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Original Research Paper

Radiology

# SINGLE BLINDED CASE CONTROL STUDY ON SALT TASTE THRESHOLD PERCEPTION IN HYPERTENSIVE PATIENTS

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## ABSTRACT

**Background:** Hypertension is a common chronic medical condition affecting majority of the population. Hypertensive patients are usually advised to take salt free diet or diet with minimal salt concentration. Many of the anti hypertensive's act by lowering the sodium levels in the body. A few studies have suggested that there is a lowering of taste threshold for salty taste in the hypertensive patients[1]. Our study was intended to assess whether there is any actual change in the threshold for salt taste in the hypertensive patients as compared with the healthy controls.

**Study Design:** This single blinded case control study was carried out among 20 hypertensive patients and 20 healthy controls. Taste threshold was measured using different concentrations of sodium chloride solution. Each individual was asked to rinse mouth with 3 cc of sodium chloride solution for 30 seconds. The final concentration at which patient was able to perceive the taste was recorded.

**Results:** The results showed that hypertensive patients (3.05±0.51) showed a significantly higher tasting ability for salt in concentrations (0.1, 0.32)($p<0.0001$) than in non-hypertensive individuals(2.15±0.37).

There was no statistically significant difference between age and sex to salty taste threshold ($p>0.05$) between hypertensive patients and controls.

**Conclusion:** Salt taste perception threshold was found to be elevated in hypertensive patients compared to controls. Our study findings suggests that the hypertensive patients need to be more careful in their selection of dietary intake as there maybe taste alterations impairing their ability to assess the salt in the food.

## KEYWORDS :

**Introduction:**

Blood pressure at rest is usually within the range of 100-140mm Hg systolic and 60-90mm Hg diastolic. This is usually considered as normal blood pressure. Hypertension is a chronic medical condition in which the arterial blood pressure is elevated, with systolic above 150 mm Hg and diastolic above 90mm Hg. Various antihypertensive drugs like thiazide diuretics, calcium channel blockers, Angiotensin converting enzyme inhibitors, Angiotensin-II receptor antagonists and beta-blockers are used to lower blood pressure and bring it within the normal range. Patients are usually advised to reduce their salt intake in their diet along with modification of lifestyle to reduce stress levels. Some of the anti hypertensives may induce changes in the oral cavity like taste acuity alterations, xerostomia, gingival hyperplasia and lichenoid reaction. Many of the anti hypertensives act by lowering the sodium levels in the body. Taste alteration is a side effect of many of the commonly used anti-hypertensives.

**Materials and Method:**

This study was conducted to assess whether there is any actual change in the threshold for salty taste in hypertensive patients on antihypertensive medications as compared with healthy controls.

The study comprised of 40 patients from the outpatient department of Oral Medicine and Radiology, Narayana Dental College and Hospital, of which 20 were hypertensive patients and 20 were healthy controls. The patients were age and gender matched.

The patients who were diagnosed by their physicians as having hypertension and taking antihypertensive medications on a regular basis were included in the study with signed informed consent. A detailed history of hypertension of the patients was recorded.

**Inclusion Criteria:**

Patients with history of hypertension for greater than 5 years, blood pressure greater than 140/90 mm of Hg

Patients taking only antihypertensive medications.
Patients willing to participate in the study.

**Exclusion Criteria:**

Patients not willing to participate in the study
Patients using drugs other than anti hypertensives which may alter taste
Patients with type – 2 Diabetes Mellitus
Sjögren syndrome
Vitamin B12 and/or Zinc deficiency
Poor oral hygiene and patients with oral infections
Neurologic disorders and head injury patients
Patients under radiation therapy and chemotherapy

Patients with gastric disorders
History of Smoking/Alcohol Intake

Analytical grade sodium chloride dissolved in distilled water to obtain solution concentrations of 0.01M, 0.032M, 0.1M, 0.32M and 1.0M were used to assess the salt taste threshold.

| solution | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Sodium chloride | 0.01M | 0.032M | 0.1M | 0.32M | 1.0M |

These solutions were stored at room temperature. Before starting the procedure the patients were asked not to eat or drink anything except water at least one hour before the threshold measurement.

Each patient was given 3 ml of salt solution starting from the lowest concentration orally. Then the patient was asked to rinse mouth for 30 seconds. If the patient was able to recognize the salt taste, then the concentration was noted. If patient was unable to perceive the taste, then the next solution of higher concentration was given orally. Between the saline water rinses, the patients were made to rinse their mouths with plain water to eliminate any residual salt taste in the mouth.. The final concentration at which the patient was able to recognize the salt taste was recorded.

**Statistical Analysis:**

Statistical analysis was performed using software SPSS version 20.0. Comparison between the groups was done using Independent sample T-test.

**Results:**

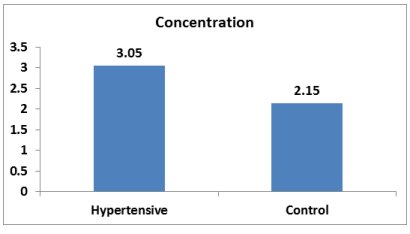
The study included 40 patients of which 20 were hypertensive and 20 were healthy controls. In both the groups there were 9 males and 11 females. Most of these patients were on Atenolol or Telmisartan.

The mean age of hypertensive patients was 55.10±9.11 and control group patients' mean age was 52.50±8.30.

The mean concentration at which the hypertensive patients were able to recognize salty taste was 0.12±0.08 and in controls it was 0.042±0.02.

| | | N | MEAN | SD | SE |
|---|---|---|---|---|---|
| Age | Hypertensive | 20 | 55.10 | 9.113 | 2.038 |
| | Control | 20 | 52.50 | 8.300 | 1.856 |
| Concentration | Hypertensive | 20 | 0.12620 | 0.86060 | 0.19244 |
| | Control | 20 | 0.04220 | 0.024912 | 0.005570 |

There was statistically significant difference in salty taste threshold in hypertensive patients under antihypertensive medication and healthy controls (p<0.0001).



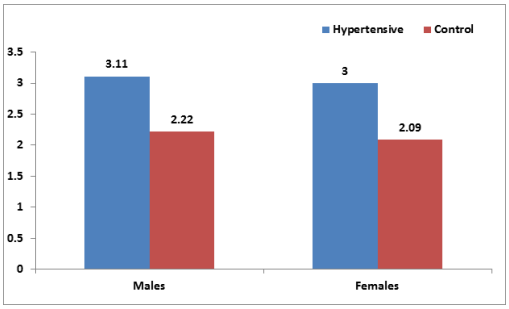

It was observed that at concentration 1(0.01M) none of the hypertensive patients were able to recognize the salty taste and at concentration 2(0.032M) 2 hypertensive patients and 17 controls, at concentration 3(0.1M) 15 hypertensive patients and 3 controls, at concentration 4(0.32M) 3 hypertensive patients were able to percept salty taste.

| | 1(0.01M) | 2(0.032M) | 3(0.1M) | 4(0.32M) | 5(1.0M) |
|---|---|---|---|---|---|
| Hypertensive group | - | 2 | 15 | 3 | - |
| Control group | - | 17 | 3 | - | - |

In the hypertensive group the mean concentration among males was 0.12±0.07 and in females it was 0.12±0.09. In the control group the mean concentration among males was 0.04±0.02 and in females it was 0.03±0.02

| | | N | MEAN | SD | SE |
|---|---|---|---|---|---|
| Hypertensive | Male | 9 | 0.12444 | 0.073333 | 0.024444 |
| | Female | 11 | 0.12764 | 0.098816 | 0.029794 |
| Control | Male | 9 | 0.04711 | 0.029985 | 0.009995 |
| | Female | 11 | 0.03818 | 0.020503 | 0.006182 |

There was no statistically significant difference between males and females in threshold concentration in both hypertensive and control group (p>0.05).




**Discussion:** Faiq Mohammad Amen in his study on 200 hypertensive patients and controls reported statistically significant differences between the 2 groups and between males and females in both groups regarding concentration.

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. Their hypothesis was hypertensive patients possess an increased blood volume and therefore expected to take high salt intakes.

Primary hypertension is more likely to occur in populations with high salt intake above >100meq/day compared to populations with low salt intake < 50meq/day . This suggests that development of hypertension maybe dependent on the level of dietary sodium consumption.

In addition to sodium, chloride also appears to play an important in the pathogenesis of primary hypertension. Increasing sodium chloride intake has been shown to cause volume expansion and rise in blood pressure in hypertensive patients. This however does not take place if sodium citrate is given to the hypertensive patients. Reduction of salt intake to <100meq/day lowers the blood pressure in normotensive adults.

Some of the medications commonly used for treating hypertension like ACE inhibitors, Ca channel blockers, Thiazide diuretics and Antiarrhythmics are known to cause effects like dysguesia or hypoguesia. Some of the antihypertensives indirectly alter taste by causing xerostomia. Therefore the physician must be careful while prescribing medications and should carefully monitor these patients.

To reduce salt intake, it is better to eat foods that have low salt content and use minimal salt in cooking or at table. By reading the label on foods, one can see if a food is low, medium or high in salt

- **Low Salt Content :** 0.3g salt or less per 100 g Consumption Recommended
- **Medium Salt Content:** 0.3 to 1.5 salt per 100g Less Consumption Recommended
- **High Salt Content:** 1.5g or more per 100g Consumption Not Recommended

**Conclusion:**

Salt taste threshold was elevated in hypertensive patients under antihypertensive medications compared to controls. This suggests that the hypertensive patients need to be more careful in their selection of dietary intake as there may be taste alteration impairing their ability to asess the salt levels in the food.

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