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REVIEW ARTICLE

# Addictive salt may not be solely responsible for causing hypertension: A sweet and fatty hypothesis

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**KEYWORDS**
Salt;
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**Abstract** In literature, since many decades, it is often believed and condoned that excessive common salt (Nacl) ingestion can lead to hypertension. Hence, every health organisation, agencies and physicians have been advising salt restriction to hypertensive patients. However, there is no concrete evidence suggesting that salt restriction can reduce the risk of hypertension (HTN). The present article is based on the current literature search which was performed using MEDLINE, EMBASE, Google Scholar and PubMed. The meta-analysis, randomised control trials, clinical trials and review articles were chosen. The present review article suggests that consumption of high salt diet does not lead to hypertension and there are other factors which can lead to hypertension, sugar and fats being the main reasons. Salt can however lead to addiction and generally, these salty food items have a larger proportion of sugar and fats, which if over-consumed has a potential to cause obesity, hyperlipidaemia and subsequently, hypertension and other cardiovascular disorders. Hence, through the present review, I would like to suggest all the physicians to ask the hypertensive patients to cut down the intake of sugar and fat containing food items and keep a check on addiction of salty food items.


**PALABRAS CLAVE**
Sal;
Azúcares;
Grasas;
Hipertensión;
Adicción;
Hidratos de carbono

**La adicción a la sal no es la única responsable de causar hipertensión: hipótesis sobre azúcares y grasas**

**Resumen** En la literatura, desde hace décadas, ha existido la creencia, y se ha justificado a menudo, que la ingesta excesiva de sal (NaCl) puede originar hipertensión. Por ello, cada organización y agencia sanitaria, al igual que los médicos, han recomendado la restricción del consumo de sal a los pacientes hipertensos. Sin embargo, no existe evidencia concreta acerca de que la restricción del consumo de sal pueda reducir el riesgo de hipertensión. El presente

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artículo se basa en la búsqueda en la literatura actual, realizada en MEDLINE, EMBASE, Google Scholar y PubMed. Se seleccionaron metaanálisis, ensayos controlados aleatorios, ensayos clínicos y artículos de revisión. El presente artículo de revisión sugiere que el consumo de una dieta rica en sal no origina hipertensión, y que existen otros factores que pueden dar lugar a dicha situación, como son el azúcar y las grasas. Sin embargo, la sal puede causar adicción y consumo excesivo de los mismos productos alimenticios con contenido de azúcares y grasas, originando obesidad, hiperlipidemia y, por añadidura, hipertensión y otros trastornos cardiovasculares. En consecuencia, a través de la presente revisión, nos gustaría sugerir a todos los médicos que soliciten a los pacientes hipertensos la reducción del consumo de alimentos con contenido de azúcares y grasas, y revisar la adicción a los productos alimenticios con alto contenido en sal.


## Introduction

Hypertension for the past many decades has been considered as one of the leading etiological factor of worldwide disability-adjusted life years.[1] In our books, excessive common salt (Nacl) ingestion is a major cause which can lead to hypertension.[2-4] Probably, everyone has an average daily salt intake of more than 6 g. It is especially higher in countries from Asian continent where people consume more than 12 g per day.[5] In India, the average daily salt consumption is more than 10.98 g per day.[6]

Hence in order to decrease HTN incidence and prevalence, various government institutions and bodies recommend population-wide sodium restriction.[7-9] However, there are pieces of evidence which suggest that salt is not the main culprit in causing HTN. This hypothesis brings forward the possible real culprits (Sugars and Fats) in leading to HTN.

## Salt induced addiction can lead to excess-consumption of sugar and fats

Human brain (hypothalamus) is hard coded to maintain salt (sodium) balance.[10,11] The reason is associated with our immediate ancestors. The evolution and transition process from sea to land- based dwelling, made the animals terrestrial, but the cells were yet adapted to keep the surrounding as salty as possible (as it was in sea water). Our immediate ancestors were mostly herbivorous and their diet (plants, herbs, grass etc.) mostly had less ionic sodium.[12]

Hence, sodium was an important factor which was needed to be conserved in our body in which brain played an important role. Extracellular fluids were supposed to be kept sodium-rich, while intracellular fluids had to be kept relatively free of sodium, and cellular and vascular volumes were supposed to be maintained. Hence, when sodium and water levels were low, they were made to be reserved and ingestion was increased.[13] However, this need can lead to addiction. It is also seen that salt leads to release of dopamine, in the same way as cigarettes does. So when the salt levels are low, there is a craving for salt.[11,14,15]

In a study conducted by Smith et al., showed that during gratification of sodium diet, the central amygdala gets activated, and endogenous mu-opioid receptor (MOR) signaling within this region increases sodium intake in sodium-depleted mice.[16]

According to the Salted Food Addition Hypothesis (SFAH), if salted food are daily consumed, then it can lead to Salted Food Addiction, subsequently leading to overeating, increase in calories intake, a sedentary lifestyle, overweight followed by obesity and its related complications.[17]

Salt (sodium) ''appetite'' is considered as a powerful drive which can make a person seek, obtain, and consume even more salt (sodium).[18] Increased amount of dietary sodium is directly proportional with increased calorie consumption, while decreased sodium consumption will lead to lower calorie intake.[19,20]

Salted food preference is also seen in children as young as 2 years.[21] Even young pre-school kids began having more preference to a specific salted food and if they are made to stay away from that salted food for one week, it can result in marked enhancement of preference.[22,23] Children who are often fed with salty food are more inclined towards food items such as pizza, burgers or macaroni and cheese. When the school children were made deprived of pizzas (full of sodium and high saturated fats), consumed lesser slices of pizzas, and left satiated.[24]

In short, the more a person is addicted to have salted food items, the more is the chance that he will have saturated fats and high calorie intake which can lead to obesity and subsequently HTN (as obesity is a risk factor of HTN).

## Sugar and Fats: The real culprits behind hypertension

According to DiNicolantonio et al, it is the sweet ''sugar'' which causes HTN.[25] Often, it is suggested that high serum sodium levels leads to an increase in volume overload and subsequently, HTN. However, it has been seen that patients with essential HTN generally have normal blood volume and serum sodium levels. Hence the major driving force which could cause HTN is an increase in peripheral vascular resistance (PVR).[26,27] However, PVR does not often improve with salt restriction,[28] which suggest that salt may not be an etiological factor for HTN.

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