Bread with iodized salt boosts iodine nutrition in Belgian children, but nonpregnant and pregnant women remain mildly deficient

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Background

Despite worldwide success in the implementation of iodine supplementation programs over the last decades, iodine deficiency still remains a public health problem in Europe and other regions of the world. In 2003, only 9 out of 40 countries in Europe had iodized salt coverage of at least 90% in their households (1). Although the number of European countries in which iodine deficiency is a public health problem decreased from 23 in 2003 to 14 at the present time (2), it is a matter of concern that iodine deficiency reappeared in countries whose previous iodine intake was sufficient, such as the UK (3).

Several surveys in the past among neonates and school-aged children indicated that Belgium is affected by MID, and that this represented a substantial economic burden to the health care system (4,5). The previous most recent national survey performed in 1998 among school-aged children found a median urinary iodine concentration (UIC) of 80 µg/l and a goiter prevalence of 5.7% (4).

Consequently, optimizing iodine intake was one of the priorities in the first national nutrition and health plan (2005-2010) of the Belgian Ministry of Health. An agreement was signed between the bakery sector and the Ministry of Health in 2009, to encourage the fortification of bread with iodized salt (10-15 ppm) (6).

The aim of the present study was to evaluate iodine status of Belgian school-aged children. We also investigated whether the median UIC in school-aged children was an adequate surrogate of iodine status of their mothers. In addition, iodine status among a nation-wide representative sample of Belgian pregnant women in the first and third trimester of pregnancy was determined, and determinants of iodine status were assessed 1 year after the introduction of bread fortified with iodized salt.

Methods

The study was cross-sectional. In a van, equipped with an ultrasound device, the thyroid volumes of children were measured and household salt samples and urine samples were collected from the children and their mothers. From across Belgium, 60 schools (see Figure 1) were selected and 1541 children participated in the study. The pregnant women were selected according to a multistage proportionate-to-size sampling design. Urine samples were collected and a general questionnaire was completed face to face with the study nurse.

Results

The overall median UIC in Belgian school-aged children was 113 µg/L (IQR=80-162 µg/L), which is within the optimal level of 100-199 µg/L (7). In a pair of 624 children and mothers, the median UIC was 115 µg/L in school-aged children, and 84 µg/L in their mothers; these medians were significantly different (Figure 2). Additionally, the frequency of school-aged children with UIC < 100 µg/L was only 39 % but 64 % of the mothers had UIC < 100 µg/L. The correlation between UIC from children and mothers was 0.17 ($p<0.001$). The percentage of school-aged children with goiter was 7.2% when using the European reference values by sex and age, while it was 4.3% as a function of sex and BSA.

Frequency of consumption of milk and dairy drinks was significantly higher among children than their mothers. The percentage of children consuming milk and dairy drinks at least once a day was 32%, while for mothers this was only 13%. Approximately 44% of the children consumed more than one glass of milk per day, among the mothers only 25%.

A brighter future for Belgian children through iodized baker's salt

Among the 904 samples of household salt obtained, 63% did not contain iodine. Of the 333 iodine-containing samples, 44% was in the form of KI and 57% was in the form of KIO3. 3% of the samples contained an iodine content of 7 ppm, 9% of the samples contained an iodine content of 15 ppm and 25% of the samples contained an iodine content of 30 ppm.

Among pregnant women, the median urinary iodine concentration (UIC) among pregnant women (n=1311) was 124 µg/l and 123 µg/g creatinine when corrected for urinary creatinine (8). The median UIC in the first trimester (118 µg/l) was significantly lower than that in the third trimester (131 µg/l) but significantly higher than among non-pregnant women (85 µg/l). Iodine-containing supplement intake was reported by 61% of the pregnant women and 57% of the women took this supplement daily.

Figure 1. ***Geographical distribution of the 60 schools investigated in Belgium and the number of school-aged children (n=1541) investigated by site.***

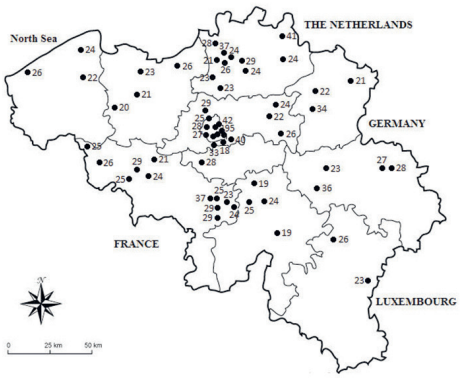
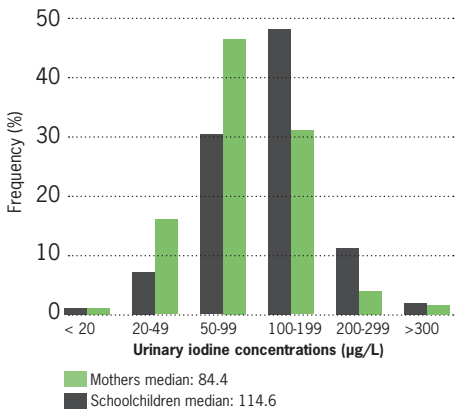


Figure 2. **Frequency distribution of urinary iodine concentration in matched pairs of school- aged children and their mothers in Belgium (n=624).**



Discussion

Compared to 12 years ago iodine status in school-aged children in Belgium improved (4); median urinary iodine concentration increased from 80 µg/L to 113 µg/L. Interestingly, despite sharing a similar household food basket, the median UIC in the school-aged children was significantly higher than the median UIC of their mothers.

The median UIC during pregnancy indicates iodine deficiency in Belgium and some women are at a higher risk of deficiency. The current low dietary iodine intake in women of childbearing age appears to prevent the correction of iodine deficiency in pregnant women supplemented with multivitamins containing 150 µg iodine as recommended.

The implementation of bread fortification with iodised salt since 2009 may have contributed to the substantial increase in iodine status and explain why Belgian school-aged children are currently iodine sufficient. According to data from ESCOSALT, one of the main suppliers of iodized salt to the bakers in Belgium, the utilization of iodized salt by the bakers increased over the years from 11% in 2001 to 41% in 2010, the year of the survey. According to ESCOSALT the total volume of salt remained remarkably constant over these 10 years. Because of this, it can be derived that there was indeed a substitution of non-iodized salt with iodised salt over the last 10 years.

Presently there is no need to increase the concentration of iodine in salt used for bread fortification (10-15 ppm) but there is a need to increase the number of bakers using iodized salt, as according to ESCOSALT data, still less than 50% of the bakers use iodized salt.

The main drawback of the current situation in Belgium is the absence of a legal frame work. The bakery industry and the ministry of health endorsed the utilization of iodized salt in bread – on voluntary basis – in 2009. Other sectors in the food industry have also expressed their willingness to use iodized salt for food fortification. Therefore, to maintain an optimal iodine intake, a regulatory framework would be preferable where a law determines the concentration of iodine in salt for the production of bread and in household salt.

In conclusion, the fortification of bread with iodized salt has corrected iodine deficiency in Belgian school-aged children but not in their mothers, or in pregnant women. To provide adequate iodine intake to women of child-bearing age the current Belgian program needs to increase the use of iodized salt in bread and the consumption of household iodized salt.

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