Varying salt iodine content and a high goiter rate in school children in Paraiba, Brazil

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Iodine deficiency is still a serious public health problem in many countries in the world. Brazil is a country historically affected by iodine deficiency in most of its territory, and severe endemic goiter and cretinism were reported by many early authors. A law ordering the iodization of all salt for human consumption as the main strategy to correct IDD was passed in 1953. However, the iodization level (10 ppm of iodine) was considered low.

The impact of the consumption of iodized salt on the iodine nutrition of the Brazilian population has not been evaluated at the national level. The ThyroidMobil campaign conducted by ICCIDD in 2000 in 17 sentinel sites throughout the country found that 88% of salt at the retail level contained ≥15 ppm of iodine. It reported the median UI concentration was 360µg/L, and the total goiter rate was 4.5%.

The aim of the present study was to determine the iodine nutrition of the municipality of Cabaceiras, Paraiba. For this purpose, two indicators were used: 1) the analysis of UI, recognized as the main indicator of iodine nutrition; 2) the measurement of thyroid volume by ultrasonography, to determine the prevalence of goiter. Additionally, the iodine content in iodized salt consumed in households and the concentration of iodine in drinking water were also investigated.

One hundred and eighty school children (9–14 y-old) attending a public school were randomly selected from among 300 students in this age group; 57.2% of the schoolchildren came from the urban area, 52% were boys and 54.4% of the study group were whites. All the children were evaluated for thyroid volume, both by ultrasonography and by palpation. A casual urine sample was collected and the iodine concentration was measured by the Rapid Iodine Urinary Test®. Household salt samples (n=180) were collected and the iodine content was determined by titration.

The following results were obtained: the goiter rate by ultrasound was 38.3%, and by palpation was 33.3%. The prevalence of goiter was higher in the 11–14 y-olds than in the 9–10 y-olds (21% vs 17%). The median UI was 130 µg/L. The median value of iodine in salt was 30.5 ppm, but only 78% of salt samples contained ≥15 ppm, and a wide variation in the iodization level was observed. In one of the rural communities, the iodine concentration in the drinking water was zero.

The results of this investigation demonstrate that despite a normal median UI, a high prevalence of endemic goiter persists in the municipality of Cabaceiras, Paraiba. The most likely explanation is the uneven iodization of the salt. The requirement of >90% household consumption of iodized salt with ≥15 ppm of iodine has not been met in this community.
Risk of Iodine Excess in Brazil

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The law mandating the iodization of salt in Brazil at a level of 10 ppm was implemented in 1977. However, the official program to provide iodine to the salt producers for iodization was interrupted in 1990 for legal reasons. As a result, low iodine intake was detected in the 1994-1995 national survey of 20,000 schoolchildren (1). Urinary iodine (UI) was <100 μg/L in more than 50% of the urine samples. In 1998, the iodization of salt was reinstated, but the fortification level of salt for human use was increased to 40–100 ppm of iodine.

In 2001, the Thyromobil project (2,3) examined 2,106 schoolchildren from 21 villages of 8 States and found a median UI of 360 μg/L, with 70.6% of State medians above 300 μg/L. The risk of excessive iodine intake was reconfirmed in 2004 in São Paulo State by Duarte et al. (4), who found a median UI of 460 μg/L. In 2003, the legal concentration of iodine in salt was reduced to 20-60 ppm.

To evaluate the possible consequences of more than 5 years of excessive iodine intake (1998-2003) on the thyroid gland, we examined 829 adults from the urban Metro Region of São Paulo, who were divided into two groups according to their residency in two different environmental areas (5): one group (Polo Area, n=409) living close to a petrochemical complex with high environmental pollution, and a second group (San Bernardo Campo area, n=420), 10 miles southwest of the petrochemical complex. The mean concentration of iodine in salt at household level in the whole area was 36±7 mg/kg (range 24.7-51.4 in Polo area and 23.8-81.2 in San Bernardo Campo area). The median UI was 306 μg/L in both areas, with 58.5% of individual values >300 μg/L.

Chronic autoimmune thyroiditis was diagnosed by the analysis of autoantibodies against thyroid peroxidase (TPO Ab) and by ultrasonography (marked hypoechogenicity). The prevalence of chronic autoimmune thyroiditis was similarly high in both groups: 15.6% in the Polo Area and 19.5% in the San Bernardo Campo area. In a previous study in Sao Paulo before 1994, in a population moderately iodine deficient, the prevalence of anti TPO Ab in healthy subjects was 4.8%. The overall prevalence of hypothyroidism was 6.6%, not significantly different between the groups (4.9% in the Polo Area and 8.3% in the San Bernardo Campo Area), a figure comparable to other countries around the world (5). The mean thyroid volume was 11.2 ml, within normal limits.

The high prevalence of chronic autoimmune thyroiditis found in the Metro Region of São Paulo may be related to the high iodine intake of the population from 1998 through 2004. It is hoped that the reduction in the level of iodization in 2003 will result in the elimination of the risk of iodine excess. Currently, the Brazilian MOH is conducting a national survey to evaluate the iodine nutrition of the population.

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References