

## Association of Salt Taste Threshold with Blood Pressure among Young Adult Having Family History of Hypertension in Rural Population of Central India.

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### Abstract:

Early development of hypertension in young adults is new challenge in India. In young college students to assess relation between hypertensive subject and their Salt Taste Threshold, 80 subjects of 18-25 years having documented hypertensive family history were selected. We observed a significantly high value of blood pressure and Salt Taste Threshold in hypertensive offspring than the control in the study population. We also found a significant positive association of Salt Taste Threshold in offspring of hypertensive cases after setting 60 mM sodium chloride solution as cut off and applying Pearson Chi-square test. Pearson analysis shows a significant positive correlation exist between Blood pressure and SST. This study reveals a strong relation of reduced salt taste sensitivity in hypertensive offspring. It might be become a reliable indicator for early screening of salt sensibility of subject belonging to hypertensive family in development of hypertension in rural areas where recourses are less.

**Keywords:** Salt Taste Threshold, Hypertension, Systolic Blood Pressure, Diastolic Blood Pressure.

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### Introduction

Hypertension is become a commonly seen health issue in a developing country like India. Hypertension follows the Iceberg Phenomenon which depict that the reported cases of hypertension are much lesser as compared to the actual present one [1]. Most of the patients are diagnosed at the later stages of hypertension either during routine check-up or when suffering from its symptoms. The main causes of primary hypertension are genetically inheritance from parents and lifestyle. The risk factors that increases the development of primary hypertension are high salt intake, smoking and excess consumption of alcohol [2]. Secondary hypertension is developed due to some other underlying issues like renal disease, excessive use of contraceptive pills or may be endocrine in origin.

As per Koster, now a day in this junk food era mostly our cultural habits are belonging to "Why does who eat what, when, and where?" there is diversification of available foodstuffs and socio-economical status influences eating habit much

more [3]. People like to eat food reach in taste which contains hidden high dietary sodium.

Studies already showed that there is close relationship persist between sodium consumption in diet and development of hypertension [4]. It has also been proven that control in sodium intake also markedly decreases the diastolic pressure which in turn reduces the morbidity and mortality.

Recommendation from The American Heart Association suggest that a normotensive adult must not have more than 2300 milligrams of salt per day in dietary intake while a hypertensive subject must not exceed 1000 mg of salt per day [5].

Role of Salt taste threshold- Earlier in some studies taste sensation alteration and its related effect on blood pressure was noted by researchers [6-10]. Few studies have pointed out that there may be alteration in Salt taste threshold in hypertensive patients [11-13]. Dr Leta Pilic conducted a study on relationship between salt taste threshold and its genetic predisposition in development of hypertension and found that subject with high salt

taste threshold prefer high salty diet. [14]. It is quite possible that hypertensive parent have altered or high thresholds sensitivity. In India, not many studies have been done to set a connection between decrease salt taste sensitivity and elevated blood pressure. STT Test is easy, cheap, less time consuming. We tried to set a relationship between hypertension and salt taste threshold so that it can be helpful in prevention of hypertension by early detection and followed by diet modification.

**Objective**

The tried to assess the salt taste threshold among young normotensive students whose parents are known case of hypertension and along with that to find out correlation between STT and raised blood pressure.

**Material method**

We conducted this study in the Physiology Department of Government Medical College, Gondia (M.S). It was a transverse study. Total 80 healthy subjects of both sexes, age between 18-25 years were selected for study. Participants with history of illness like impaired taste sensation, suffering from Bell’s palsy and diabetics were excluded. We divided subjects into two study groups, one group whose parents are having history of hypertension in family and second group whose parents are normotensive. We included male and female participants in the both group. We documented Age, sex, weight of all participants.

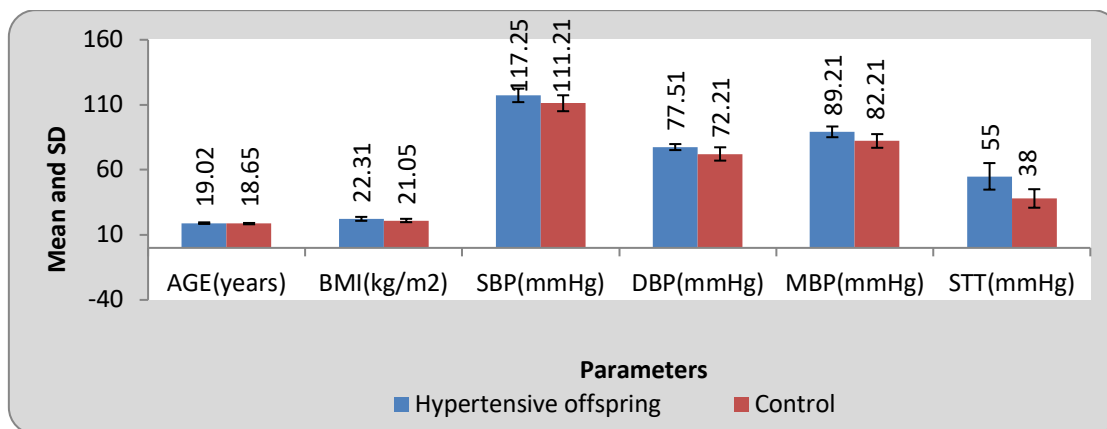
Salt taste threshold is the taste used to assess the salt taste sensibility of a person at lower most concentration of Sodium chloride solution. In this, we prepare a series of Sodium chloride solution from lower concentration of 0.002 mol/l(0.140 g/l) to higher concentration of 0.002 mol/l (0.140 g/l). A drop of this solution starting from lower to higher concentration at the time interval of thirty second was applied on the tip of tongue of each subject until subject recognize the salty taste. Once salty taste was recognized than mouth with pure distilled water and the procedure is again repeated to confirm the finding [15,16]. We applied various test like Chi square test, Pearson’s Correlation Coefficient and student’s unpaired t test to analyze data with the help of software SPSS 27.0 version and Graph Pad Prism 7.0 version. The level of significance in the study was considered as  $p < 0.05$ . We had calculated Mean and Standard Deviation and conveyed as Mean  $\pm$  SD. Assessment of distribution of salt taste threshold in both groups was done by using Pearson Chi square test. Fisher’s Exact test was used to evaluate the gender disparity in distribution of Salt taste threshold values in the study group. To correlate STT with BP we used the Karl-Pearson Correlation Coefficient analysis test. Finally, the Statistical significance of difference had been determined.

**Results**

**Table 1: Study groups showing comparison of various parameters and salt taste threshold in the study groups.**

Parameter	Hypertensive progeny (n= 40) Expressed in Mean and SD	Control group(n= 40) Expressed in Mean and SD	t-value	P-value
AGE(Year)	19.02 $\pm$ 0.61	18.65 $\pm$ 0.51	1.956	0.051,NS
BMI(kg/m <sup>2</sup> )	22.31 $\pm$ 1.52	21.05 $\pm$ 1.29	1.256	0.059,NS
SBP(mmHg)	117.25 $\pm$ 5.19	111.21 $\pm$ 6.12	3.319**	0.001,S
DBP(mmHg)	77.51 $\pm$ 2.31	72.21 $\pm$ 5.12	3.812**	0.0001,S
MBP(mmHg)	89.21 $\pm$ 4.12	82.21 $\pm$ 5.26	5.219**	0.0001,S
STT(mmHg)	55 $\pm$ 10.21	38 $\pm$ 7.12	8.216**	0.0001,S

We applied Student’s unpaired test and  $p < 0.01$  which is statistically highly significant



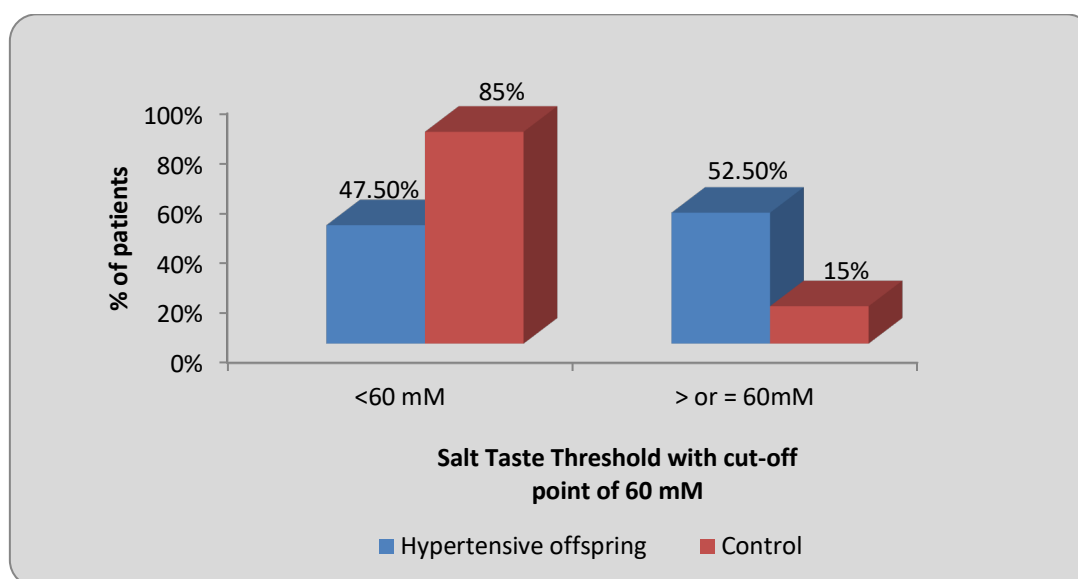
**Figure 1: Comparison of various parameters, their Mean and SD in normotensive offspring and control group.**

Table I illustrate Mean and SD values of Age, BMI, SBP, DBP, MBP and STT for Hypertensive and Control group. We compared the data by employing Students unpaired t test. Table I also depict that there is no significant difference between two study group regarding parameters Age and BMI. The SBP, DBP, MBP and STT value was significantly high in Hypertensive progeny than in Control ( $P < 0.01$ ).

**Table 2: Association of Salt Taste Threshold variables in the two study groups:**

Salt Taste Threshold with cut-off point of 60 mM	Hypertensive offspring	Control	Total	$\chi^2$ -value
<60 mMol	19(47.5%)	34(85%)	53(66.25%)	12.58 P=0.0004,S
> or = 60 mMol	21(52.5%)	06(15%)	27(33.75%)	
Total	40(100%)	40(100%)	80(100%)	

Data is tabulated with the help of Pearson Chi Square test.



**Figure 2: Comparison of Salt Taste Threshold in Hypertensive offspring group and Control group.**

As per Pearson Chi Square test, Table 2 represents significantly high association of Salt Taste Threshold values in Hypertensive offspring than Control. We had applied this test to evaluate the distribution of STT values with a cut-off point of 60 mM sodium chloride concentration in the study

groups as a test of homogeneity. We found that 52.5% of hypertensive offspring group had higher STT value of 60 mM and greater as compare to 15% of control group. This was found to be significantly high difference ( $X^2 = 12.58$ ,  $P = 0.0004$ ).

**Table 3: Association of Salt Taste Threshold in males subjects of study group.**

Salt Taste Threshold with cut-off point of 60 mM	Hypertensive off-spring	Control	Total	$\chi^2$ -value
<60 mMol	09(45%)	18(90%)	27(67.5%)	6.23 P=0.0024,S
> or = 60mMol	11(55%)	02(10%)	13(32.5%)	
Total	20(100%)	20(100%)	40(100%)	

Data is tabulated with the help of Fisher's Exact test.

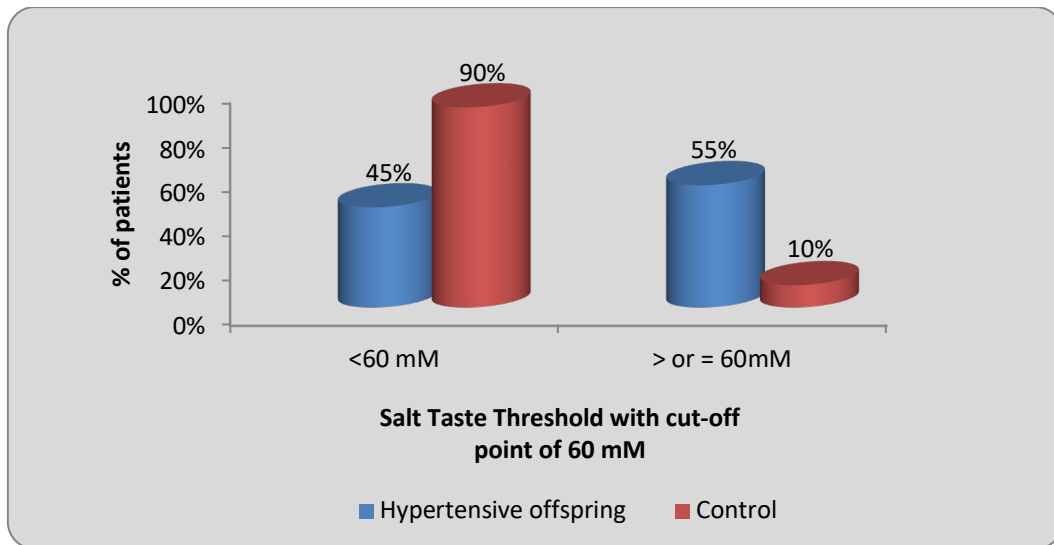


Figure 3: Comparison of Salt Taste Threshold in male Hypertensive offspring and Control group.

Table 4: Association of Salt Taste Threshold in females subjects of study group.

Salt Taste Threshold with cut-off point of 60 mM	Hypertensive offspring	Control	Total	$\chi^2$ -value
<60 mMol	09(45%)	20(100%)	29(72.5%)	15.17 P=0.0001,S
> or = 60mMol	11(55%)	0(0%)	11(27.5%)	
Total	20(100%)	20(100%)	40(100%)	

Data is tabulated with the help of Fisher’s Exact test.

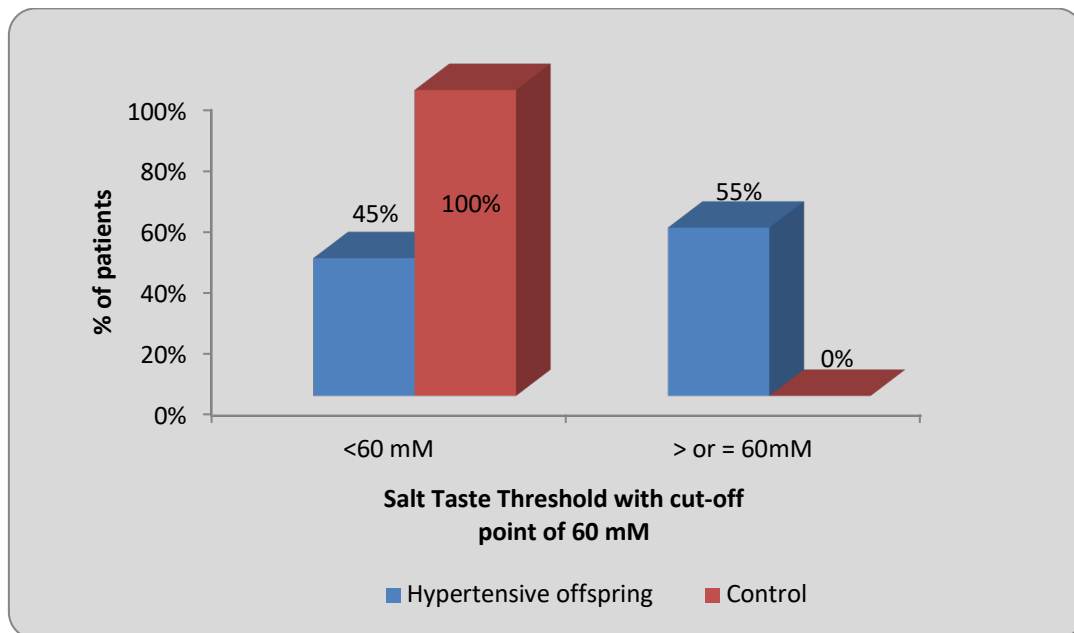


Figure 4: Comparison of Salt Taste Threshold in female Hypertensive offspring and Control group.

Table 3 and 4 depict the Salt Taste Threshold comparison on the basis of gender distribution in the both study group. By using Fisher’s Exact test, it shows that the female population in the group had significantly high association with Salt Taste Threshold values (P =0.0001) in comparison to male population (P=0.0024).

Table 5: Relationship of Salt Taste Threshold with Systolic Blood Pressure, Diastolic Blood Pressure and Mean Blood Pressure reading in Hypertensive offspring and Control groups.

Parameters	Hypertensive offspring (n=40)		Control (n=40)	
	r-value	P-value	r-value	P-value

SBP(mmHg)	0.951**	0.0001,S	0.829**	0.0001,S
DBP(mmHg)	0.956**	0.0001,S	0.856**	0.0001,S
MBP(mmHg)	0.921**	0.0001,S	0.812**	0.0001,S

\*\*P value <0.01 - statistically highly significant.

Table 5 reveals that correlation of Salt Taste Threshold values with SBP, DBP and MBP readings was found to be highly significant. Karl-Pearson correlation coefficient analysis test reveals significantly high positive correlation statistically exist between Salt Taste Threshold and Blood pressure (P<0.01).

### Discussion

Present study was done to highlight out the relation between parameter like Age, BMI, SBP, DBP, MBP and STT of Hypertensive offspring and Control group. The Salt Taste Threshold in Hypertensive offspring group is found to be significantly raised as compare to control group and some article has similar findings [17, 18]. Moreover, few article has shown that some preexisting conditions like hypertension and diabetes are genetically linked and inherited in offspring which strengthen the assumption that there must be a relationship exist between reduced salt taste sensitivity and hypertension [19, 20, and 21]. This article strongly suggests that normotensive offspring of hypertensive individuals are more prone to develop hypertension as their salt taste threshold is significantly increased and if prior specific interventions are not taken in such cases. These findings in the present study are comply with other related researches [22, 23]. This study also suggest that most of hypertensive offspring are having reduced salt taste sensitivity which pointed out the Taste Threshold of Hypertensive offspring may be genetically linked with hypertension and therefore it is must to identify and counsel such offspring in early detection and prevention of development of hypertension [24,25]. In such cases, the most effective way to reduce the progression of hypertension is diet modification [26, 27]. As Salt taste sensitivity is less in these cases we cannot denied that they might consume salt rich diet to fulfill the salty taste. Furthermore, in this study we have seen that female offspring of hypertensive parents have significantly raised Salt Taste Threshold than male offspring indicating that females are at more risk to develop hypertension. In the present study, Hypertensive offspring group have higher Salt taste threshold as well as blood pressure compared to control who are normotensive with normal salt taste threshold. We found a remarkable positive association between STT and SBP, DBP and MBP readings in above groups. Now a day few studies shown that many young adults are suffering from high blood pressure and no doubt there may be possibility of altered salt taste sensation [28, 29]. From the

above study we can conclude that decrease salt taste sensitivity plays important role in augmentation of hypertension and we can delay the progression of rising blood pressure by counseling and low salt diet and decrease salt taste sensitivity can be used as a early marker in development of hypertension in normotensive offspring of hypertensive individuals .

### Conclusions

Salt taste threshold in normotensive offspring of hypertensive population was found to be significantly high and this study can be beneficial to normotensive offspring of hypertensive individuals in early prevention to develop hypertension by assessing salt taste threshold. It might also become a cheap and reliable indicator for early screening of salt sensibility of subject belonging to hypertensive family in progression and development of hypertension in rural areas where resources are less.

### Abbreviation

mMol - Millimole

BP- Blood pressure

STT- Salt Taste Threshold

SBP- Systolic Blood Pressure

DBP- Diastolic Blood pressure

MBP-Mean Blood pressure

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