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Sodium intake in the Belgian population Research limitations and policy implications

by

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Abstract

Objective: To analyse the current sodium intake level in the Belgian adult population and to determine the most important foods contributing to the total sodium intake.

Design and setting: Information on food intake was collected using two non-consecutive 24-hour recalls. Habitual food intake was estimated by the Nusser method. Non-dietary variables were obtained using a face-to-face questionnaire.

Subjects: A representative sample of the Belgian population 15 years and older was randomly selected from the National Register using a multistage stratified procedure. This study only comprised adults 18 years and older (n=2439).

Results: The mean sodium intake of the Belgian population was 2.7 ±1.0 grams per day. Men ingested substantially more sodium than women (3.3 ±1.2 grams per day versus 2.3 ±0.9 grams per day). Men exceeded the upper limit of the recommended sodium intake of the World Health Organisation at the 10th percentile while women exceeded this limit at the 41st percentile.
Cereals, especially bread, contributed most to the total sodium intake. Meat products, sauces, soups and cheese also were important contributors.

Conclusion: Efficient sodium reduction measures are urgently needed in Belgium. Ideally sodium reduction should be organised at European level. Food producers, especially manufacturers of bread (products), meat products, sauces, soups and cheese, are strongly encouraged to take initiatives to reduce the sodium content of their foods. While reducing sodium content of foods, one must not forget to follow up iodine status of the population and consumer acceptance of sodium-reduced foods.

Keywords

Sodium intake, food consumption survey, Belgium, food groups

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Introduction

Conclusive scientific evidence links excessive consumption of sodium with cardiovascular disease, gastric cancer, osteoporosis, cataract, kidney stones and diabetes (1-4). Results of the national Health Interview Survey of 2004 show that the prevalence of high blood pressure, cardiovascular disease, diabetes, cataract, osteoporosis and all cancers in Belgium is respectively 10.9%, 4.3%, 1.2%, 8% and 7% for men and 13.6%, 3.1%, 3.6%, 2.5%, 5.6% and 1.3% for women (5). World Health Organisation (WHO) and Food and Agriculture Organisation of the United Nations (FAO) experts stress the influence of sodium on blood pressure and increased risk of coronary heart disease and stroke (6).

A recent report from the World Health Organisation recommends that salt consumption from all sources be reduced to 5 grams per day (2 grams of sodium per day), and that the salt consumed be iodised (7). The Belgian Superior Health Council (SHC) recommends that sodium intake should be lower than 3.5 grams per day (8). In the Netherlands, the Health Council recommends that no more than 6 grams of salt a day should be consumed (9). The latter limit is justified in terms of tackling hypertension using non-pharmacological measures (10).

As dietary habits are changing continuously, it is important to monitor and document nutrient intakes in order to develop effective policies on nutrition (11, 12). Belgium has recently launched its National Plan on Nutrition and Health and conducted the first Belgian National Food Consumption Survey (BNFCS) in 2004. One of the nutritional priorities of the national plan is the establishment of a task force focussing on the formulation of measures to reduce sodium, sugar and fat content of foods in the Belgian diet.

The objective of this paper is to analyse the current sodium intake level in the Belgian adult population and to determine the most important foods contributing to the total sodium intake.

Design and methods

The study was approved by the ethical committee of the Scientific Institute of Public Health. An in-depth description of the study design, ethical aspects and the methodology used, has been published elsewhere (13).

Sampling design

A representative sample (n=3245) of the Belgian population of 15 years and older was randomly selected from the National Register. The sampling method followed a multi-stage stratified procedure. The strata were categorised by four age groups (15-18 years, 19-59 years, 60-74 years and older than 75 years) and both genders. Belgium was divided into three regions and 11 provincial strata. The participants were sampled in a way that the population densities of the regions, the provinces and the municipalities were taken into account. For the purposes of this study, the 15-18 year old age group was excluded.

Study design

Participants were invited to take part in the study through a letter and a leaflet. They were visited twice by a trained dietician. During the first visit the participants completed a face-to-face questionnaire about general health, lifestyle and physical activity. The latter was assessed using the International Physical Activity Questionnaire (14). A 24-hour recall assessed the previous day's dietary intake.

During the second visit, two to eight weeks later, a second 24-hour recall was performed. The interviews were distributed equally over all seasons and days of the week. During the 24-hour recall the participants reported the types and quantities of all foods and beverages consumed during the preceding day. To obtain standardised 24-hour recall interviews, the validated software package EPIC-SOFT was used (15). The software enables to obtain detailed descriptions and quantities of foods and supplements consumed and recipes used, in a standardised way. Quantification of the consumed foods was supported by a validated picture book that contains photographs of foods in different portion sizes. Liquid foods were quantified with the help of household measures and foods that were consumed as more or less standard units were counted as such.

To calculate the dietary intake of sodium, the database of consumed food items was linked to food composition data, based on the following tables: the Belgian food composition database (FCDB) (16), the Dutch FCDB (17), the FCDB of the Belgian Institut Paul Lambin (18) and McCance and Widdowson's FCDB (19). Sodium occurs naturally in most foods. The most common form of sodium is sodium chloride, which is table salt. Sodium is also added to various food products. Some of these added forms are monosodium glutamate, sodium nitrite, sodium saccharin, baking soda (sodium bicarbonate), and sodium benzoate. Sodium content of foods in composition tables comprises both added sodium and sodium naturally present.

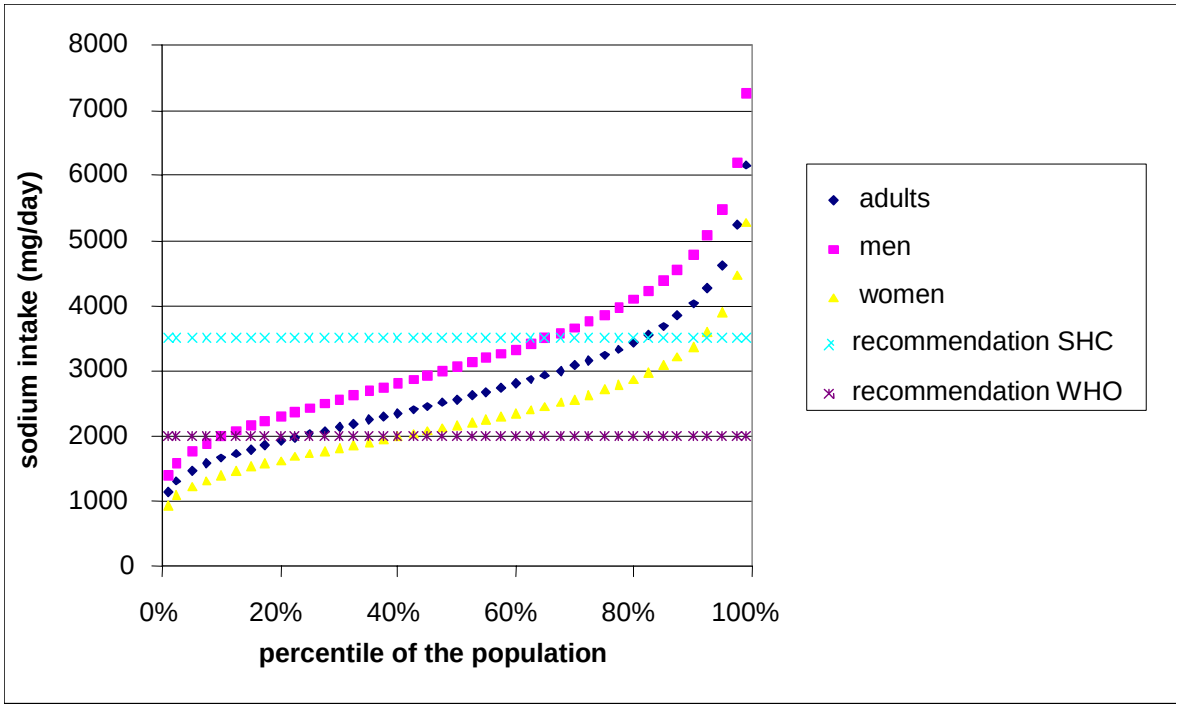
Statistical analysis

Because of day-to-day variations in individual nutrient intakes, a large number of days of intake data are typically needed to determine usual nutrient intakes. The Nusser method (20), which is recommended by the Institute of Medicine (21), was used to correct for the within-individual variation in nutrient intakes. With this method the total variance is adjusted for the intra-individual variances of day-to-day variability. In addition, data were transformed to a normal distribution. This statistical method for estimating usual intake distributions and the proportion below or above defined cutoff values was developed at Iowa State University (20, 22). The Nusser method was applied using Software for Intake Distribution Estimation (C-side) (23). The reported sodium intakes were weighted and adjusted for interview day and season and for the age and sex distribution of the Belgian population.

Results

The mean sodium intake of the Belgian population, adjusted for age and gender, was 2.7 ±1.0 grams per day. Only 23.3 % of the Belgian population complied with the WHO recommendation of ingesting less than 2 grams of sodium a day. The threshold of 3.5 grams per day (SHC) was met by 81.2% of the population.

FIGURE 1. Usual sodium intake (mg/day) in the Belgian population (n=2439), adjusted for interview day and season, and sex and age distribution of the Belgian population (Belgian food consumption survey, 2004)



Men ingested substantially more sodium than women (3.3 ±1.2 grams per day versus 2.3 ±0.9 grams per day). More women met the WHO and SHC recommendation of consuming less than respectively 2 grams or 3.5 grams of sodium a day (40.8 % and 91.5% respectively) than men (10.2% and 65.1% respectively) (Figure 1).

Food groups contributing most to the total sodium intake (more than 1.0%) of the Belgian population, are given in Table 1. Cereals, especially bread, contributed most to the total sodium intake. Meat (products), sauces, soups and cheeses were also important contributors.

TABLE 1. Food groups, contributing most (more than 1%) to the salt intake of the Belgian population (n=2439) (Belgian food consumption survey, 2004)

Food group	**% contribution to salt intake**	
	MEN	**WOMEN**
Cereals*	28.4	25.8
bread	25.8	23.0
breakfast cereals	0.8	1.2
Meat and meat products	21.0	16.5
meat products	15.2	11.1
fresh meat	4.5	4.2
poultry	1.2	1.1
Sauces, spices, condiments and herbs	14.3	14.2
sauces	13.7	13.7
Soups	9.3	14.1
Milk and dairy products	9.8	10.3
cheeses	7.6	7.3
Cakes and biscuits	2.9	3.9
Fish, crustaceans and mollusks	2.3	2.9
Non-alcoholic drinks	1.9	2.5
Vegetables	1.9	2.0
Potatoes and tubers**	1.2	1.2

* excluding salty snacks such as salty biscuits
** excluding potato-based chips
All salty snacks (* and **) only contribute for 0.75% of the total salt intake.

Discussion

Sodium intake

The mean estimated sodium intake in Belgium is lower than found in the INTERSALT study (1984), which has the largest set of standardised data on 24-hour urinary sodium excretion around the world, from 10,079 men and women aged 20-59 years from 52 population samples in 32 countries (24, 25). In this survey ingested sodium intake was estimated to be 3.4 ±1.4 mg/day in the region of Charleroi and 3.6 ±1.3 mg/day in the region of Ghent (26).

Limitations

Consumption of table salt and salt added during recipe preparations (including in restaurants) were strongly underestimated. During the interviews the dieticians did not ask

specifically about the use of household salt. In the UK, it has been shown that table salt and salt added during cooking contribute 11% while food processing contributes 77% to the total sodium intake of the population (27). Moreover, even when this information would be available, it is difficult to estimate the proportion of added salt which is retained by the food and the proportion of salt which is left behind on the plate.

For some sodium-poor foods, no data were available in the food composition databases. Therefore, the sodium-rich equivalent was used to perform the calculations.

Food composition data are not always obtained from analyses but often come from industry. This means that sodium content of some foods may be underestimated due to the fact that sodium concentrations higher than the maximum permitted levels will not be reported. In the NUBEL database, at this moment only 44% of the sodium concentrations are obtained from analyses, other values come from industry or labels. Data obtained from the FPS Economy, SMEs, Self-employed and Energy show that the salt content of 21.8% of the controlled breads exceeds the permitted level of 2% salt on a dry matter basis.

Due to the above limitations, estimates based on food diaries, 24-hour recalls and food frequency questionnaires tend to underestimate sodium intakes as compared with intakes estimated using duplicate diets or 24-hour urine collections (28-30). Preferably sodium status of the population should be evaluated using 24-hour urine collections.

Another limitation is that consumption data for children and adolescents younger than 15 years lack in this survey. This age group should not be neglected when sodium reduction measures are being designed. The Preschool Children Survey in Flanders showed that all preschool children exceeded the tolerable upper intake levels for sodium (31).

Policy implications

The mean sodium intake in Belgium is most likely underestimated (27) but even in that case, the intake is shown to be quite high and more than half of the population, especially men, do not meet the WHO recommendation. Interventions to reduce population-wide sodium intake in other countries showed to be highly cost-effective (32, 33), hence the urgency to implement choices tackling the reduction of dietary sodium intake. A survey in Finland shows the potential impact of labelling and giving consumers the possibility to choose products with less salt (34). The mean salt intake would be reduced by 1.8 g in men and by 1.0 g in women if the entire population were to choose lightly salted products.

The food industry should do efforts to reduce levels of sodium in foods. A first start could be to modify foods with an extreme sodium content, which can no longer be justified from a technological, microbiological point of view. Multinational food industries should be encouraged to harmonise the sodium content of their products according to the lowest threshold possible. Because bread (products), meat (products), sauces, soups and cheese are the main contributors to the total sodium intake, possibilities for reducing sodium content in these products should be first explored. In Belgium, from the mid-1960s to the early 1980s the

amount of sodium in bread was already reduced significantly (35) and 24-hour urinary sodium excretion declined over the same period. At this moment a task force has been established, comprising both industrial bodies and scientific and governmental bodies, to explore the possibilities for further sodium reduction, based on the premise that action must address reformulation of foods but also people and environment.

When reducing sodium intake, obviously technical constraints and food safety issues should be taken into account. Another important issue is the consumer acceptability. Sodium reduction should be performed in a gradual way because sodium is very important for the taste of the foods and consumers will need time to accept these changes.

A reduction of one third or more in added sodium can be made to some foods without significantly affecting consumer acceptance (36). A one quarter reduction in the sodium content of white bread can be delivered over a short time period, while maintaining consumer acceptance (37). In the UK, major reductions in the sodium content of many processed foods have already been made, i.e. over 30% in some foods, without any consumer rejection as these reductions have been gradually applied over several years.

Further, small surveys in the last 50 years have repeatedly indicated that Belgium is affected by mild iodine deficiency (38, 39). Consequently, this issue should be taken into account when designing policies for reducing sodium intake by the population. A comprehensive strategy that encompasses both public health problems must be developed. In Belgium a selective, progressive, monitored approach has been proposed recently to optimise iodine intake in the population (40). Only bread will be fortified with iodised salt to avoid an increase of iodine beyond the optimal intake. Fortification will be done progressively and iodine status of the population will be monitored every 5 years. Anyway, one should avoid that a salt iodisation programme induces individuals to perceive that increased salt consumption is needed to prevent iodine deficiency.

Conclusion

Efficient sodium reduction measures are urgently needed in Belgium. Ideally sodium reduction should be organised at European level. Food producers, especially manufacturers of bread (products), meat products, sauces, soups and cheese, are strongly encouraged to take initiatives to reduce the sodium content of their foods. While reducing sodium content of foods, one must not forget to follow up iodine status of the population and consumer acceptance of sodium-reduced foods.

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