Severe Iodine Deficiency in Southern Albania

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Abstract: Albania does not yet have a national program for control of iodine deficiency and there are no recent data on the severity of the iodine deficiency disorders (IDD) in the country. The aim of the present study was to assess current IDD status in southern Albania. In primary school children in urban and rural areas urinary iodine concentration (UI) and iodine concentration in salt at retail and household levels was measured. Goiter was graded by palpation and thyroid volume determined by ultrasound. Children aged 5–14 yr (n = 826) were sampled at 2 urban and 5 rural primary schools. In the 2 urban schools, the median UI was 45 µg/L, the goiter prevalence was 32%, and salt iodine levels were inadequate (< 15 µg/g) in 78% of household salt samples. In the rural schools, the median UI was 17 µg/L, the goiter prevalence was 95%, and no household salt samples were adequately iodized. Among children in the rural schools, 73% had grade 2 goiter and 20% had nodular changes detected by thyroid ultrasound. In southern Albania, school children in urban areas are moderately iodine deficient and those in rural villages are severely iodine deficient. These findings suggest that regional distribution of oral iodized oil capsules is indicated to control IDD in vulnerable groups until salt iodization is implemented.

Key words: Iodine, deficiency, Albania, children, thyroid, ultrasound, goiter, salt

Introduction

The iodine deficiency disorders (IDD) have multiple adverse effects on health and economic development, with 2.2 billion people at risk worldwide [1]. More than half of the population of West and Central Europe is at risk of iodine deficiency [2]. In the southern Balkans, Montenegro and Greece remain mildly iodine deficient, despite the efforts of national IDD control programs [2]. In Albania, there is no national program for control of IDD, and although the country is likely iodine deficient, there are no current data on the severity of IDD.

Goiter surveys in Albania in the 1980's found severe IDD, particularly in the mountainous regions: the goiter prevalence among schoolchildren ranged from 41 to 92% [3]. A study of 241 school children using thyroid ultrasound in villages in the north reported a goiter prevalence of 28.9% [3]. In 1993, a national study reported median urinary iodines (UI) in 8–10 yr-old children ranged from 2–49 µg/L, with 63% of samples having < 20 µg I/L. The prevalence of cretinism was estimated to be 0.1%. Whole blood TSH measured in 227 newborns in Tirana, the capital of Albania, showed a mean (± SD) of 4.9 ± 5.3 mU/L, with 33% of values > 5 mU/L. It was estimated that only

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5% of the country's salt was iodized [3]. Based on these data, UNICEF Albania recommended urgent implementation of salt iodization. However, due to political and economic instability, including traumatic and violent civil unrest in 1997 and the dramatic influx of Kosovar refugees in 1999, no action was taken.

A Multiple Indicator Cluster Survey Report by UNICEF Albania in 2000 reported 56% of households had adequately iodized salt (≥15 µg I/g salt) [4]. The percentage of households with adequately iodized salt ranged from 71% in the urban areas to 48% in rural areas [4]. These data were surprising in that there is no national or local iodization of salt in Albania and only limited amounts of iodized salt are imported. The aim of the present study was to estimate the current severity of IDD in southern Albania. In urban and rural areas, we measured iodine concentration in salt at retail and household levels, and in school children, we measured UI and thyroid volume by ultrasound to determine goiter prevalence.

Figure 1: Map showing the Korçe region of southeastern Albania.

Subjects and Methods

Subjects were enrolled from 2 primary schools in the city of Korçe (the largest city in southeast Albania; pop. ca. 50,000) and 5 primary schools in villages in the surrounding mountains (Lozhan, Qenske, Proptisht, Vanice, Godolisht; pop. 500–3000 each) (Fig. 1). Selection of this region was purposive, on the basis of suspected IDD, and schools were chosen to represent urban and rural environments. The elevation in this region is 400–800 m, and the staple foods are wheat bread, goat cheese and white beans. Ethical approval for the study was obtained from the University of Sheffield and the Albanian Ministry of Health. Written consent was obtained from the school principals, and oral consent was obtained from the teachers and families of the children. All families gave consent, and all children attending school on the day of the survey were sampled. Data were collected in March 2003.

Height and weight of the children were measured using standard anthropometric technique [5]. For the measurements, subjects removed their shoes, emptied their pockets and wore light indoor summer clothing. Height was recorded to the nearest mm using a Leicester Stadiometer and weight to the nearest 100 g using a digital scale. The thyroid was inspected and palpated, and goiter was graded using the simplified classification scheme proposed by WHO/UNICEF/ICCIDD [1]. Thyroid gland volume was measured in all children using an Aloka SSD-500 Echocamera (Aloka, Mure, Japan) with a 7.5 MHz 5 cm linear transducer [6]. Measurements were performed on subjects sitting upright with the neck extended. M.Z performed all ultrasound measurements using validated technique [6]. Spot urine samples were collected from every second child and stored at –20°C until analysis. Retail salt samples were collected from a convenience sample of retail outlets (1 sample per outlet) as well as the central market (4 samples). Household salt samples were collected from every fourth or fifth child enrolled in the study. Health care workers in Korçe and each village were interviewed to determine if there had been cases of recent cretinism [7]. In addition, local orphanages and psychiatric hospitals were visited to check for institutionalized cretins in the area.

Urinary and salt iodine concentrations were measured in duplicate using a modification of the Sandell-Kolthoff reaction [8]. Samples with an iodine level < 2 µg/L (the detection limit of our assay) were assigned a value of 0. The CV of this method in our laboratory is 10.0% at 47.4 ± 0.6 µg/L and 12.7% at 79.5 ± 0.8 µg/L.

Data processing and statistics were done using Prism3 (GraphPad, San Diego, USA), Excel 97 (Microsoft, Seattle, WA, USA). Body surface area (BSA) was calculated using the formula: = weight $(kg)^{0.425} \times$ height $(cm)^{0.725} \times 71{,}84 \times 10^{-4}$ [6]. Height, weight and body mass index (BMI) standard deviation scores were derived using UK 1990 survey data (Child Growth Foundation, London, UK). Thyroid volumes were compared to body surface area/sex specific normative data for thyroid volume in children [6]. Normally distributed data were compared by Student's *t* test. UI and thyroid volume were not normally distributed; the distributions by age and sex were skewed to the right.

They were expressed as medians with ranges, and differences between groups were tested using the Mann-Whitney test. Pearson correlation coefficients were calculated to check for associations. Proportions were compared using the chi-square test. Significance was set at $P < 0.05$.

Results

The sample of 826 students aged 5–14 y included 53% girls (Table I). Based on z-scores for height and weight, children from the villages were significantly shorter and lighter than the Korçe children ($p < 0.01$). Urine samples obtained from 414 children showed a median UI (range) of 30 µg/L (0–424); 34% of the children had UI < 20 µg/L (Table II). Comparing Korçe to the villages, children in the villages had a significantly lower median UI (17 µg/L), and the percentage of village children with a UI < 20 µg/L was sharply higher ($p < 0.001$).

Salt samples from retail outlets in Korçe (n = 18) contained a median (range) iodine concentration of 12.3 (0–57.3) µg/g salt; these included 8 samples of iodized salt imported from Greece containing > 40 µg I/g. Fifty six percent of the retail salt samples in Korçe and 87% of retail samples from the villages (n = 15) was salt of uncertain origin sold from open bins and contained < 3 µg I/g salt. In the household salt samples from Korçe (n = 76), 22% had iodine concentrations ≥ 15 µg/g. The household salt samples from the villages (n = 73) showed a median (range) iodine concentration of 3.3 (0–7.7) µg/g.

Using new WHO references for thyroid volume by ultrasound [6], 55% of children were goitrous. The goiter prevalence was significantly higher in the villages than in Korçe ($p < 0.001$). Compared to ultrasound, palpation overestimated the goiter prevalence in Korçe (32 vs. 42%, respectively). In the villages, the goiter prevalence by ultrasound and palpation was similar (94.5 vs. 93%, respectively). In Korçe, by palpation, only 14% of goiters were Grade 2 and no nodular changes were noted on ultrasound. In the villages, by palpation, 73% of children had Grade 2 goiter, and 1 in 5 had nodular changes by ultrasound. There was no correlation between thyroid volume and UI. No cases of cretinism were found in the villages or in the local orphanages and psychiatric institutions.

Discussion

These data indicate the city of Korçe is moderately iodine deficient, with a median UI of 45 µg/L [1]. Salt iodine levels are inadequate (< 15 µg/g) in 78% of samples at the household level. Iodized imported Greek salt is available

Table I: Age, gender ratio, anthropometric characteristics, thyroid volume and goiter in 5–14 yr-old Albanian schoolchildren by geographic location

	n	Age[1] (yr)	female/ male ratio[2]	Height (cm) [z score][1]	Weight (kg) [z score][1]	BMI (kg/m²) [z score][1]	Thyroid volume[3] (ml)	Goiter prevalence by ultrasound[2] Goiter by palpation [Grade 0/1/2][2] Nodular changes on ultrasound[2]
Korçe	518	9.4 ± 1.8	52/48	133.9 ± 10.9 –0.21±1.0	30.7 ± 8.2 –0.12 ± 1.08	16.8 ± 2.3 0.00 ± 1.1	3.1 (1.1–11.2)	32.2 57.5/28.2/14.3 0
Villages	308	10.4 ± 2.0	54/46	136.1 ± 12.6 –0.71 ± 1.0[5]	32.3 ± 8.6 –0.44 ± 0.90[5]	17.1 ± 1.9 –0.0 ±1.1	7.4 (1.5–26.7)	94.5[4] 7.34/19.64/73.1[4] 20.5[4]
Total	826	9.8 ± 1.9	53/47	134.8 ± 11.7 –0.39 ± 1.1	31.3 ± 8.4 –0.24 ± 1.1	16.9 ± 2.2 0.06 ± 0.73	4.3 (1.1–26.7)	55.4 39.1/24.7/36.1 7.6

[1] As means ± SD; [2] As percentages; [3] As medians (range); [4] $p < 0.001$ vs. Korçe; [5] $p < 0.01$ vs. Korçe.

Table II: Concentration of iodine in salt at the retail and household level in southern Albania, and urinary iodine concentration in 5–14 yr-old schoolchildren, by geographic location

	Salt iodine concentration[1] (µg I /g salt)			Urinary iodine concentration (µg/L)		
	n	Retail	Household	n	Median (range)	< 20/< 50/< 100[2]
Korçe	94	12.3 (0–57.3)	12.5 (0–44.1)	211	45 (15–424)	12/55/82
Villages	88	3.13 (0–7.4)	3.33 (0–7.7)	203	17 (0–162)[3]	58[3]/93[3]/99[3]
Total	181	8.0 (0–57.3)	8.4 (0–44.1)	414	30 (0–424)	34/72/91

[1] As medians (range); [2] As percentages; [3] $p<0.001$ vs. Korçe.

in retail outlets but at a price 2–4× higher than the lower grade salt sold from open bins at the market. The rural villages, with a median UI of 17 μg/L, are severely iodine deficient [1], and no household salt samples were adequately iodized. The marked severity of IDD in the villages was reflected in the high prevalence of Grade 2 goiter and nodular changes detected by thyroid ultrasound. Consistent with previous reports comparing palpation to ultrasound [10], palpation provided an accurate estimate of goiter prevalence in the villages affected by severe IDD, but overestimated goiter prevalence by ca. 30% in Korçe, an area of moderate IDD.

Albania is undergoing rapid change since emerging from ≈ 40 years of isolation in 1991, when the communist regime gave way to democracy and a market economy. Social and economic conditions are amongst the worst in Europe, and protein-energy and micronutrient malnutrition remain serious public health problems. A decree passed in 1999 banned the importation of non-iodised salt, but import controls remain weak. A National Committee for the Prevention of Iodine Deficiency Disorders has been formed. Working with UNICEF and ICCIDD, plans include a national survey, legislation mandating that all edible grade salt meets specified minimum standards and is adequately iodized, and implementation of a social mobilization campaign and salt monitoring system. In 2002, the World Bank identified specific conditions that Albania must achieve in order for the country to qualify for credits. These include approval of the National Iodine Deficiency Disorder Action Plan, and development of the implementation strategy for salt iodization [9].

The findings of this study strongly support current efforts in Albania to begin iodization of salt. Moreover, the severity of IDD found in the mountain villages suggests that the Albanian government, supported by UNICEF, should strongly consider a program of oral iodized oil prophylaxis [1]. Capsules could be distributed through school districts and health clinics. Given to children and women of child-bearing age, this approach could help control IDD in the most vulnerable groups until salt iodization is implemented [1, 11].

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