste disturbance among hypertensive and among healthy individuals.

sensations. The reduced ability to perceive salt taste may play an important role in the pattern of blood pressure observed in individuals with a family history of hypertension.

Bernard et al. examined salt taste responsiveness in seven hypertensive and seven controls with a magnitude estimation procedure, the mean blood pressure of the hypertensive patients was 142/98 mmHg and they were all considered to have low plasma rennin activities, the decision to focus attention on low rennin hypertensive was based upon an hypothesis that such individuals possess an increased blood volume and could therefore be expected to display high salt intakes [9].

Henkin noted that the therapy of taste perception disorders related to used drugs should include the functioning of the receptors of senses and physiological factors affecting the correct functioning of the sense of taste among others the level of zinc and magnesium [10].

Weinberger suggested that evaluating salt sensitivity may be a way to evaluate an inherited characteristic, a simple way to verify in the clinic the gustatory sensitivity threshold to salt. Investigating salt sensitivity and its associations with urinary salt excretion, hypertension genetic markers and vascular disease risk factors, may help to determine the relevance of this simple test [11]. While Olayemi et al. mentioned that patients suffering from arterial hypertension, who did not undergo a hypotensive therapy, were observed to have decreased sensitivity to salty taste [12]. Lefrancq et al. put forward a hypothesis that genetically determined sodium channel disorder is the reason of this problem, the dysfunction of sodium channels affects incorrect sodium, in the light of this hypothesis it can be assumed that some of the hypotensive drugs are an additional factor decreasing the taste sensitivity through affecting the way sodium channels function [13].

More over Lefrancq et al. mentioned that changes in taste perception were a common reason for discontinuing the drug therapy by patients suffering from arterial hypertension, which poses a serious threat to their lives [13].

In this study, age and sex were associated with taste disorder; the result of analysis suggests that the age was the most important parameter to explain taste disturbance in hypertensive individual; to support this, taste disorders have been found in hypertensive patients using certain types of antihypertensive drugs with significant relation between taste function and age.

The findings of this study suggest that the taste was impaired in hypertensive patients and this impairment may induce mistakes in salt intake, when food composition is unknown and only estimated by

tasting.

In conclusion, the evaluation of taste sensation in hypertensive patients using captopril and atenolol showed less sensitivity to salty taste than healthy individuals; age and sex were significantly associated with taste disturbance in hypertensive patients.

Further suggested investigations are including patients their blood pressure within a limited range; blood investigation to detect zinc and vitamin E levels to exclude taste buds atrophy, select equal number of male and female to evaluate the effect of sex on taste alteration; as well as investigating salt sensitivity and its associations with urinary salt excretion, hypertension genetic markers and vascular disease risk factors may help to determine the relevance of this simple test.

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