DOI: 10.1111/jch.14086

LETTER TO THE EDITOR

WILEY

Everything in moderation: Understanding the interplay between salt and sugar intake

To the Editor,

We read with pleasure the article by Gress et al., titled "Relationship between dietary sodium and sugar intake: A cross-sectional study of the National Health and Nutrition Examination Survey 2001-2016"[1] that found an inverse association between salt intake and sugar intake and suggested that this association may partially explain a proposed J-shaped association between salt intake and cardiovascular disease. While we cannot claim that salt reduction is unequivocally beneficial for health outcomes, there are methodological and interpretive limitations in this study that may cloud the validity of the conclusions.

Firstly, by standardizing caloric intake to 2000 kcal, researchers aimed to increase comparability between diets. However, by doing so, they may have overestimated macronutrient intake in those consuming <2000 kcal and underestimated intake in those consuming >2000 kcal, introducing a possible non-normal distribution of intake. Furthermore, standardizing total daily calories consumed introduces bias as there are well-established sex, racial/ethnic, height, and mortality differences associated with caloric intake that are important to consider.[2,3] Methodologically, it would have been more appropriate to analyze the % of calories from each macronutrient and adjust for total caloric intake. Other confounders that should have been included in the adjusted analysis include measurement of kidney function through urine or serum values, potassium intake, fluid intake, antihypertensive medication use, lipid levels, race/ethnicity, and socioeconomic status.[2–6]

Secondly, while added sugar intake has been associated with adverse outcomes, several studies have suggested that higher proportional carbohydrate intake (vs. fat or protein intake) up to a threshold is associated with decreased mortality.[3,7–9] In fact, Seidelmann et al.[7] found, in a United States study of 15 428 adults aged 45–64, that those with 50%–55% of calories derived from carbohydrates had significant mortality benefit compared to those consuming >70% or <40% of calories from carbohydrates. They also found that exchanging carbohydrates for animal-based protein or fat increased mortality and plant-based protein or fat decreased mortality.[7] We observe in this study that mean carbohydrate intakes per salt quintile make up between 45% and 55% of calories, suggesting that it is within healthy limits and may not explain the J-shaped association of salt intake and end-outcomes. Additionally, there is an exchange of carbohydrates for fats and proteins with increasing salt quintiles. Because mean cholesterol levels increase with increasing salt quintile, we can surmise that the additional fat and protein is largely animal-based and thus confers greater risk of end-outcomes. Although not the focus of the study, the increasing prevalence of congestive heart failure, coronary artery disease, diabetes, and obesity with increasing salt quintiles corroborate these speculations.

Ultimately, the ideal study would stratify analyses by race/ethnicity and sex as dietary patterns and physiological mechanisms like salt sensitivity are vastly different across subgroups.[10] The study would also further analyze food consumption and determine the source of salt intake as increasing evidence suggests that the whole food item is more than the sum of its macronutrients.[11]

Overall, we believe the authors make a strong case for the inverse association between carbohydrate intake and salt intake as a partial explanation for the proposed J-shaped association between salt and health outcomes. Future studies need to rigorously adjust for confounders, analyze food patterns in detail, and determine causality with outcomes to truly determine the health effect of low salt intake.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

Aayush Visaria MPH[1]
Jai Shahani BA[1]
Megh Shah BA[1]
Anurag Modak BA[1,2]
Rachana Chilakapati BA[1]

[1]*Department of Medicine, Rutgers New Jersey Medical School, Newark, New Jersey, USA*
[2]*Center for Advanced Biotechnology and Medicine, Rutgers Robert Wood Johnson Medical School, Piscataway, New Jersey, USA*

Correspondence
Aayush Visaria, MPH, Department of Medicine, Rutgers New Jersey Medical School, 185 South Orange Ave, Newark, NJ 07103, USA.
Email: aayush.visaria@rutgers.edu

ORCID

Aayush Visaria https://orcid.org/0000-0002-2170-212X

REFERENCES

1. Gress TW, Mansoor K, Rayyan YM, et al. Relationship between dietary sodium and sugar intake: a cross-sectional study of the National Health and Nutrition Examination Survey 2001–2016. *J Clin Hypertens*. 2020 Aug 6;22(9):1694–1702.
2. Block GL, Rosenberger WF, Patterson BH. Calories, fat and cholesterol: intake patterns in the US population by race, sex and age. *Am J Public Health*. 1988;78(9):1150-1155.
3. Colman RJ, Anderson RM, Johnson SC, et al. Caloric restriction delays disease onset and mortality in rhesus monkeys. *Science*. 2009;325(5937):201-204.
4. Li M, Yan S, Li X, et al. Association between blood pressure and dietary intakes of sodium and potassium among US adults using quantile regression analysis NHANES 2007–2014. *J Hum Hypertens*. 2020;34(5):346-354.
5. Filippini T, Naska A, Kasdagli MI, et al. Potassium intake and blood pressure: a dose-response meta-analysis of randomized controlled trials. *J Am Heart Assoc*. 2020;5(9):e015719.
6. Yoon CY, Noh J, Lee J, et al. High and low sodium intakes are associated with incident chronic kidney disease in patients with normal renal function and hypertension. *Kidney Int*. 2018;93(4):921-931.
7. Seidelmann SB, Claggett B, Cheng S, et al. Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis. *Lancet Public Health*. 2018;3(9):e419-e428.
8. Brown IJ, Stamler J, Van Horn L, et al. Sugar-sweetened beverage, sugar intake of individuals, and their blood pressure: international study of macro/micronutrients and blood pressure. *Hypertension*. 2011;57(4):695-701.
9. Shan Z, Guo Y, Hu FB, Liu L, Qi Q. Association of low-carbohydrate and low-fat diets with mortality among US adults. *JAMA Intern Med*. 2020;180(4):513-523.
10. Franco V, Oparil S. Salt sensitivity, a determinant of blood pressure, cardiovascular disease and survival. *J Am Coll Nutr*. 2006;25(sup3):247S-S255.
11. Panagiotakos DB, Pitsavos C, Skoumas Y, Stefanadis C. The association between food patterns and the metabolic syndrome using principal components analysis: the ATTICA Study. *J Am Diet Assoc*. 2007;107(6):979-987.

How to cite this article: Visaria A, Shahani J, Shah M, Modak A, Chilakapati R. Everything in moderation: Understanding the interplay between salt and sugar intake. *J Clin Hypertens*. 2020;22:2385–2386. https://doi.org/10.1111/jch.14086