



Salt in the diet: opinions, guides and evidence

Sal en la dieta: pareceres, guías y pruebas

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Dear Editor:

We were interested to see that the last issue of the journal was a monograph dedicated to food and eating and their connection to both health and public policy. In particular, Freidin's article⁽¹⁾ caught our attention. The article makes mention of the views regarding food practices and health of a part of the population, among which salt consumption is included. Such practices are described as generally reflecting the "dominant food discourse" and national health policies. The work also mentions the uncertainty and suspicion generated by the frequent changes in the medical-scientific discourse.

In this letter we do not intend to cast doubt upon the importance of campaigns directed at reducing salt intake, but rather to take this opportunity to put into perspective the justifications of the specific recommended values in the light of recent publications.

WHAT DO THE OFFICIAL RECOMMENDATIONS SAY?

The World Health Organization (WHO) recommends a sodium intake of less than

2,000 mg/day for all adults,⁽²⁾ which equates to 5,000 mg/day of sodium chloride (to avoid confusion, this text will express intake in terms of mg/day of the sodium element). The *Guías alimentarias para la población argentina* [Food guidelines for the Argentine population] for 2016 propose the same upper limit.⁽³⁾ The US recommendation for 2015 advises consuming no more than 2,300 mg/day of sodium in the general population, and a reduction to 1,500 mg/day in those with prehypertension or hypertension.⁽⁴⁾

However, real sodium consumption differs greatly from these recommendations. In Argentina, the local participants in the observational studies INTERSALT and PURE showed average values of 3,600 and 4,660 mg/day respectively.^(5,6) The most recent measurement carried out in 2011-2012 by the program *Menos Sal, Más Vida* [Less Salt, More Life] showed an average sodium intake of 4,500 mg/day.⁽⁷⁾ In the US, only 9% of the population complies with the official recommendation for the general population and only 0,6% meet the value suggested for those with prehypertension or hypertension.⁽⁸⁾

WHAT ARE THE RECOMMENDATIONS BASED ON?

The justification for these recommendations utilizes two well-established bodies of evidence indicating that, on one hand, greater sodium intake is associated with greater prevalence of arterial hypertension, and on the other, that hypertension is a known risk factor for coronary and cerebrovascular disease. Therefore, it seems natural to conclude that reducing the amount of dietary salt would lead to a reduction in vascular events, but the latter has not been as easy to demonstrate. Let us review the existing evidence.

Salt consumption varies greatly among cultures, and arterial hypertension prevalence follows this variation. The INTERSALT study evaluated sodium intake in 52 countries and

found median values as extreme as 5 mg/day in the Yanomamo people of Brazil and 5,600 mg/day in the north of China.⁽⁵⁾ Mean blood pressure varies similarly, with an increase of 3 to 6 mmHg in systolic blood pressure and 0 to 3 mmHg in diastolic blood pressure for every additional 2,300 mg/day of sodium consumed. Populations with an intake of less than 1,000 mg/day show practically no arterial hypertension. In addition, the results of the Framingham study have identified arterial hypertension as a primary risk factor for coronary and cerebrovascular disease.⁽⁹⁾

With respect to the impact of interventions to reduce salt intake in clinically relevant outcomes, an extensive WHO review confirmed the expected decrease in blood pressure⁽¹⁰⁾ but found only two clinical trials that had explored the effect on vascular events – and these did not show a significant reduction when compared to the usual diet.⁽¹¹⁾ Regarding the numerous observational studies that evaluate the relationship between sodium intake and cardiovascular events, a systematic review that gathered individual data on more than 133,000 people from 49 countries showed a “J-shaped” relationship: intake both above 7,000 mg/day and below 3,000 mg/day are associated with greater all-cause mortality and non-fatal cardiovascular events.⁽¹²⁾ Another meta-analysis showed similar results.⁽¹³⁾

Reflecting this uncertainty, a 2013 report carried out by the prestigious US Institute of Medicine concluded⁽¹⁴⁾:

The committee found that the evidence from studies on direct health outcomes was insufficient and inconsistent regarding an association between sodium intake below 2,300 mg per day and benefit or risk of CVD outcomes (including stroke and CVD mortality) or all-cause mortality in the general US population.

The controversy is thus established: official bodies recommend an ideal sodium intake whose efficacy is not appropriately studied in clinical trials and that is associated

with increased mortality and non-fatal outcomes in observational studies. Is it possible to reconcile these views?

AN UNRESOLVED CONTROVERSY

Defenders of the policy of substantially reducing sodium intake in the general population argue that the observational studies that describe the “J-shaped” relationship between dietary sodium and vascular events could be wrong, because they have important methodological flaws,⁽¹⁵⁾ such as:

- measurement imprecision, given that sodium intake is estimated through questionnaires (in some cases), or through a single measurement of the urine Na/creatinine ratio;
- the possibility of inverse causality, that is, an individual could have a smaller sodium intake precisely because they were diagnosed with cardiovascular disease, and not the opposite; and
- the inappropriateness of pooling results within a meta-analysis given the different methods of measuring exposure and outcomes, in addition to the different cutoff limits established in categorizing sodium levels within the diet.

These same defenders recognize, however, that clinical studies of dietary sodium restriction in people with hypertension have not had enough power to demonstrate a reduction in cardiovascular disease; they also highlight the difficulties in organizing and funding a study that could show the benefits in the low-risk population, which would require that a randomized sample of 30,000 people be followed over 5 years.⁽¹⁵⁾

On the other hand, the researchers who described the cardiovascular risks of low sodium intake in the extensive international PURE study showed that the observed effect persists after excluding from the analysis all individuals with prior cardiovascular disease, use of hypertension drugs, or cancer; after excluding the episodes that occurred in the first

two years of the study follow-up; and after adjusting for all the measured confounders.⁽¹⁶⁾ This makes inverse causation or the existence of confounders improbable as an explanation of the findings.

The plausibility of the harmful effects of a sodium intake under 2,300 mg/day could be explained by the activation of renal sodium retention mechanisms, including the renin-angiotensin-aldosterone system and the sympathetic system, in addition to producing unfavorable lipid changes and increased insulin resistance.⁽⁸⁾

Considering the totality of the results reviewed, we can conclude that the controversy is not resolved. The detection of a harmful effect of low sodium intake in observational studies merits questioning the justifications behind the universal recommendation of limiting sodium to less than 2,000 or 2,300 mg/day, but it is not possible to reach a definitive conclusion until clinical trials with sufficient strength to address this issue are carried out.^(14,17,18,19)

HOW SHOULD PUBLIC POLICY BE ORIENTED IN THE MEANTIME?

Reaching compliance with official guidelines in the entire population would imply modifications in dietary habits of a magnitude that cannot be justified in the absence of solid evidence. The disparity between real sodium intake and the recommendations, as well as the acknowledged difficulty in achieving sustained habit modifications at the population level, generate a very particular situation: the proposed goal is so strict that there is no realistic hope of reaching it, and therefore, the debate regarding the eventual harm that could be caused were the recommendation to be complied with becomes in part an academic exercise.

Ideally public policy would recognize this uncertainty and propose a less ambitious but more realistic reduction in the population's sodium consumption, enough to achieve a significant reduction in blood pressure and

the vascular events associated with excessive consumption. In this way, it has been estimated that in Argentina a reduction of 1,200 mg/day in the average sodium intake (from 4,500 to 3,300 mg/day) would decrease heart attacks and strokes by 20% and lower all-cause mortality by 6,4%.⁽²⁰⁾ Another publication recently showed the cost-effectiveness of reducing the population's sodium intake by 10% to 30% in relative terms, or by 500 to 1,500 mg/day in absolute terms,⁽²¹⁾ which would achieve clear benefits even though the resulting sodium intake would remain far above the recommendations in question.

A policy adapted to the available evidence would propose a moderate goal, achievable in the general population, and would avoid the severity of such an extreme objective that lacks scientific foundation.

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