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Beyond the Shaker: Quantifying Salt Intake in Tirana through Urinary Sodium Analysis

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Abstract

Background: High salt intake is associated with high blood pressure and adverse cardiovascular health. To figure out average salt intake, we investigated the dietary salt intake from 24-h urinary sodium excretion with a random adult sample from Tirana, the capital city of Albania. **Materials and Methods:** One hundred and fifty adults aged 18–75 years were randomly selected from a sample of 100000 people from 2 quarters of Tirana's adult population. Anthropometric measures and sodium excretion in a 24-h urine collection were measured. The accuracy of urine collections was verified using creatinine excretion in relation to weight. **Results:** The mean Na excretions over 24 h were 202.54 (standard deviation [SD] 93.56) mmol/day. Urinary sodium excretion was significantly higher in men (223.85 [SD 106.51] mmol Na/day) than in women (190.80 [SD 83.96] mmol Na/d); *P* = 0,045. Average salt intake was 11.8 (SD 5.48) g/d, higher in men than in women (13.08 [SD 6.23] vs. 11,09 [SD 4.92] g/d, respectively). Salt intake increases slightly with increasing age, but there was no significant correlation between age and salt intake. It was also seen that salt consumption increased with increasing body mass index (r = 0.183, *P* = 0.001). **Conclusion:** Dietary salt intake in Tirana adults was high, which exceeds the World Health Organization recommended population nutrient intake. Reducing the intake of table salt and traditionally processed foods will be an important strategy to reduce sodium intake among our adults. A national program for reducing salt intake in Albania needs to be conducted through systematic efforts, including public education and involving the health-care sector and the food industry.

Keywords: 24 h urine collection, Dietary salt intake, High blood pressure, Salt excretion

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Introduction

In 2018, chronic diseases took the lives of 43 million people globally, accounting for 75% of the total deaths that year, and this is projected to rise in 53 million in 2030.[1] Among these chronic disease-related fatalities, cardiovascular (CV) diseases were responsible for 41.6% of them.[2] In Albania, in 2021, non-communicable disease account for 66% of all deaths. Among females, stroke and ischemic heart disease were top leading causes of death with 291 and 256 per 100000 population respectively.[3]

Excessive dietary salt consumption is associated with hypertension, which, in turn, increases the risk of stroke and cardiovascular disease (CVD)[4-7] contributing to an estimated 3 million deaths/year (including CVD, kidney disease, and stomach cancer).[8] Huge and reliable evidence suggests that modest reductions in dietary sodium could substantially reduce CV events[9] and medical costs. Reducing sodium intake is one of the most cost-effective measures to improve health and reduce the burden of non-communicable diseases: For every US$1 invested in scaling up sodium reduction interventions, there will be a return of at least US$12.[8]

Many populations have an average daily salt intake of 10 g (172 mmol Na), and a substantial number of individuals consume at least 12 g (207 mmol Na) daily.[4] As nations strive to meet the World Health Organization (WHO) target of reducing salt intake to <5 g/day,[10] exact population-level assessments are critical to inform public health policies.

Salt intake can be measured using various methods, such as short-term dietary recalls (24–96 h), food frequency questionnaires, and 24-h urine collection. 24-h urine collection is the gold standard method to evaluate salt intake.[11-13] Since the 24-h urinary excretion method only measures sodium lost through the kidneys, it does not account for other electrolyte losses, leading to a slight underestimation of actual intake.[14]

In Albania, where traditional diets often rely on salt-preserved foods (e.g., pickled vegetables and cured meats) and processed foods are increasingly accessible, understanding sodium consumption patterns is urgent. In recent years, there have been initiatives by the Public Health Institute on the negative effects of excessive salt consumption,[15] but no concrete initiatives with a significant impact on the population have been implemented. However, robust data on salt intake in the Albanian population-particularly using the gold-standard method of 24-h urinary sodium excretion-are still lacking, limiting evidence-based interventions.

This study aimed to measure salt intake in adults by analyzing sodium levels in 24-h urine samples. Although the method has some limitations, researchers used urinary creatinine as a standard check to rule out incomplete urine collections.[16]

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Materials and Methods

Participants

The study was conducted in April 2025. Two neighboring quarters in the city of Tirana with approximately 100,000 inhabitants were selected. This corresponds to an important regional health center. The established sample size of approximately 150 individuals was more than sufficient to have a representation with 95% reliability and 5% acceptable error, considering the 11% prevalence. It should be noted that Tirana has experienced major demographic movements from all regions of Albania in the past 20 years, and we think that the selected sample would be representative in terms of eating habits in different regions of our country. In this neighborhood, we randomly selected, from the family doctor's registers, 300 people aged 18–70. All subjects were contacted by phone and explained in detail the purpose and details of the project. The first 150 people who agreed to take part in the study were invited to the regional health center. They were given an invitation to participate that included the purpose of the study, as well as important data on the prevalence of chronic diseases in Albania, the negative CV effects, but not only, of excessive salt consumption. To increase cooperation in the study, it was emphasized in the invitation that everyone would receive the results of laboratory examinations and would be given advice about diet depending on the results. Also at that moment, a consent form was also given, which detailed the method of urine collection, and it was recommended that they should not amend their daily diet. The study protocol was approved by the Ethical Review Committee of the Albanian Center for Disease Control and Prevention.

24-h Urine Collection and Measurement

On that day, they were measured and weighed, and their demographic information was gathered. There was only one 24-h urine collection for sodium and creatinine determination. Instructions on the collection of the urine were given verbally and written in the consent form. After that, a standard container was given to all the participants. The first early morning urine should be discarded, and a 24-h urine collection started, with the next morning's urine being added.

Participants were instructed to bring the container between 8:00 and 8:30 AM, from Monday to Saturday, to the healthcare center, together with the signed consent form, where the urine samples were at once sent to the certified laboratory (Intermedica Laboratory Tirana), located near the regional healthcare center. This process lasted 1 month.

Following standard procedures, the urine volume was measured, and sodium levels in the urine were analyzed using the ion-selective electrode with the Siemens analyzer. According to standard practices in the literature, urinary sodium excretion is measured in mmol, whereas estimates of dietary salt intake are given in grams. Daily salt intake is figured out by calculating 24-h urinary sodium excretion with the assumption that all sodium consumed was in the form of sodium chloride and all sodium is excreted by the kidneys.

To change sodium (Na) measurements to salt (NaCl), the sodium amount is multiplied by 2.54, and 1 mmol sodium/17 = 1 g salt. The daily sodium excretion was calculated by multiplying urine concentration by total urine volume (adjusted to 24 h) and reported in mmol/day (mmol/d). 24-h urine collections were considered complete according to the calculation of urinary creatinine in relation to body weight (i.e., the creatinine coefficient = creatinine [mg/day]/body weight [kg]). Creatinine coefficients of 14.4–33.6 in men and 10.8–25.2 in women were classified as showing an acceptable 24-h urine collection.[16] Eighteen participants were disqualified due to incomplete urine collection.

Statistical Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences, version 26.0.

- Descriptive statistics were applied to summarize the data. For categorical variables, absolute frequencies (counts) and corresponding percentages were calculated.
- For continuous numerical variables, measures of central tendency and variability were computed, including the interquartile range, arithmetic means, and their corresponding standard deviations (SD).
- Group differences in continuous quantitative variables were evaluated using the Mann–Whitney U-test, due to the non-parametric nature of the data. Analysis of variance was used to analyze differences in quantitative variables across more than two groups.
- Associations between variables were assessed using Kendall's tau correlation coefficient.
- A $P < 0.05$ was considered statistically significant.

Results

Participant Characteristics

The main data of the participants are detailed in Table 1. The difference in the number of males and females was significant. Of the 138 participants, 89 (64.49%) were female and 49 (35.51%) were male. The response rate of females was greater. The mean age of the subjects was 56 years, with non-significant differences between genders ($P = 0.292$). The mean urinary volume was 1991.05 (SD 680) mL/day. No statistically significant differences were seen between the amount of urination between males and

Table 1: Characteristics of the study population related with the results of 24 h urinary sodium

Variable	*Male (n=49)*	*Female (n=89)*	*Total population (n=138)*	*P*-value*
Age (mean+SD)	57.16±17.59	55.57±15.48	56.14±16.21	0.292
BMI (mean+SD)	28.08±4.01	27.09±4.84	27.44±4.57	0.146
Na (mmol) (mean+SD)	223.85±106.51	190.80±83.96	202.54±93.56	0.045
Na (g) (mean+SD)	5.10±2.43	4.33±1.91	4.60±2.13	0.043
NaCl (mean+SD)	13.08±6.23	11.09±4.92	11.80±5.48	0.039
Creat (g) (mean+SD)	1,5±0.47	1,14±0.41	1,27±0.46	<0.001
Urine amount (mL) (mean+SD)	2015.31±646.32	1977.70±701.18	1991.05±680.06	0.665

*Mann-Whitney U-test. BMI: Body mass index

females. Urinary creatinine excretion was significantly higher in males (1.50 ± 0.47) than in females (1.14 ± 0.412), ($P < 0.001$).

Sodium and Salt Intake

The mean sodium excretion in the adult population was 202.54 (SD 93.56), which corresponds to 11.80 ± 5.48 g NaCl/day. Urinary sodium excretion was significantly higher in men (223.85 ± 106.51 mmol/d) than in women (190.80 ± 83.96 mmol/d; $P = 0.045$, [Figure 1]), corresponding to 13.08 ± 6.23 g/day and 11.09 ± 4.92 g/day NaCl, respectively. Most of the population (94%) consumed more than the recommended 5 g of salt/day, including almost all men (100%) and most women (92%).

At the beginning of the study, all participants were measured and weighed. Their mean body mass index (BMI) was 27.44 ± 4.57 kg/m^2, with no significant gender differences ($P = 0.146$). According to Figure 2, a positive correlation between BMI and daily intake of salt ($r = 0.183$, $P = 0.001$) was found.

The average age in men and women was not significantly different ($P = 0.292$). In comparing salt consumption by age groups, there was no significant correlation between them [Figure 3].

Discussion

We found that average urinary sodium excretion among adults in Tirana was 202.54 (SD 93,56) mmol/d (11.8 g salt/d). This study's findings reflect a critical public health concern in Albania, at a 24-h urinary salt excretion average of 11.8 g/day–close to twice the WHO estimated upper limit of 5 g/day. This places Albania among the highest salt-consuming populations worldwide, alongside countries in East Asia (e.g., China: 10.9 g/day) and Central Asia (e.g., Kazakhstan: 15 g/day), where traditional diets and processed foods drive excessive sodium intake.[17] Daily sodium intake varied considerably across population groups, according to INTERSALT,[18] from a low of 4 g salt/d (sodium: 1,56 g/d, 68 mmol/d) among Alaskan Inuit to 27 g salt/d (sodium: 10,6 g/d, 460 mmol/d) in the Akita prefecture in north-east Japan. It has been estimated in the INTERSALT study that salt intakes in Belgium, Denmark, and the Netherlands were between 8 and 9 g/d, and in Finland, Italy, and Portugal, intakes were between 9 and 12 g/d.

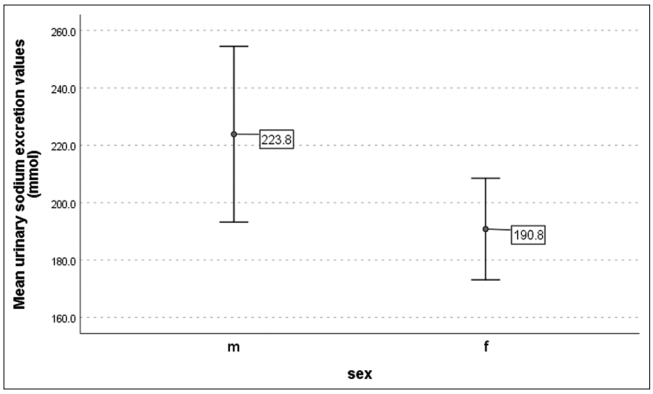

Figure 1: Mean value of 24 h urinary sodium excretion (n=138) by gender

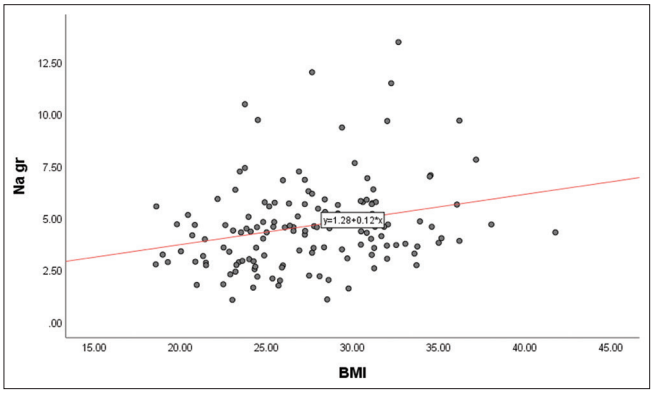

Figure 2: Correlation between salt intake and body mass index

Contextualizing Regional Similarities

Albania's salt excretion patterns mirror those of nearby nations, pointing to common cultural and economic factors driving high sodium consumption in the Balkan region. Traditional diets in the area emphasize preserved foods-including dried meats, cured cheeses, pickled vegetables-due to cultural practices and ease of storage, though urbanization has further driven the shift toward processed and convenience foods. This twin burden of traditional and modern diet for food creates a "perfect storm" for excessive salt consumption. The lack of tough controls on the food industry on sodium content, coupled with low public awareness of the risk that salt poses, further contributes to the issue. These results resonate with local trends observed in neighboring Balkan countries, such as Montenegro (11.5 g/day),[19] Slovenia (10.9 g/day),[12] and Greece (9.54 g/day),[20] which suggest a similar dietary pattern of reliance on salt-preserved traditional foods, processed meat, and widespread use of discretionary salt.

Gender Disparities and Implications

The gender difference in salt consumption (13.08 g/day in men compared with 11.09 g/day in women) follows international trends, with men tend to consume more sodium. In the Chinese study, urinary sodium excretion was significantly higher in men (218.3 ± 81.4 mmol/d) than in women (183.8 ± 69.8 mmol/d; $P = 0.002$).[17] Results from the Finland survey, in 2002, also showed higher urinary sodium excretion among men.[21] The higher salt

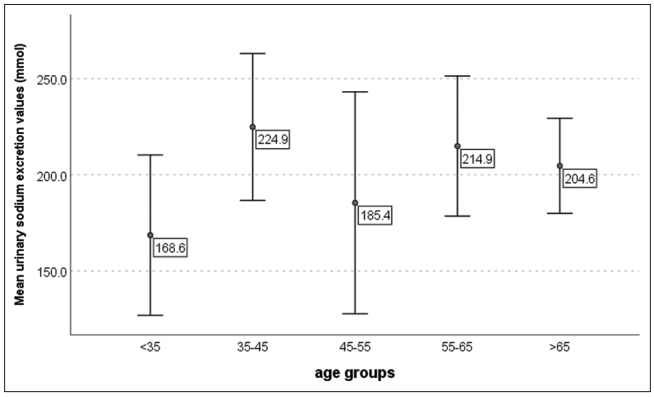

Figure 3: Correlation between salt intake and age groups

excretion among Albanian men may reflect gender-specific food habits, such as a higher intake of processed foods, salt-containing snacks, or greater portions. Occupational reasons (e.g., more energy-demanding manual labor) and social culture, wherein men might be more willing to sacrifice health for taste, may also play a role. Women's modest reduction in intake may alternatively stand for increased health consciousness or following dietary recommendations, although consumption stays vastly more than safe levels. Targeted interventions must address these gendered inequalities–such as positioning messages about public health in terms relevant to men's interest in food and strengthening women as key influencers of family food choice.

Methodological Considerations

The gold-standard measure of salt intake assessment, 24 h urinary sodium excretion, was employed in our research; thus, our findings are more likely to be valid than surveys of dietary intake. However, minor underestimation may be introduced by issues, such as missing urine or non-compliance. So far, this is the first Albanian study that measures the 24 h sodium excretions or the salt consumption. Furthermore, there aren't earlier Albanian studies using the Food Frequency Questionnaire.

Public Health Priorities

Multisectoral action is urgently needed because the situation is extremely concerning. Policy actions ought to consist of: Food industry regulation: Implementing sodium reduction goals on bread, an essential in Albania, and processed foods. Public education: Awareness campaigns to cut down on unnecessary salt use, and to encourage the use of alternatives, such as herbs and spices, tapping into cultural pride in traditional cuisine. Cooperation with neighboring nations: Coordinating Balkan salt reduction initiatives to address prevalent dietary issues. Monitoring and evaluation: Creating national surveillance systems to track advancement toward the WHO's goals.

Limitations

A cross-sectional design that prevents any causal inferences and possible selection bias (such as the underrepresentation of remote rural populations) are two of the study's limitations, despite its strength in terms of baseline data. Although preserved foods are consumed throughout the year in Albania, there was no investigation of seasonal dietary variations. Longitudinal trends, and particularly the role of dietary sources (such as bread, cheese, or processed meat) in total salt intake, require more research.

Conclusion

This report places Albania inside a high dietary salt belt in Southeast Europe, which reflects historically conditioned cultural practices and badly functioning regulatory systems. The results support the need for implementing place-based approaches that respect and align with culinary traditions and health goals. This could be enhanced by harmonizing national policies with WHO recommendations and encouraging regional cooperation to deal with the CV risk of high salt consumption.

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