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Excess dietary sodium and inadequate potassium intake in Italy: Results of the MINISAL study

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Abstract *Objective:* As excess sodium and inadequate potassium intake are causally related to hypertension and cardiovascular disease, the MINISAL-GIRCSI Program aimed to provide reliable estimates of dietary sodium and potassium intake in representative samples of the Italian population.
Design and methods: Random samples of adult population were collected from 12 Italian regions, including 1168 men and 1112 women aged 35–79 yrs. Electrolyte intake was estimated from 24 hour urine collections and creatinine was measured to estimate the accuracy of the collection. Anthropometric indices were measured with standardised procedures.
Results: The average sodium excretion was 189 mmol (or 10.9 g of salt/day) among men and 147 mmol (or 8.5 g) among women (range 27–472 and 36–471 mmol, respectively). Ninety-seven % of men and 87% of women had a consumption higher than the WHO recommended target of 5g/day. The 24 h average potassium excretion was 63 and 55 mmol, respectively (range 17–171 and 20–126 mmol), 96% of men and 99% of women having an intake lower than 100 mmol/day (European and American guideline recommendation). The mean sodium/

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potassium ratio was 3.1 and 2.8 respectively, i.e. over threefold greater than the desirable level of 0.85. The highest sodium intake was observed in Southern regions. Sodium and potassium excretion were both progressively higher the higher the BMI ($p < 0.0001$).
Conclusions: These MINISAL preliminary results indicate that in all the Italian regions thus far surveyed dietary sodium intake was largely higher and potassium intake lower than the recommended intakes. They also highlight the critical association between overweight and excess salt intake.

Introduction

Strategies aiming at reducing dietary sodium and increasing potassium intake are being implemented in many countries based on robust evidence-based knowledge supporting their beneficial effects and their cost-effectiveness for reduction of cardiovascular and other chronic diseases [1]. A causal relationship between dietary sodium chloride (salt) intake and high blood pressure (BP) has been demonstrated by epidemiological, clinical and experimental studies [2]. High BP is responsible for 62% of cerebrovascular and 49% of ischaemic heart disease [3]. The INTERSALT Study unravelled a significant direct association between average population salt intake and the rate of BP increase with age [4]. In clinical trials, a BP lowering effect of reduced salt intake was observed in both hypertensive and non-hypertensive individuals [5]. A recent meta-analysis of population-based prospective studies demonstrated that a 5 g/day higher salt intake was associated with 23% greater risk of stroke and 17% higher risk of cardiovascular disease [6]. An interaction was detected between elevated sodium intake and overweight in increasing the risk of stroke [7,8]. High salt consumption has been linked in addition to higher risk of gastric cancer, kidney stone disease, and osteoporosis [9—11].

Habitual dietary potassium intake also appears to impact on the risk of cardiovascular disease. A recent meta-analysis of prospective studies showed that a 42 mmol/day higher habitual potassium intake was associated with a 21% lower risk of stroke [12]. Numerous studies, including the Dietary Approaches to Stop Hypertension (DASH) trial, showed that higher dietary potassium intake is associated with significantly lower BP values [13—15]. In a one-year long randomised controlled trial, hypertensive patients assigned to a potassium-rich diet achieved and maintained BP control with significantly lower drug consumption than that needed by the control group [16]. Higher potassium intake has also been found protective against the risk of kidney stones [17].

In 2005, the Food and Nutrition Board of the Institute of Medicine in the United States established an intake of 100 mmol/day (or 3.9 g of potassium) as an adequate potassium intake level [18]. In 2007, a WHO technical report recommended a consumption of less than 5 g of salt (85 mmol sodium) per day as a population nutrient intake goal [19].

The evaluation of population current dietary sodium and potassium intakes is necessary to measure the success of future intervention strategies. In Italy, where stroke mortality rates have, for decades, been higher than those of most Western countries [20], information about habitual sodium and potassium intake is scanty and derives from only a few local studies [21—23]. Thus, in 2009, the Interdisciplinary Working Group for Reduction of Salt Intake in Italy (GIRCSI), a non governmental association based on the cooperation of eight national scientific societies promoted the MINISAL-GIRCSI Program with the support of the Italian Ministry of Health (24). The general objective of the Program is the assessment of the dietary intake of sodium, potassium and iodine in representative samples of the Italian adult general population (35—79 years), of a young population in the age range 6—15 years and of an unselected sample of hypertensive population. Upon its completion, the program will integrate a valuable piece of knowledge about the eating habits of the Italians in the early 2000s' and will provide an instrument to appreciate the changes occurring in the years to come. The dissemination of the MINISAL final results is due by end 2012. However, the efforts put forward by the European Salt Action Network (ESAN), a group supported by WHO with the aim to promote joint policies for reduction of salt intake in Europe, prompted us to prepare the present report containing advanced preliminary information useful to compare the Italian situation with that of other European Union countries and to provide a provisional baseline for present and future Italian initiatives. We hereby describe the characteristics of the participants in the adult general population survey, the methodologies adopted for the study, and the results of the assessment of sodium and potassium dietary intakes in twelve Italian regions performed through the Cardiovascular Epidemiology Observatory/Health Examination Survey (OEC/HES) 2008—2012 study conducted by the Istituto Superiore di Sanità (ISS) in collaboration with the Associazione Nazionale Medici Cardiologi Ospedalieri (ANMCO).

Methods

Study population

Starting in 2008, the OEC/HES has investigated randomly selected age- and sex-specific samples of 220 men and women per 1.5 million residents of twelve Italian regions (Friuli Venezia Giulia, Piedmont, Veneto, Emilia Romagna, Marche, Umbria, Lazio, Molise, Calabria, Basilicata, Sicily and Sardinia) for a total of 2488 men and 2487 women aged 35—79 years. For the purposes of the MINISAL-GIRCSI study, we used for each region a randomly selected subsample of 100 men and 100 women stratified by age and sex, based on the WHO recommendation that a sample of 100—200