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Iodine deficiency disorders and salt iodisation - public health implications

Abstract

Iodine deficiency disorders represent the broad negative health and development consequences as a result of low iodine in the diet. Iodine deficiency is a public health problem in many countries around the world and the most common cause of preventable mental impairment worldwide. Pregnant women and young children present a group most susceptible to iodine deficiency. Salt iodization is a safe, efficient, cost-effective and sustainable strategy for improving the iodine intake by the population and the control of iodine deficiency disorders. During the past twenty five years universal salt iodization was introduced in many countries worldwide and now two thirds of world's population is consuming iodized salt. Salt is a vehicle for iodization but high salt intake correlates with high blood pressure, the leading factor for global mortality, deaths from coronary heart diseases and stroke. Two dominating global public health problems with clear commonalities are hypertension leading to cardiovascular diseases (CVD) and IDD. They are both preventable and salt reduction does notcontradict to salt iodization. The concentration ofiodine in salt can easily be adjusted to meet policies aimed at reducing the consumptionof salt in order to prevent cardiovascular disease and to ensure adequate iodine intake of the population. The only groups at risk for low iodine intake when salt intake will be reduced are pregnant women and small children. In these cases careful monitoringof iodine status and eventually additional supplementation must be of high priority.

Keywords: iodine deficiency disorders, universal salt iodization, salt reduction

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Abbreviations: CVD, cardiovascular diseases; IDD, iodine deficiency disorders; T4, thyroxin; T3, triiodthyronine; ID, iodine deficiency; USI, universal salt iodization; UIC, urinary iodine concentration; ICCIDD, international council for control of iodine deficiency disorders

Introduction

Iodine deficiency disorders (IDD) is an epidemiological concept, proposed by Hetzel[1] to represent all the negative health consequences of low iodine intake on the growth and the development, which could be totally prevented by adequate iodine intake. Iodine is an essential microelement, a component of the thyroid hormones thyroxin (T4) and its active form triiodthyronine (T3). Through these hormones, iodine has an important role in energy metabolism and on the expression of genes that impact many physiological functions, from embryogenesis to growth and development as well as neurological and cognitive functions. Thyroid hormones are required for normal neuronal migration and myelination of the developing brain. Iodine deficiency (ID) during early life may cause irreversible damage to the developing brain structures. Hypothyroidism during these critical periods can cause mental retardation and neurological abnormalities even in mild iodine deficiency.[2–4] Therefore pregnant women and young children are the most susceptible population groups and it is critical that iodine nutrition is adequate during pregnancy and early childhood.

Epidemiology and public health implications

Iodine deficiency was recognized as a worldwide public health problem in early 1960s and since then international bodies have made efforts to determine the global extent of the problem and to identify the most effective strategy for its control. In the past the importance of iodine deficiency on public health has been underestimatedbecause it was not recognized as the most common single preventable cause of mental defects. The focus of biomedical research was oriented mainly on endemic goiter and thyroid disorders, but public health actions for the control of IDD were limited and not systematic.

As an expression of political will was the Declaration signed by 71 heads of state and eventually by 88 other governments in 1990 during the World Summit of Children held at UN. This Declaration accepted a wide range of goals for improving health, nutrition and human rights of children throughout the world, including virtual elimination of IDD by the year 2000.[5] The first exact quantification of at risk-population presented in 1993 shows that 1.570million people or 29% of the total world's population is at risk. It has been estimated a global total goiter prevalence of 12%, with 655 million individuals in 110 countries having palpable goiter.[6] In May 2002 the Special session on Children of the United Nations General Assembly (New York) endorsed the goal of IDD elimination by the year 2005.[7] Universal salt iodization (USI) was the recommended strategy for preventing and correcting iodine deficiency. The advantage of USI is its cost-effectiveness, health impact and sustainability.[8] Since the introduction of USI in most countries where iodine deficiency was identified as a public health problem, the elimination of IDD has made rapid and significant progress.[9] The urinary iodine concentration (UIC) was introduced as an additional indicator for measuring of iodine intake in 2001.[10] The shift from clinical to biochemical assessment of iodine status has improved the quality and the objectivity of national data.

The most recent data on UIC of school children(SAC) worldwide show a progress between 2003 and 2011 when the number of iodine deficient countries decreased from 54 to 32 and the countries with adequate intake increased from 67 to 105. However, globally 29.8% (241million) of SAC are estimate to have still insufficient iodine intake.[8] Iodine deficiency remains a major public health concern in many countries, including some European countries.[11]

Compatibility of salt iodization and salt reduction

Two dominating global public health problems with clear commonalities are hypertension leading to cardiovascular diseases (CVD) and IDD. They are both preventable, both lead to impaired health and development, and to premature death and for both, evidence-based, cost-effective interventions are available. High blood pressure is the leading factor for global mortality, responsible for 50% of deaths from coronary heart diseases and over 60% of those from stroke.[12] There is a significant correlation between hypertension and salt intake.[13] Reduction of salt intake was recommended by WHO with the aim of of achieving a target of less than 5g/per day (approximately 2g sodium) by 2025.[14]

Salt iodization is the best strategy for eradication of IDD. Salt is an appropriate vehicle for fortification with iodine because it is universally consumed with little inter- and intra individual variations, it is inexpensive and the process of iodization is relatively simple and iodine remains in processed foods. The level of iodization of 20-40mg/kg salt recommended by WHO/UNICEF/ICCIDD in 1994 assumes an average salt intake 5g-10g/day.[15] Considering the existing policies about reducing the intake of salt and delivering adequate dietary iodine to the population, it is important to establish the amount of iodine in salt that would provide sufficient iodine for salt intakes of<5g/day.[16] To improve the public health it is more effective the development of an integrated strategy for prevention of several diseases, rather than focusing on individual ones. The concentration of iodine in salt can easily be adjusted to meet policies aimed at reducing the consumption of salt in order to prevent cardiovascular disease and to provide adequate iodine to the whole population. The only groups at risk for low iodine intake are pregnant women and small children but careful monitoring of iodine status of these priority groups and additional supplementation is very important.[17]

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Conflict of interest

The author declares no conflict of interest.

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