

Prevalence of Hypertension and its Relationship between Dietary Salt Intake in Urban Population

Mandapaka RT^{1*} and Rachabathuni S²

¹Department of Microbiology and Immunology, National Institute of Nutrition, Jamai Osmania, Hyderabad, India

²Larson & Toubro Infotech Ltd, Chennai, Tamil Nadu, India

*Corresponding author: Ravi Teja Mandapaka, Senior Research Fellow, Department of Microbiology and Immunology, National Institute of Nutrition, Jamai Osmania, Tamaka, Hyderabad, Telangana, India 500007, E-mail: ravitejmandapaka@gmail.com

Received date: Apr 16, 2016; Accepted date: Apr 28, 2016; Published date: May 15, 2016

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Abstract

Water, they say, is the most neglected nutrient. Salt? Well, isn't it the most used nutrient in the daily dose of culinary preparations? Professionals and aficionados of medicine say, excess intake salt leads to hypertension and substitute sugar in the place of salt, you will end up being diabetic. But our question here is, can the sore throated social animal ever feel their meal sumptuous, should they find a dearth of the aforementioned foods? Hands on hearts, will we really dare to think about the indulgence of ingredients when a dish of sublime culinaryism is put before us, and our appetite whets? Our objective, in this study, was to understand the role and importance of dietary salt intake in increasing and decreasing the incidence of non-communicable diseases, precisely, hypertension.

Keywords: Salt; Hypertension; Non-communicable diseases; Nutrition

Introduction

Salt, in general, they say is a regular practice in daily cuisines. Many a river and ocean has its roots in a nation we all proudly call India. If you are students of science interested in understanding many a culinary art, salt, spice and for any matter sugar occupy the first spoon of your spice. For housewives and food lovers like us, who would boast of the fact that spices add to the richest flavor of our daily food preparations, salt and sugar are the best things that are forever included to whet the appetite of our god-gifted human body. Salt and its extraction across the everlasting waters of around Indian soil can found literature to a flabbergasted level of extremism. The philosophy of inclusion of salt Indian diet, especially in the south Indian population invites questions, which will attract answers of blathering frankness. Asking an Indian about their daily salt intake is the equaling of asking a New Zealander about the level of Rugby they play. Both are inborn, have a history and inherent as part of their lives [1].

Yet, we understand there's more obscurity in the literature of salt and then prosperity and, we feel there's a certain lack of correlation between the research done on salt and the research to be done on it. Adding to these two, we feel there's a minimal level of educating the common man and the facts with which a layman is expected to be familiar. If the doctrines of beneficiaries and diffidence of salt are studied in the light of both ancient and modern thought, it will be very much easier for the student, the educated professional and last but not the least, the common man to understand and appreciate them. India, we know is a developing country.

But, even in the most developed countries like the ones in the west, salt is often mostly added during normal day preparations. It's no rocket science, nor for a fact, does maxillofacial surgery, every common man know excess intake of salt lead to diseases like obesity, heart ailments and blood pressure. But, at one point of the time during

our lives, and careers, good health and healthy mind stands the difference between darkness and light. Harmony is a Precious Treasure of Human Life [2].

Minimal intake of salt or any nutrient helps us attain good health and prevents the body from contacting any disease. I wonder if that has worked with many saints and sages who practiced this age-old technique of preparing food in the most traditional ways and passed the baton to us, the younger generation. But, for that too, controlling the intake of salt, junk foods and last but not the least, soft drinks, as a part of our regular dietary routine, helps us a lot in achieving healthy nutritional status. Henceforth, therein, lays the adept and adamant importance of taking our food and regular diets, by adding salt, sugar, and fat in the most minimal amounts, if not refraining its use on a permanent basis.

Now then, after all that's been said and done in the above, we would like to bring out a few points, if not many, on the importance of salt and its usage in our normal diet. For us, in particular, to be frank lineout what has been just put a few words back, it all depends on how we control our mind. Indeed, it all depends on the mental will to control the appetite of spice and salt and the will and wit of our magnetizing saliva to attract many a flavored dish [3].

Despite the wealth of evidence for unfavorable effects of salt consumption on BP and cardiovascular health, public health efforts to decrease sodium consumption have been limited to a few countries [4]. Individuals are often unaware of the detrimental effect of salt on health and in developed countries; the majority of salt consumed is hidden in processed foods [5].

In another study, it has been reported that, the association between salt and fluid consumption has been demonstrated in an experimental trial in adults in which a 100 M mol/d reduction in sodium (6 g/d salt) in hypertensive adults predicted a 367 mL reduction in 24-hour urinary volume. Studies like these were done and conducted successfully in the European countries too. In a national survey of UK children aged 4-18 years, dietary salt intake was positively associated

with total fluid consumption and the rewash a weak, but statistically significant, positive association with Sugar-Sweetened Beverage SSB consumption [6].

In another study it has been suggested that in an environment where soft drinks are readily available, a high salt diet may encourage greater consumption of soft drinks in children [7]. Research on salt and its consumption is being carried out since a long long time. In adults, the quantitative relationship between salt intake and fluid consumption is well documented by both observational epidemiological studies and controlled trials where salt intake was altered. It has been estimated that reducing salt intake by half, e.g., from the current intake of 10 g/d to the World Health Organization recommended level of 5 g/d, would reduce fluid intake by 350 mL/d per person. However, there are no studies in children that have looked at the relationship between salt intake and fluid consumption [6].

He et al. said that, even though the effect of dietary salt on blood pressure in children is relatively modest. Added to this, a small shift in the distribution of population blood pressure levels would provide considerable gains to cardiovascular health in adulthood [8]. The above researched reports give us an important, albeit clear picture in the advancement of research. They say, therein lies much more importance of evaluating and supervening the daily consumption of salt among the population and we have to identify and evaluate certain measures that will enhance a minimal intake of salt in daily diets, if not to a maximum.

Review of Literature

Salt is one the essential nutrients, and is tightly regulated by the human body. But, when taken in amounts more than required, it does produce a few adverse effects. Coming to Indian population, it's consumed nearly twice the RDA. Through this section, we would like to highlight a few studies wherein past research has been conducted on this very interesting topic and wherein future research invites many questions to be eruditely answered for.

One of the most important constituents in salt is sodium, which is required for a range of physiologic processes. It is involved in the transport of molecules across cell membranes as well as the maintenance of electrochemical gradients via the Na/K ATPase pump. Sodium is concentrated in the extracellular (140-145 mmol/L), rather than intracellular (10 mmol/L) compartments. The osmotic properties of sodium make it a determinant of the extracellular fluid (ECF) volume, including plasma and interstitial volumes. Therefore, total body sodium determines blood volume and thus blood pressure [9].

Because of the possibility of cardiovascular overload or collapse from either sodium excess or depletion, mammals have developed sophisticated feedback mechanisms to precisely regulate sodium intake and excretion, enabling humans to survive at extremes of sodium exposure [10].

Public health recommendations in most developed countries are to reduce salt intake by about half, i.e. from E10-E5 g/day. This is because salt intake is thought to play an important role in regulating population blood pressure in epidemiological, migration, intervention, genetic, and animal studies [11].

Experimental studies also show that most healthy individuals can adapt to extreme changes in sodium intake, including a decrease from 1500 mmol/day (34,500 mg/day) to 10 mmol/day (230 mg/day), without significant changes to extracellular fluid volume or plasma

sodium concentration. Tight regulation of total body sodium is required to maintain extracellular fluid volume, ensuring organ perfusion and preventing cardiovascular volume overload or collapse. Regulation of sodium balance occurs through a complex interplay between neurohumoral and intra-renal mechanisms, which ultimately aim to maintain ECF volume and arterial blood pressure [12]. Should sodium depletion result in a reduction in blood volume great enough to cause a systemic fall in arterial pressure, the mechanical stretch of the arterial baro receptor nerve endings situated in the aorta and carotid sinus would be reduced, causing further activation of the sympathetic nervous system [13-15].

A study conducted in Panama on lifestyle interventions of sodium intake and overall health, said, independently of type of hypertension, all patients need to be educated on lifestyle modifications in such areas as physical activity, stress reduction, avoidance of tobacco use, alcohol intake moderation, weight control, sodium intake reduction, maintaining cholesterol and triglycerides in normal ranges and rest.

Weight control guidelines recommend including fruit in all meals, avoiding sugar drinks, drinking at least eight glasses of water a day, to avoid the intake of simple sugars like chocolates, candies and others, eating salads both at lunch and dinner time, small portions of meals, regular schedules for eating, no fried food, choosing grilled over fried meals and using low fat products [16]. Barriers to follow these guidelines can be attributed to the lack of knowledge and lack of assessment of patients' individual barriers as well as an assessment of their environment [17].

Intake of salt, and for that fact, any food product varies among people living across different parts of the globe. That includes, rural, and urban. Urbanization and work patterns affect dietary patterns and the lifestyle of individuals. In one report among urbanites, very often nutrition shifts towards a higher-energy dense diet which includes mostly saturated fat and added sugars, with a corresponding reduced intake of complex carbohydrates and dietary fiber found in fruits and vegetables [18].

In the Institute of Medicine [19] report for strategies to reduce sodium intake in the United States, salt is explained to have been used through the years as the means of both preserving food and enhancing flavor for more than 4000 years

The Institute of Medicine's report was a response to the request of the United States Congress to provide recommendations for salt intake management.

The World Health Organization recommends a reduction in sodium intake of less than 2 grams per day to reduce hypertension and the risk of developing a cardiovascular disease independently of age (WHO). Americans have an average daily intake of more than 3,400 mg of sodium which exceeds daily sodium recommendation by the WHO (2012).

However, in countries like Japan, China and many developing nations, it is the salt added during cooking and the seasonings which form the bulk of daily salt consumption. However, data regarding the pattern of salt consumption in India is not available and is likely to vary markedly within the country. In a prevalence study conducted by Cardiological Society of India Kerala Chapter Coronary Artery Disease and its Risk factor (CSIK-CRP), about 20% of the screened >5100 individuals in Kerala were verified to be already on treatment for hypertension. About 28% of these hypertensive individuals in the study

were not aware about the importance of salt restriction in the management of high blood pressure [20].

The large and growing burden of diseases, despite improved medical therapies and increased awareness that dietary salt reduction can help prevent and treat hypertension reinforce the urgent need for dietary change. It has been predicted that by 2020, there would be a 111% increase in cardiovascular deaths in India. Control of the predicted increase in cardiovascular disease will require modification of risk factors [21].

The development and progression of cardiovascular disease (CVD) is associated with non-modifiable risk factors; including age, gender, genetics, ethnicity, modifiable risk factors; including high blood pressure, tobacco use, dyslipidemia, physical inactivity, unhealthy diet, obesity and contextual risk factors, including socioeconomic status (SES) [22]. It is also understood; through reviews that sodium intake in excess leads to blood pressure among the population. However, throughout life blood pressure follows a tracking pattern, such that children with elevated blood pressure are more likely to have raised blood pressure as adults [23-25].

This brings us to a stage where therein lies uplift the importance of relationship between the intake of salt in daily diet and the morbid factors it will lead to. Recent findings suggest that dietary salt intake may be associated with SSB consumption [26], identifying a link with obesity risk. Given the well-established relationship between dietary salt intake, thirst and fluid consumption [27-29], along with high access and marketing of SSBs to adolescents [30], it is plausible that the high salt diet of children may encourage greater consumption of SSBs.

India's premier research conglomerate in the field of medical sciences carries out extensive research to unearth many an unknown fact. The Indian Council of Medical Research-India Diabetes (ICMR-INDIAB) study is a community based survey conceived with the aim of obtaining the prevalence rates of diabetes in India as a whole, covering all 28 states, the National Capital Territory of Delhi, and two of the union territories in the mainland of India, with a total sample size of 124,000 individuals. A few years ago, this study reported the average intake of 7.6 g of salt among the subjects [31]. Such types of studies are extremely important in view of the rapid urbanization with the consequent epidemiological and nutritional transition.

This brings to a point to understand the dietary reference intakes of sodium and its availability in common foods. The Dietary Reference Intakes (DRI) were developed by the Institute of Medicine and are comprised of a set of nutrient-specific reference values for defined age and sex categories [32].

The first of the DRI values is the Estimated Average Requirement (EAR). The EAR is the amount of a given nutrient that meets the needs of 50% of the population; therefore it is used to establish nutritional inadequacy of a group or population [6,26,33]. However, for daily requirements of individuals the Recommended Daily Allowance (RDA) has been established. The RDA is set two standard deviations from the EAR, thereby meeting the nutritional requirements for 97-98% of individuals. The EAR, and thus RDA, are only established when sufficient dose-response data are available. When there is insufficient evidence to establish an EAR and RDA, an Adequate 4 Intake (AI) level is generated. The AI level is often based on available observational and experimental data, and is set at a level considered to meet the needs of most of the population.

The final reference level is the Tolerable Upper Level (UL), which is the highest possible daily nutrient intake that can be consumed without the risk of adverse health effects, including nutrient toxicity or onset of acute or chronic disease.

The NNMB (National Nutrition Monitoring Bureau) situated in the premises of erstwhile National Institute of Nutrition, have conducted a survey in 1987 [34]. Their data indicate that salt consumption (added NaCl) ranges from <5 to 30 g in different states with almost 40% of families consuming around 10 g/day. The amount of sodium ingested through water sources can differ from place to place. Sodium content of 20-235 mg/L has been reported. Sodium content of water can be of a problem when severe salt restricted diet is to be used.

On an international note, the most common cause of sodium deficit is acute diarrhea. The other disease, where it has a vital role to play, is hypertension. In 192 general, one can easily manage with less than 1 mmol of sodium. A safe and adequate level is 1100-3300 mg/day [35]. The minimum requirement for a healthy person is 500 mg of sodium for adults and for infants and children, 58 mg/day.

Lorig et al. has indeed reported that, self-management is also of concern in this research. Understanding limitations, acknowledging the disease, taking control of the disease, and taking part in the decision making on health with the help of physicians are factors that affect hypertension prognosis [36]. They also gave a good example of one such program which yielded good results. A program like Stanford's Chronic Disease Self-Management Program (CDSMP), has been developed to empower people with various chronic diseases through improvement of their self-efficacy. The goal is to make the patient responsible for solving problems, making decisions, and building self-confidence. To speak about the results part of this, Patients who enrolled had statistically significant improvements in health behaviors which included: communication with physicians, exercise and management of symptoms, self-efficacy, and reduced visits to the emergency room [37].

Domingo et al. reported that, "Modest reductions in dietary salt could substantially reduce cardiovascular events and medical costs and should be a public health target [38]. The Departments of Agriculture and Health and Human Services recommend daily intake of less than 5.8 g of salt (2300 mg of sodium), with a lower target of 3.7 g of salt per day for most adults (persons over 40 years of age, blacks, and persons with hypertension)".

Elliott said that, "Intersalt found significant positive relations between 24 hour urinary sodium excretion and systolic and diastolic blood pressure in individual participants and between individual urinary sodium to potassium ratios and blood pressure [9]. These relations were shown by pooling regression coefficients from 52 separate within centre analyses on 10079 people worldwide after adjustment for age and sex.

When also adjusted for body mass index and alcohol consumption of individual subjects and for urinary potassium in the sodium-blood pressure analysis the relation of systolic pressure to both sodium excretion and the sodium to potassium ratio remained significant. With age, sex, body mass index and urinary sodium excretion in the multiple regression analysis, significant negative relations were shown between potassium excretion, blood pressure (both systolic and diastolic).

Risk Factors of High Salt Intake

Salt puts up our blood pressure. Raised blood pressure (hypertension) is the major factor which causes strokes, heart failure and heart attacks, the leading causes of death. There is also increasing evidence of a link between high salt intake and stomach cancer, osteoporosis, obesity, kidney stones, kidney disease and vascular dementia and water retention.

Discussion

With the impedance and incidence of many a disease, it can be clearly understood that dietary salt and its intake is going to be one of the most vital factors that's going to change the way we look at curse of human life in the near future. One of the major factors contributing to this will be the intake of dietary salt in our regular diet. It does call for an action. Isn't it?

Seconding to this, the socioeconomic status will determine the intake of salt too. The affluent the population, the less the intake of salt. Further research is required using 24 hr urinary sodium excretion to confirm these socioeconomic disparities in salt intake and provide accurate data on the total intake of salt (i.e., from food and discretionary sources).

Overall, the food choices that contribute to a higher intake of salt within this sub-group of children are primarily convenience style foods which require minimal food preparation skills (i.e., processed meat, pies/sausage rolls, savory sauces, fried potato and potato snacks). The trend for higher salt consumption in those from a lower SES background is consistent with overall poorer dietary patterns that are often reported in lower SES groups [39].

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