

WORLD HEALTH ORGANIZATION GUIDELINES ON SALT INTAKE IN ADULTS AND CHILDREN

CARMEN DANIELA DOMNARIU¹, ALEXANDRA CUCU², FLORENTINA LIGIA FURTUNESCU³

¹“Lucian Blaga” University of Sibiu, ^{2,3}“Carol Davila” University of Medicine and Pharmacy București

Keywords: sodium intake, World Health Organization, recommendations, children, adults

Abstract: In 2012, the World Health Organization (WHO) developed a guideline on the optimal sodium intake in both adults and children, with a view to reduce blood pressure and the risk of cardiovascular disease, coronary diseases, strokes. This guideline was developed based on systematic reviews and meta-analyses of a solid body of evidence showing a direct link between sodium intake and blood pressure. This guideline also includes evidence on the possible negative effects of a low-sodium intake.

Cuvinte cheie: consum de sodiu, Organizația Mondială a Sănătății, recomandări, copii, adulți

Rezumat: În anul 2012, Organizația Mondială a Sănătății (OMS) a elaborat un ghid cu recomandări privind cantitatea de sodiu optimă care ar trebui consumată atât de adulți, cât și de copii, în vederea reducerii tensiunii arteriale, dar și a riscului de boli cardiovasculare, boli coronariene, accidente vasculare cerebrale. Acest ghid a fost elaborat având la bază analize sistematice și meta-analize ale unui corp solid de dovezi, care atestă legătura directă între consumul de sodiu și valorile tensiunii arteriale. De asemenea, în acest ghid, sunt prezentate dovezi și cu privire la posibilele efecte negative ale unui consum redus de sodiu.

Non-communicable diseases (NCDs) represent the main contributing factor to increased mortality and morbidity, at a global level (1,2), and the interventions to reduce the burden of NCDs are extremely cost-effective.(3) High sodium intake was associated with certain non-communicable diseases (such as hypertension, cardiovascular disease and stroke), and a reduced sodium intake can reduce blood pressure and the risk of associated NCDs.(4,5) Recent data on sodium consumption across populations around the world show that these ones consume more sodium than is physiologically necessary.(6) In many cases, they consume sodium above the current recommendations of the World Health Organization (WHO). WHO recommendation for sodium intake for adults is of 2 g/day sodium (equivalent to 5 g salt/day).(7)

Thus, at the same time with the publication in 2007 of the previous guidelines issued by WHO on sodium intake (7), a number of scientific evidence was published on sodium intake, hypertension and the risk of cardiovascular diseases. Thus, the Member States requested WHO and the international partners to revise the current sodium intake recommendations in adults, and also to develop such a guideline for children.

The objective of the current guideline, issued in 2012 by the World Health Organization, is to provide recommendations on sodium intake in order to reduce non-communicable diseases in adults and children. WHO has developed this evidence-based guideline, using the principles described in the WHO Handbook for guideline development.(8)

The steps in this process included the following:

- identifying the main priority issues and findings;
- evidence collection;
- assessing and synthesising the evidence;
- formulating recommendations;
- identifying the research gaps;

- planning for dissemination, implementation, impact assessment, as well as guidelines updating.

Sodium is considered the main cation of the extracellular fluid of the body, and represents an essential nutrient for maintaining plasma volume, acid-base balance, transmission of nerve impulses and for the normal functioning of cells. In healthy persons, almost 100% of the sodium ingested is absorbed during digestion and urinary excretion is the primary mechanism for maintaining sodium balance.(9) Even in a warm, wet climate, only minimal amounts of sodium are lost through faeces and sweating. Heat acclimatization occurs quickly, so only a few days after the exposure to heat and humidity conditions, people lose only small amounts of sodium through sweating.(10,11) In conditions of extreme heat and intense physical activity, resulting in the production of large amounts of sweat, the amounts of sodium lost are significant, however, most people can replace sodium requirements without making changes in their diet, without consuming supplements or specially prepared products.(12)

Sodium and chlorine are the chemical components of the ordinary table salt, however, sodium can be found in other forms, and the main factors contributing to diets based on sodium consumption depends on cultural and food habits of the population.(13) Sodium can be found naturally in a variety of foods such as milk, meat, shellfish etc. It is often found in large amounts in processed foods such as bread, biscuits, processed meat and snacks. Large amounts of sodium are also found in many spices (e.g. soy and fish sauce).(14) Thus, a diet rich in processed foods and a diet low in fruits and vegetables is usually a diet high in sodium content.

High sodium intake is associated with increased blood pressure, and a lower consumption of sodium seems to lower blood pressure in adults.(15) Several recent systematic reviews,

¹Corresponding author: Alexandra Cucu, B-dul Eroilor Sanitari, Nr. 8, Sector 5, București, România, E-mail: alexandracucu2003@yahoo.com, Tel: +4021 3183620

Article received on 05.01.2013 and accepted for publication on 25.02.2013
ACTA MEDICA TRANSILVANICA March 2013;2(1):166-168

of high quality on randomized trials concluded that reduced sodium consumption as against a relative or a high one, can lower the blood pressure in the adults with and without hypertension.(16,17,18,19) A study on the recommendations to reduce sodium intake concluded that sustained behaviour changing initiatives aiming at reducing sodium intake has successfully reduced blood pressure in the adults with hypertension or not.(20)

A high amount of sodium was also associated with the development of cardiovascular disease (7), although evidence is less clear than for blood pressure. Numerous observational cohort studies have explored the relation between sodium intake and cardiovascular disease. Most of these studies have reported a direct relationship between sodium intake and cardiovascular disease, coronary heart disease, strokes. However, there have been other studies which did not show any relationship, other even an inverse or a J-shaped relationship (i.e. an increased risk both in terms of the highest sodium consumption, but also regarding the lowest intake). A recent meta-analysis that included 13 cohort studies over a period of four years or more, which did not include the most recent observational cohort studies, established the existence of a direct relationship between high salt consumption and the subsequent risks for cardiovascular diseases and stroke.(21)

There is some disagreement about the fact that a reduced sodium intake lowers blood pressure, but there are concerns that it could have even adverse effects on health. Lowering sodium intake results in reduced blood volume, thus activating the renin-angiotensin-aldosterone and sympathetic nervous system (by increasing adrenaline and noradrenaline), which help controlling the blood volume. Similarly, a reduction in blood volume without a concomitant reduction in blood lipids can lead to increased lipid levels. A recent systematic review reported an increase in the level of renin, aldosterone, adrenaline and noradrenaline, total cholesterol and triglycerides with reduced sodium consumption.(19) However, changes in blood lipid levels and catecholamine levels were transient and were no longer recorded after 4 weeks of low-sodium intake.(19) Although changes in renin and aldosterone levels persisted with reduced sodium intake, the importance of these changes remains uncertain. It was reported an increased risk of cardiovascular morbidity and mortality with increasing levels of renin and aldosterone, but the evidence is not conclusive. Unlike blood pressure, changes in the levels of these hormones are not yet validated biomarkers for potential risks.

Following the systematic reviews and meta-analyses of evidence and taking into account the whole body of evidence, WHO has generated the following recommendations for sodium intake in adults and children:

- WHO recommends reducing sodium intake to reduce blood pressure and the risk for cardiovascular disease, heart disease, strokes, coronary disease in adults. WHO recommends a reduction to < 2 g/day sodium (5 g salt/day).
- WHO recommends a reduction of sodium intake to control blood pressure in children. The maximum recommended sodium consumption in adults is less than 2 g/day sodium, which should be adjusted downward depending on the energy requirements of children, as compared to adults.

These recommendations apply to all persons, with or without hypertension (including pregnant and breastfeeding women), except persons under drug therapy, or diseases that could lead to acute hyponatremia or water accumulation in the body or those requiring medically supervised diets (e.g. patients with heart failure and those with diabetes type I). In these

subpopulations, there may be a particular relationship between sodium intake and health. Therefore, these subpopulations were not taken into account in reviewing the evidence and in generating these guidelines.

These recommendations complement WHO guidelines on potassium intake, and should be used in combination with other guidelines and recommendations for the consumption of other nutrients, in the development of public health nutrition programmes. The optimal ratio of sodium is not of concern regarding this guideline, however, if a person consumes the amount of sodium recommended in this guideline and WHO recommended amount of potassium in potassium intake guidelines, sodium/potassium ratio should be of one to one, which is considered to be beneficial to health.(15)

These recommendations recognize that reducing salt and salt iodizing are compatible. Monitoring salt consumption and salt iodizing at national level is required in order to make adjustments in salt iodizing depending on the observed population salt intake, to ensure that people who consume the recommended amount of sodium continues to consume enough iodine.

These recommendations are based on all evidence regarding the relationship between sodium intake and blood pressure, all cause mortality, cardiovascular disease, coronary heart disease, stroke, and potential adverse effects on blood lipids, catecholamine levels and renal function. Evidence on the relationship between sodium intake and blood pressure are of high quality, while the evidence of sodium intake and all cause morbidity, cardiovascular disease, coronary heart disease, stroke was of low quality. Therefore, these recommendations should be reviewed when more evidence becomes available on the relationship between sodium intake and all cause mortality and cardiovascular diseases.

Successful implementation of these recommendations would have a significant impact on public health by reducing morbidity and mortality and improving the quality of life of millions of people, as well as substantial reductions in health care costs.(1,3)

Experience in some countries has shown that the reduction of sodium in processed foods is feasible and achievable for food producers, who work closely with the government agencies and that these efforts may lead to significant reductions in the sodium content of products without negative reactions from consumers.(22)

REFERENCES

1. WHO. Global health risks: Mortality and burden of disease attributable to selected major risks. Geneva, World Health Organization (WHO); 2009 (http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf).
2. WHO. Preventing chronic disease: a vital investment. Geneva, World Health Organization (WHO), 2005 (http://www.who.int/chp/chronic_disease_report/contents/en/index.html).
3. Murray CJ, Lauer JA, Hutubessy RC, et al. Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular-disease risk. *Lancet*. 2003;361(9359):717-725(<http://www.ncbi.nlm.nih.gov/pubmed/12620735>).
4. WHO. Prevention of recurrent heart attacks and strokes in low and middle income populations: Evidence-based recommendations for policy makers and health professionals. Geneva, World Health Organization (WHO),

- 2003(http://www.who.int/cardiovascular_diseases/resource/pub0402/en/).
5. Bibbins-Domingo K, Chertow GM, Coxson PG, et al. Projected effect of dietary salt reductions on future cardiovascular disease. *New England Journal of Medicine*. 2010;362(7):590-599. (<http://www.ncbi.nlm.nih.gov/pubmed/20089957>).
 6. Elliott P. Sodium intakes around the world. Background document prepared for the Forum and Technical meeting on Reducing Salt Intake in Populations (Paris 5-7 October 2006). Geneva, World Health Organization; 2007.
 7. WHO. Prevention of cardiovascular disease: guidelines for assessment and management of cardiovascular risk. Geneva, World Health Organization (WHO), 2007 (http://whqlibdoc.who.int/publications/2007/9789241547178_eng.pdf).
 8. WHO's Guidelines Review Committee. WHO Handbook for guideline development. Geneva, World Health Organization (WHO), 2012 (http://apps.who.int/iris/bitstream/10665/75146/1/9789241548441_eng.pdf).
 9. Holbrook JT, Patterson KY, Bodner JE, et al. Sodium and potassium intake and balance in adults consuming self-selected diets. *American Journal of Clinical Nutrition*. 1984;40(4):786-793 (<http://www.ncbi.nlm.nih.gov/pubmed/6486085>).
 10. Fukumoto T, Tanaka T, Fujioka H, et al. Differences in composition of sweat induced by thermal exposure and by running exercise. *Clin Cardiol*. 1988;11(10):707-709 (<http://www.ncbi.nlm.nih.gov/pubmed/3224454>).
 11. Sawka MN, Montain SJ. Fluid and electrolyte supplementation for exercise heat stress. *American Journal of Clinical Nutrition*. 2000;72(2 Suppl):564S-572S (<http://www.ncbi.nlm.nih.gov/pubmed/10919961>).
 12. American College of Sports Medicine, Sawka MN, Burke LM, et al. American College of Sports Medicine position stand. Exercise and fluid replacement. *Medicine and Science in Sports Exercise*. 2007;39(2):377-90 (<http://www.ncbi.nlm.nih.gov/pubmed/17277604>).
 13. Brown IJ, Tzoulaki I, Candeias V, et al. Salt intakes around the world: implications for public health. *Int J Epidemiol*. 2009;38(3):791-813 (<http://www.ncbi.nlm.nih.gov/pubmed/19351697>).
 14. Wu Leung W, Butrum R, Chang F, et al. Food composition table for use in East Asia. Rome and Washington, D.C., FAO and US Department of Health, Education, and Welfare; 1972.
 15. WHO. Diet, nutrition and the prevention of chronic disease. Report of a Joint WHO/ FAO Expert Consultation. Geneva, World Health Organization (WHO); 2003 (http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf).
 16. He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. *Cochrane Database of Systemic Reviews*. 2004;(3):CD004937 (<http://www.ncbi.nlm.nih.gov/pubmed/15266549>).
 17. Dickinson HO, Mason JM, Nicolson DJ et al. Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials. *J Hypertens*. 2006;24(2):215-233 (<http://www.ncbi.nlm.nih.gov/pubmed/16508562>).
 18. Dietary Guidelines Advisory Committee. Adults and sodium: what is the relationship between sodium and blood pressure in adults aged 19 years and older? Washington, D.C., Department of Health and Human Services and Department of Agriculture, 2010 (http://www.nutritionevidencelibrary.com/evidence.cfm?evidence_summary_id=250164&highlight=adults%20and%20sodium&home=1).
 19. Graudal NA, Hubeck-Graudal T, Jurgens G. Effects of low sodium diet versus high sodium diet on blood pressure, renin, aldosterone, catecholamines, cholesterol, and triglyceride. *Cochrane Database of Systemic Reviews*, 2011;(11):CD004022 (<http://www.ncbi.nlm.nih.gov/pubmed/22071811>).
 20. Hooper L, Bartlett C, Davey SG et al. Advice to reduce dietary salt for prevention of cardiovascular disease. *Cochrane Database of Systemic Reviews*, 2004;(1):CD003656 (<http://www.ncbi.nlm.nih.gov/pubmed/14974027>).
 21. Strazzullo P, D'Elia L, Kandala NB, et al. Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *BMJ*, 2009, 339:b4567 (<http://www.ncbi.nlm.nih.gov/pubmed/19934192>).
 22. World Health Organization, Guideline: Sodium intake for adults and children. Geneva; 2012.