



A review on excess Sodium: A hidden culprit behind constipation

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Abstract

The expanding corpus of research on the connection between sodium consumption and constipation is examined in this review. Although sodium is essential for gastrointestinal health and fluid balance, little is known about how it affects constipation. Constipation may be exacerbated by high salt intake, which has been linked to alterations in water absorption, decreased gut motility, and possible disruptions in the gut micro biota. These results suggest that sodium intake may play a complex role in regulating bowel movements. However, further research is needed to explore the underlying mechanisms, and whether this association is causal or influenced by other dietary or lifestyle factors. Excessive sodium intake can lead to dehydration, affecting gut water retention and contributing to constipation. It also raises blood pressure by causing fluid retention, increasing the risk of hypertension, heart disease, kidney damage, and stroke. This review may help to establish evidence-based recommendations for excessive dietary sodium that may cause digestive problems, mainly constipation.

Keywords: Sodium, constipation, gut health, micro-biota, digestive health

Introduction

High sodium intake is associated with several health outcomes, including hypertension and cardiovascular diseases; however, its relationship with constipation remains unclear, especially in adult males ^[1]. Constipation affects hundreds of millions of adults worldwide and is a common gastrointestinal functional condition. Studies reveal that the incidence of constipation can reach 15.3% worldwide, but surveys using the Rome criteria reveal a frequency of about 8.5% in China ^[2, 3, 4]. According to the World Health Organization, constipation is not just a physical problem; it can also have serious psychological and social repercussions that drastically lower a patient's quality of life ^[5, 6]. Although there are many different causes of constipation, dietary factors—in particular, dietary fiber intake—have been identified as a key strategy for both preventing and treating the condition ^[7, 8]. But aside from dietary fiber, the research has seldom ever discussed other dietary aspects like sodium intake, particularly when it comes to adult males. Numerous studies have suggested that salt intake should be restricted in the diet, with the majority of current research concentrating on the effects of sodium consumption on blood pressure and cardiovascular disorders ^[9, 10].

Unusual Negative Relationship between Constipation and Sodium

Some research has examined how sodium consumption may impact digestive health, including constipation, despite the common belief that it is linked to negative health outcomes like hypertension or renal disease. The fact that some research suggests a negative relationship between salt intake and constipation is interesting. This implies that less severe or frequent constipation may be associated with a larger salt intake ^[11].

Definition of Constipation

The constipation was defined using two main criteria: stool consistency and defecation frequency. Either of these indicators could be used to determine the state of constipation. During the study period, participants' stool consistency and defecation frequency were recorded continuously for 30 days. Specifically, stool consistency was assessed using the Bristol Stool Form Scale, which identifies constipation conditions by describing seven different types of stool forms ^[12]. According to this scale, Type 1 (hard lumps, like nuts) and Type 2 (sausage-shaped but lumpy) are classified as constipation. Other types (3 to 7) are considered non-constipated states. Regarding defecation frequency, data were collected by asking participants, "How many times do you usually defecate per week?" Based on the participants' responses, defecating fewer than three times per week was defined as constipation, while three or more times per week was considered normal ^[13].

Sodium Intake Affects Gut Health and Contributes to Constipation

1. Dehydration and Water Retention

Fluid balance: Sodium plays a crucial role in controlling the body's fluid balance. High sodium intake causes the body to retain extra water in order to counteract the elevated blood salt levels ^[14].

Decreased Colon Water: This water retention may restrict the quantity of water that enters the colon and intestines, which is essential for stool softening. Constipation results from drier, firmer stools that are more difficult to pass due to a lack of water in the colon ^[15].

2. Interrupting the Motility of The Gut

Electrolyte Imbalance: A high sodium intake can interfere with the balance of other essential electrolytes in the body, such as potassium and magnesium. Potassium, for example, is critical for smooth muscle contraction in the gut. Without adequate potassium, the muscles of the intestines may not contract properly (a condition known as peristalsis), slowing down the movement of stool and contributing to constipation [16].

Diminished Muscle Function: The sodium and potassium balance is necessary for the gut muscles to contract properly. Bowel motility may be hampered by this imbalance, which can result in constipation and slow digestion [17].

3. Alteration of Gut Micro-biota

Gut Flora Imbalance: Changes in the gut micro-biota, or the community of bacteria that reside in your intestines, have been connected to excessive sodium consumption. Diets high in salt may inhibit helpful bacteria while encouraging the growth of some harmful ones [18].

Impact on Digestion: For optimum digestion and bowel regularity, a healthy microbiome is necessary. Constipation and delayed bowel movements are two digestive problems that can result from an imbalance in gut flora [19].

4. Inflammation and Sodium: Chronic Inflammation:

Eating a diet heavy in sodium can cause inflammation in the gut, which can harm the intestinal lining and interfere with regular digestion. Constipation can be made worse by intestinal inflammation, which can interfere with the body's ability to absorb water [20, 21].

5. Impact on the Gastrointestinal System: Increased stress on the kidneys:

As the kidneys try to remove too much sodium from the blood, a high sodium diet puts them under more strain. Constipation may result from changes in fluid balance brought on by the kidneys' attempts to eliminate excess salt, which also affects gut health [22].

Discussion

Rollet *et al.* study suggest a positive association between sodium intake and constipation, these results may be limited by the specific population, dietary structures, or analytical methods of their study. This Study demonstrates a negative association between daily sodium intake and constipation risk among adult males, suggesting that sodium intake might influence intestinal function [23]. The survey conducted in US from 2005-2010, was aimed to investigate the association between daily sodium intake and constipation prevalence in adult males, using data from the NHANES 2005–2010 cohort. This survey finding indicates that higher daily sodium intake is significantly associated with a lower prevalence of constipation. While sodium intake plays a key role in maintaining electrolyte balance in the human body, research on its association with constipation remains limited [24].

Although their study also utilized the NHANES database and had a larger sample size, our research differs in several key aspects. First, our study specifically focuses on the

impact of daily sodium intake on constipation in adult males, rather than overall dietary quality. Considering the differences in physiological structure, hormone levels, and lifestyle between males and females [25, 26] focusing on males allows for a more precise analysis of the physiological mechanisms of constipation.

The potential mechanisms by which increased daily sodium intake may reduce the prevalence of constipation involve several interrelated factors, aligning with the findings of this study. One primary mechanism is sodium's role in hydration regulation within the intestines. As a crucial component of electrolyte balance, sodium helps regulate intracellular and extracellular fluid balance. Increased sodium intake can influence water absorption in the intestines, which in turn affects the water content of stool, increasing stool volume and moisture, preventing excessive dryness, and facilitating smoother bowel movements. This mechanism aligns with our findings, where higher sodium intake was associated with a reduced prevalence of constipation [27, 28, 29, 30]. Thus, grains, lipid-rich foods, total fats and starch were associated with a lower constipation score, while sugary products, sodium, and higher energy intake were correlated with higher constipation [31]. In addition, sodium was found to be positively associated with the odds of constipation [32].

This may be explained by that higher intake of salt reduced the amount of water in the stool, making it difficult to move along the digestive tract and causing difficulties in defecation [33]. Previous research has indicated that bowel movements are influenced by various factors, including gender, age, and body mass index (BMI) [34]. Women have been reported to be more frequently impacted by bowel movement-related disorders, especially chronic constipation [35]. However, increasing age is related to increased gastrointestinal motility disorders for both genders, i.e., constipation, diarrhea, or incontinence [36]. Except fiber and sodium some other drugs also influence the peristaltic movements of gastro intestinal system [37].

Conclusion

As a result, the association between sodium consumption and constipation is still complicated. It is yet unclear exactly how salt consumption affects gut function, and more study is required to elucidate this relationship. Determining the effects of sodium on intestinal motility, water absorption, and the gut micro-biota will be essential to creating dietary recommendations that are specifically tailored to the treatment of constipation. The findings suggest that dietary adjustments, such as increasing fiber and water intake, may be helpful in treating and avoiding adult constipation. Resolving these dietary problems may help improve the general digestive health of the population.

Excessive sodium intake can lead to dehydration, affecting gut water retention and contributing to constipation. It also raises blood pressure by causing fluid retention, increasing the risk of hypertension, heart disease, kidney damage, and stroke. Additionally, high sodium can contribute to bone loss, stomach cancer, and metabolic disorders. Future research aims to explore how different levels of sodium intake influence gastrointestinal motility, water absorption in the colon, and gut micro-biota, to understand the mechanisms behind sodium-induced constipation. This review may help to establish evidence-based recommendations for excessive dietary sodium that may

cause digestive problems, mainly constipation.

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