

## A Study on Barriers in Salt Restriction Among Hypertensive Patients in Urban Population of Chidambaram

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**Abstract:** Despite the wealth of evidence for unfavourable effects of salt consumption on blood pressure dietary adherence remains unachievable. Behaviour modification by considering the perceived barriers has emerged as a promising control measure. This is a cross sectional study carried out in primary health centre of Chidambaram to assess the level of perceived barriers to salt restriction among known hypertensive patients in an urban population and to find out the various factors influencing the level of barriers. The study assessed known hypertensive patients for their prior behaviours and perceived barriers in following salt restriction along with dietary sodium estimation and clinical details. The barriers perceived by the participants were assessed and categorized as less, moderate and severe using Fredmann test. It was analyzed for association with factors of prior behaviour, duration of disease and treatment regularity using ANOVA. The study revealed no association between socio-demographic factors and perceived barriers yet duration of disease and treatment regularity had positive association with perceived barriers which was statistically significant ( $p < 0.05$ ). Also prior behaviours were statistically associated with perceived barriers ( $p < 0.05$ ). This study highlights the importance of knowledge of perceived barriers to encourage behavioural change for adapting salt restriction as a healthy practice.

**Keywords:** hypertension, salt restriction, duration of hypertension, dietary sodium, perceived barriers

## INTRODUCTION

Hypertension is an important public health challenge in both economically developing and developed countries affecting a large number of people all over the world [2]. Suboptimal blood pressure control has been identified as the third ranked factor for disability adjusted life years [3]. Hypertensives, when compared to normotensives, develop twice as much coronary heart disease, four times as much congestive heart failure and seven times as much stroke [4]. With only 3 percent patients on antihypertensive medications, and only half of them with blood pressure within normal range, attention has shifted to control and prevention of non-communicable at the national level [5]. Although antihypertensive drugs are effective, and now inexpensive for most populations in the world, their use is far short of ideal and often inadequate [6,14].

Prevalence of hypertension has increased by 30 times among the urban dwellers [7] with only one

fifth of urban Indian hypertensive population have their Blood Pressure under control [8]. Efforts to reduce the prevalence of hypertension have focused on non-pharmacologic approaches that lower blood pressure [8] specifically on primordial prevention efforts in large scale [6]. Among the complex interaction of genetic, environmental, and demographic factors causing hypertension [10]. dietary factors have a prominent role in Blood Pressure homeostasis [10]. A substantial body of evidence strongly supports the concept that multiple dietary factors affect blood pressure [10] among which, high salt intake is a relatively major one [1]. Salt contains about 40 per cent sodium, and a teaspoon of salt, which weighs about 5 grams, contains about 2 grams of sodium [11]. Studies on the effect of salt intake on BP in humans have been carried out extensively indicating regional differences in habitual salt intake and BP within a population [13]. The report from the Eighth Joint National Committee recommends a reduction in dietary salt from the current intake of 9 – 12g/day to less than 5 – 6g/day to have beneficial

effects on health [13]. The 5gm of recommended salt consists 2gms of sodium thus the recommended levels of sodium intake to be <2gms [14].

Despite the wealth of evidence for unfavourable effects of salt consumption on BP and cardiovascular health, public health efforts to decrease sodium consumption have been limited to a few countries [15]. Unfortunately, most of the hypertensive patients do not actually adhere to recommendations and only less than half of the patients generally accept healthy diet as a part of their treatment. Dietary adherence is a lifelong action in this group, and internal desires and temptations play a role as a barrier around this issue [1]. Behaviour modification is an important step in the management of HTN, attributed to social and cultural barriers including different body image ideals and food attitudes [16]. Better understanding of the importance of one's beliefs and perception in salt consumption and salt reduction, in turn, may reduce the barriers faced by these individuals and to better Salt Restriction [2]. Studies have shown that health benefits do not outweigh the importance of sensory properties of foods, and consumers are not ready to make sacrifices in hedonic pleasures indicating the difficulty in changing one's taste habit [2].

Thus with very few studies about the assessment of barriers perceived in salt restriction among Indian population, the present study has been carried out with the objectives to assess the level of perceived barriers to salt restriction among known hypertensive patients in an urban population and to find out the various factors influencing the level of barriers.

## METHODOLOGY

### Study design and area

This is a cross sectional study carried out among out patients attending the primary urban health care centre functioning under Department of community medicine of RMMCH in Chidambaram. This study was carried out for a period of 4 months from 2<sup>nd</sup> January to 30<sup>th</sup> of April 2017. The study population consisted of individuals >30yrs of age diagnosed as hypertension atleast 3 months prior, irrespective of their treatment status. Patients having other co-morbidities, previously diagnosed cardiac conditions were excluded. Prior ethical clearance was obtained from the institute and informed written consent was also obtained from each participant after explaining the details of study.

### Sample size and Sampling technique

Based on the results of a study by Kamran *et al* [1], the correlation coefficient of the variables were taken into consideration to calculate sample sizes for each variable of the model. The aggregate of these calculated sample sizes was estimated to be 105, which was taken as the sample size for this study. With this sample size the study was conducted among the patients

attending the urban health centre from 2<sup>nd</sup> January, who fulfilled the inclusion criteria, were included in the study. Thereafter the consecutive patients attending the centre on daily basis were included till the sample size was reached on 30<sup>th</sup> April 2017.

The study tool consisted of pre -validated, semi –structured interview schedule including details on the (1) socio demographic data,(2) 3 days dietary history by recall method, (3)clinical details of hypertension and (4)questions on prior behaviour and perceived barriers. Along with the participants' socio demographic details, 3 days dietary history was recorded by recall method of food items consumed. The sodium content of common food items, prelisted from validated reference of National health research institute, was used for the estimation of sodium intake. The average sodium intake for the three days was calculated to avoid bias. With the dietary sodium intake calculated, the salt intake of the participant was estimated in grams. The clinical details of hypertension status such as duration of hypertension and regularity of treatment were also noted.

Then it was followed by questions on prior behaviour and perceived barriers of salt restriction by the participants. The responses to the questions on perceived barrier were recorded using 5 point Likert scale [strongly agree, agree, neutral, disagree and strongly disagree]. Each participant was interviewed for 15 to 20 mins without any external pressures or influences granting them free will to respond. The responses were recorded and documented for further analysis.

### Statistical analysis

The data obtained was compiled and entered in excel sheet and then analysed using spss, 21<sup>st</sup> version. The data was analysed in descriptive for sociodemographic details. The perceived barriers were ranked by Fredmanns test and association of perceived barriers with other factors were analysed using ANOVA.

## RESULTS

This study included 105 participants in total, with mean age of 57.09±10.7 yrs. Majority of participants were above 60yrs of age ie 43(41%). Among the study population 59% were female and 29.5% were illiterate and 40% were dependents. Among those of working group 24 [22.8%] were earning an annual income between 5000 and 20000 rupees. Majority of participants 40.9%(43) had duration of hypertension more than 5 yrs and also among them 52.3%(55) were regular in their treatment [table1].

Table 2 represents the distribution of study participants based on their perceived barriers of low salt diet. Amongst the barriers perceived, majority of participants reported low salt diet being tasteless. Thus

it was ranked first among the barriers perceived based on Fredmann test result of 461. The other perceived barriers such as physical weakness, unpleasantness, devoid of taste preferences and difficult to adhere all the times were ranked second. Having no knowledge of high salted food items to be avoided and separate preparation were the barriers ranked the least among the barriers.

Fig 1 represents the level of perceived barrier based on scoring. Each response on the five point Likert scale was assigned a score with strongly disagree as 1 and strongly agree as 5. The magnitude of barriers perceived by participants was measured in terms of difficulty felt on following salt restriction. The participants were categorized based on the aggregate of their responses. The persons with score less than 15 were ranked as perceiving less barriers, scores between 16 to 30 as moderate and above 31 till maximum of 45 as perceiving severe barriers. In this study about 80% of

the participants perceived moderate to severe barriers [fig 1].

Fig 2 represents the distribution of sodium intake among the participants in this study which states that 74.3% and 22.8% of participants had salt intake of 2grams to 4 grams and >5grams per day respectively which is higher than the recommended levels of <2grams of sodium per day [fig 2].

Table 3 shows the ANOVA analysis for association of perceived barriers with socio-demographic variables, duration of hypertension and regularity of treatment and prior behaviours which reveals that duration of hypertension and regularity of treatment along with prior behaviours of salt reduction were statistically significant. Socio-demographic variables were not associated with the perceived barriers [table 3].

**Table 1: Sociodemographical distribution of study population**

Socio demographical variables	Frequency (%)
Age	
31-45	21(20)
46-60	41(39)
>61	43(41)
Gender	
Male	43(41)
Female	62(59)
Education	
Illiterate	31(29.5)
Literate	16(15.2)
Primary	24(22.9)
Secondary	9(8.6)
Higher secondary	9(8.6)
Graduate	16(15.2)
Occupation	
Skilled	18(17.1)
Semi skilled	19(18.1)
Unskilled	26(24.8)
Dependent	42(40)
Income	
<5000	23(21.9)
5000-20000	24(22.8)
>20000	16(15.3)
Total	105(100%)

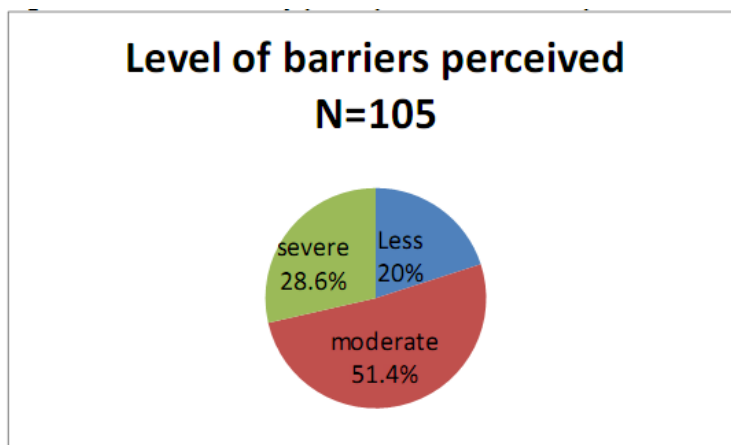


Fig-1: Distribution of study participants based on the perceived Barrier Scoring

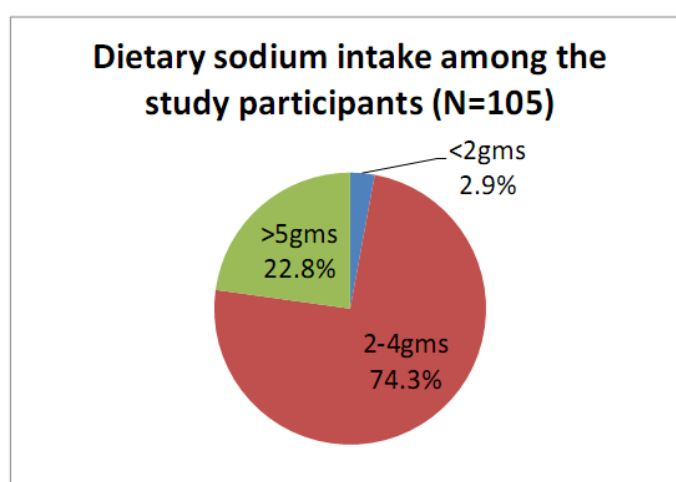


Fig-2: Distribution of study participants based on the dietary intake of sodium

Table 2: Distribution of study participants according to perceived barriers regarding low salt diet

Perceived barriers to practice low salt diet.	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean ± SD	Fredmann test result
	N(%)	N(%)	N(%)	N(%)	N(%)		
It is difficult to adapt	21(20)	22(21)	0(0)	30(28.6)	32(30.5)	3.29±1.57	III
Separate preparation is difficult	18(17.1)	25(23.8)	1(1)	37(35.2)	24(22.9)	3.23±1.47	III
It is tasteless	25(23.8)	25(23.8)	4(3.8)	33(31.4)	18(17.1)	2.94±1.49	I
Makes me feel weakened	12(11.4)	38(36.2)	2(1.9)	39(37.1)	14(13.3)	3.05±1.32	II
unpleasant and unsatisfactory	18(17.1)	30(28.6)	5(4.8)	37(35.2)	15(14.3)	3.01±1.38	II
Low salt diet doesn't include my taste preferences:	13(12.4)	37(35.2)	11(10.5)	33(31.4)	11(10.5)	2.92±1.26	II
I do not know which food items to be avoided	2 (1.9)	21(20)	12(11.4)	59(56.2)	11(10.5)	3.53±0.99	IV
Taking Low salt diet cannot be followed all the time	4(3.8)	42(40.0)	6(5.7)	44(41.9)	9(8.6)	3.11±1.15	II
I cannot quit the habit of taking pickle or papads	11(10.5)	38(36.2)	7(6.7)	37(35.2)	12(11.4)	3.01±1.27	II

**Table 3: ANOVA analysis of association perceived barriers and different factors**

Variables	Mean	SD	95% CI for mean	P value
Age				0.335
31-45yrs	22.9	±1.69	(19.42 – 26.47)	
46- 60yrs	26.36	±1.64	(23.03 – 29.69)	
>61yrs	26.9	±1.69	(23.48-30.33)	
Gender				0.412
Male	24.9	±11.14	(21.47 – 28.33)	
Female	9.7	±1.24	(24.12 – 29.07)	
Education				0.255
Illiterate	29.29	11.39	(25.11 – 33.46)	
Literate	25.43	9.54	(20.35 – 30.52)	
Primary	24.67	8.78	(20.95 – 28.37)	
Secondary	27.22	10.92	(18.83 – 35.61)	
Higher secondary	24.33	11.15	(15.75 – 32.91)	
Graduate	21.81	9.65	(16.66 – 26.95)	
Occupation				0.133
Dependant	27.47	10.58	(24.17 – 30.77)	
Unskilled	21.11	9.34	(16.46 – 25.75)	
Semi-skilled	27.78	10.55	(22.70 – 32.87)	
Skilled	25.30	9.82	(21.34 – 30.77)	
Hypertension				0.042*
Duration				
<3yrs	22.48	7.69	(19.92 -25.05)	
4-5 yrs	27.52	10.19	(23.31 – 31.72)	
>5yrs	27.90	11.74	(24.29 – 31.51)	
Regularity				<0.05*
Regular	19.78	7.38	(17.78 – 21.77)	
Irregular	32.64	8.81	(30.14 – 35.14)	
Prior behaviour				<0.05*
• Following low salt diet	21.79	8.48	(19.88 – 23.70)	
• Precautions taken to avoid high salt diet	18.60	6.64	(16.74 – 20.48)	
• Outside food taken outside	30.35	9.00	(27.91 – 32.78)	<0.05*

## DISCUSSION

India currently is faced with triple burden of diseases i.e. the existing communicable diseases, the emerging and re-emerging communicable diseases and the ever increasing non communicable, lifestyle related diseases [18]. Elevated blood pressure [BP] remains an extraordinarily common condition and important risk factor for cardiovascular and renal diseases, including stroke, Coronary heart disease, heart failure, and kidney failure [19, 10]. Globally, a causal link between sodium intake and high blood pressure levels is well established [20]. Despite its prescription, the majority of even well informed, chronically ill patients remain non-adherent [21].

The present study has enlightened the need for behavioural changes in the patients through theories and models. The study provides important information on barriers and factors affecting the salt restriction

behaviour among population. In turn provides initiation and designs for interventions required for effective salt reduction.

The amount of salt intake in this study was more than 8gms per day which is higher than the recommended daily intake of <5 gms of salt by hypertensives. Based the dietary sodium intake calculated only 3 participants were following the recommended sodium intake of <2gms per day ie 5gms of salt, thus the rest being at high risk due to consumption of > 2gms of sodium or 5gms of salt per day. This reflects the findings of Mclean et al in which the global mean sodium intake estimation of 66 countries was 3.95 g/day [22]. This is also in accordance with the study by Day WH and Radhika et al which reports average per person intake of salt is high between 9 and 12 gms per day [23, 24]. Similarly a recent heart study in Tamilnadu done by Campbell *et al*

reported a salt intake of 12g/day which is twice higher than the recommended level [25].

This study concluded that socio demographic variable such as age, sex, education, occupation or income were not associate with the barriers perceived by the participants. Similar results were reported by Radhika *et al* [24]. Whereas this is in contrast to the study by Chen j et al which reported lower education level and rural persons perceived more barriers [2]. Also the present study contradicts the statement by Nasreddine et al that older age and women have favourable attitudes towards salt reduction [26].

In this study we assessed the prior behaviour and perceived barriers along with the duration of hypertension and regularity of treatment among participants. Both hypertension duration and regularity were significantly associated with the barriers perceived. This indicates that the more the duration of hypertension in patients resulted in more barriers perceived. Thus with increase in duration of suffering from hypertension renders the individual careless, in turn not caring to follow healthy habits ie salt restriction. This study supports the theory of giving in to temptations and desires of individual in due course of disease as reported by Chen J *et al.*[2]. This study also reported that participants with irregular or non adherence to drugs perceive higher barriers than the ones on regular treatment. This indicates that persons understanding the role of regular treatment also tend to adhere to the practice of low salt diet understanding its importance as a control measure. Yet the rest being non adherent in treatment ignore or even avoid knowing the importance of salt restriction.

In assessment of the prior behaviours of participants 78% accepted the habit of reduced salt intake important. Still many perceived barriers to adapt to the habit which was statistically significant. Similarly taking precautions to avoid high salt food and taking of outside food were also significantly associated with the perceived barriers. Thus indicating the prior behaviour of participants influences the barriers perceived by them. Persons habituated to high salt food and outside food found it difficult to follow low salt diet. It indirectly states that individuals with preference of high salt diet tend to follow the same perceiving barriers in reducing salt intake. This is in accordance with the results of the study by Bobowski et al which states the difficulty in adaption of low salt diet among high salt consumers [27].

The present study results showed that sodium intake was significantly associated with perceived barriers. This means that sodium intake increased with an increase in perceived barriers. This is in accordance to the study by Kamran et al which stated negative association of perceived barriers with salt intake reduction [1].

According to the participants the most perceived barrier was that the food being tasteless without salt. This indicates the taste preferences and habituation of high salt diet among the Indian population who are not ready to compromise the taste at any cost. This is supported by study by Kamran et al where participants trying to reduce salt were prone to use it more than normal practice [1]. The other barriers perceived were unpleasantness, unsatisfactory, difficulty to adapt, not including ones taste preferences, unable to avoid taking pickles and pappads etc. The influence of our traditional cultural and dietary practices in our country in the lifestyle adaptation of individual has been blamed to be the reason behind. With these age old practices applied since childhood resists any idea of new change or sudden adaptation. This very reason has lead to the adaptation low salt diet difficult among our people. Some Participants also reported feeling of physical weakness after low salt diet which was also difficult to adapt and prepare separately for the individual. The claim of being unaware of food items of high salt content has ranked least in this study which indicates the knowledge of people is adequate except for some which is encouraging. This is in contrast to the study by Kamran A which also emphasised the lack of knowledge on sodium sources as one of the many barriers.

Difficulty in separate Preparation of low salt diet has been reported in this study which is justifiable in our society where the task of cooking is done by women of household. This is in similar to the findings in a study by Kamran A in Iran And in study by Hardy which reported the major perceived barriers to be difficulty of preparing low-salt diets separately [1, 28]. These various misperceptions of dietary behaviours have posed as barriers in adapting salt restriction behaviours through ages [1].

Thus to conclude the perception of these barriers needs to be taken into consideration while implementing behaviour interventions among hypertensives for salt reduction along with their prior behaviours. Although Individual characteristics and biological factors may influence the salt restriction behaviour yet their confounding effect can be overlooked to emphasis on behaviour modifications. Providing alternative such as high potassium salt for improvement of taste keeping in phase with restricted sodium can help patient to overcome tastelessness complaints. Also educating and emphasising behavioural changes for adapting low salt diet has good promising results in control of hypertension in near future.

#### **LIMITATIONS AND STRENGTHS OF THE STUDY**

Our study has limitations which couldn't be ruled out. First, as a cross-sectional study, the findings

can only be used to examine associations, and not to draw inferences regarding causality. Secondly having emphasised Knowledge of sodium and its sources and amount to be taken as one of the important predictor of salt restriction behaviour, it has not been assessed in our study. Also, female preponderance of the study population is another of our study limitations. Therefore, future studies should be extended to study other factors that may mediate the relationship between socio demographic factors and sodium intake, such as knowledge and salt taste.

The optimal sample size and the valid and reliable tools are the strengths of this study. The study was conducted by single observer so there is less chance of observer bias. The three days of dietary recall ensures accuracy of sodium estimation. Apart from these according to our knowledge this is the first study to attempt the assessment of perceived barriers in salt restriction in India.

## CONCLUSION

This study has highlighted the significance of barriers and difficulties perceived by hypertensive patients in reducing their salt intake, which is influenced by their duration and regularity of treatment along with their prior behaviours. Perceived barriers by individuals influence health behaviours by either directly or indirectly as they can reduce commitment and devotion. Thus, people perceiving severe barriers or giving in to temptations cannot adapt salt restriction as routine habit in day to day life. Also mere advising or emphasising the behaviour will not help patients to overcome these barriers. Thus it needs both population strategy and individualized approach with health education and behavioural interventions to help hypertensive patients accept salt restriction as part of the treatment and thereby cultivate a favourable attitude towards salt reduction.

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