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Iodine Status and Thyroid Volumes of School Age Children From Northern Cyprus

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In an epidemiological stu dy carried out in eight different inland and coastal areas from the northern part of Cyprus 625 School Age Children (SAC) aged 9 and 10 years, underwent thyroid ultrasonography for determination of thyroid volume (TV). Urinary Iodine Concentration (UIC) was measured from morning urine samples taken from all of the children. Mean TV values were 3.2±1.0 ml, 3.3(0.8 ml and 3.8±1.1ml, 3.7±1.1 ml for 9 and 10-years-old girls and boys respectively. None of the SAC had TV exceeding the recommended upper limits for their age and gender. Median UIC of the whole group was 120 μg/l (11-900 μg/l) and only 12.6 % of the SAC had UIC below 50 μg/l, indicating adequate iodine intake.

In this first epidemiological survey conducted in the northern part of Cyprus Island, iodine status was found to be satisfactory and goiter does not pose a public heath problem at the time of the study. Periodical surveys are required especially for the regions which have marginally adequate values and for a coastal region with a significantly higher median value compared to the others (i.e. 458 μg/l) ($p<0.001$).

KEY WORDS Iodine deficiency, Endemic goiter

Introduction

Iodine deficiency (ID) and related iodine deficiency disorders (IDD) are still major, yet unresolved health concerns for the world. Available data indicate that, in 1990 approximately 1.5 billion people were at risk of IDD and that 655 million, 12 % of the earth's population, were affected by goiter (1). Endemic goiter, occasionally complicated by endemic cretinism, has been reported from mainland Europe during the last century, especially from mountainous areas in central and southern parts of the continent (2-4) as well as the mediterranean islands like Sicily (5), and oceanic islands like Reunion Island (6), Sao Miguel (the Azores) (7), Karkar Island (8) and Idjwi Island (9).

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Iodine supplementation, mostly by iodination of salt, has been used for decades. The situation has improved markedly during the past years, but in 1992, ID was under control in only five European countries namely, Austria, Switzerland, Finland, Norway and Sweden (10,11). Consequently, additional measures were taken following an official document sent by WHO, UNICEF and ICCIDD, to all European governments (12). However in 1997, ID was still found in an important number of European countries, or at least certain areas of these countries (13). A remarkable point about ID in Europe has been very limited information on IDD from the Eastern part of the continent until 1992.

There has been no systematic national survey, evaluating iodine status until now in Cyprus. The aim of the current study was to evaluate the status of iodine nutrition and thyroid size in eight different inland and coastal areas in Northern

Cyprus by using urinary iodine concentrations (UIC) and the sonographic thyroid volumes (TV) and normative values recommended by the World Health Organisation-WHO and International Council for Control of Iodine Deficiency-ICCIDD (14).

Materials and Methods

Northern Cyprus has 188 000 inhabitants. A total of 625 school age children (308 girls, 317 boys) from eight different inland and coastal areas was studied, representing the Northern part of the island. Clusters representing the population of the study areas, including 9- 10 year old school age children (SAC) were chosen since these age groups are more suitable for ultrasonographical examination. Children were examined in their areas during September 1998 by a research team consisting of a doctor and two nurses equipped with an ultrasonography and other required equipment.

The study included the determination of the following variables:

1) Thyroid ultrasonography was performed by the same experienced physician, strictly obeying the recommendations of Vitti et al (15).

2) Morning urine samples from all of the SAC, for UIC determinations were taken, with the permission of local education and health authorities.

Thyroid volumes were estimated using real-time sonography with a General Electric© Logiq 100α apparatus, using a 7.5 MHz linear array transducer. Longitudinal and transverse scans were performed, 3 dimensions were obtained from each thyroid lobe and thyroid volume was calculated according to the formula of the ellipsoid model proposed by Brunn et al (16). Upper normal limits (percentile 97) for the age and gender match iodine-replete European children were used to define the goitrous SAC (14).

Urine samples were kept covered up and frozen at -20°C, in deionized tubes until the day of analysis. Urinary iodine concentrations were determined, using the method recommended by WHO-ICCIDD (Colorimetric ceric ion arsenous acid wet ash method based on Sandell Kolthoff Reaction), using Fisher® reagents and spectronic 20, Genesis autoanalyzer (17-18). Results were expressed as micrograms per liter (µg/l).

Usual statistics, Chi-Square and Student-Newman-Keuls test were used for statistical analysis.

Results

Sex was equally distributed in the whole group which was made up of 308 (49.28 %) girls and 317 (50.72 %) boys. 301 (48.16 %) of the SAC studied were 9 years old and 324 (51.84 %) were 10 years old respectively. Table 1, represents the median TV values obtained from SAC examined and median values (percentile 50) as well as upper normal limits (percentile 97) of the age and gender match iodine-replete European SAC (14). None of the SAC had TV exceeding recommended upper limit for their age and gender.

Table 2 shows mean±s.d. and median UIC and mean±s.d. TV of SAC from 8 different study areas. Median UIC, exceeded 100 µg/l in most of the study areas and TV was low normal TV, compared to iodine-replete SAC from Europe (14). Mean and median iodine values and standard deviations were significantly high and mean TV was significantly low in the Yeni Erenköy region. Water from three different wells in this region was tested for its iodine content and found to have high concentrations (i.e. 170 µg/l, 187 µg/l and 155 µg/l). Median and mean±s.d. UIC of the whole group was 120 µg/l (11-900 µg/l) and 160.4±141 µg/l respectively. Only 12.6 % of the SAC had UIC below 50 µg/l indicating adequate iodine intake.

Discussion

Cyprus, is an island located in the Mediterranean sea approximately 40 nautical miles south of the Turkey. This study attempted to evaluate iodine nutrition in northern Cyprus by using two standardised methods in school age children (SAC), namely sonographic thyroid volumes (TV) measured by ultrasonography and urinary iodine concentrations (UIC).

Table 1. Mean±s.d. and median sonographical thyroid volumes (TV) of 625 school age children (SAC) from Northern Cyprus and normative values (97 percentile) (50 percentile) recommended by WHO and ICCIDD (14)

Age/ Sex N= 625	Median TV (ml)	Mean±s.d (ml)	WHO (%50) TV (ml)	WHO (% 97) TV (ml)
9 / Female	3.1 n= 149	3.2±1.0 n= 149	4.3	8.0
9 / Male	3.2 n= 152	3.3±0.8 n= 152	3.9	6.8
10/ Female	3.7 n= 159	3.8±1.1 n= 159	5.0	9.2
10/ Male	3.4 n= 165	3.7±1.1 n= 165	4.3	7.8

Table 2. Mean±s.d, median urinary iodine concentrations (UIC) and mean±s.d sonographic thyroid volumes of 625 school age children from 8 different regions of northern Cyprus.

Total N= 625	Lefke n=57	Y.İskele n=66	Lapta n=54	G.yurt N=77	Magosa N=75	Y.Erenköy n=75	Girne N=81	Lefkosa n=140
UIC-µg/L mean±sd	108±82	180±9	110±70	157±93	164±105	458±180 *	120±84	110±67
UIC-µg/L median	90	150	102	137	121	421 *	95	104
TV-ml mean±sd	3.97±1.2	3.91±1.1	3.31±1.0	3.36±1.1	4.01±1.2	3.08*±0.8	3.28±1.0	3.47±1.1

* Significantly different from other areas Student-Newman-Keuls test. ($p<0.001$).

Being far away and relatively isolated from the mainland, iodine status in islands has been a matter of interest for some investigators. Iodine deficiency (ID) has been reported from the Mediterranean islands like Sicily (5), and oceanic islands like Reunion Island (6), Sao Miguel(the Azores) (7), Karkar Island [8] and Idjwi Island (9). Common geographical features of these islands are high mountains covering most of the territory, reaching to a narrow sea-shore line with steep skirts. High pluviosity which leaches the soil of its iodine along with the above mentioned geography may be responsible for the iodine deficiency observed in these islands (5-9). Additionally some of these islands have volcanic activity, like M.Etna in Sicily, and volcanoes have leached the soil several times during the past centuries (5,6). Steep skirts are especially prone to this leaching process. Cyprus is a relatively flat island, the Besparmak mountains divide the island from east to west, but the sea-shore is relatively wide and the island has broad flat inlands where a considerable part of the population lives. The climate is sunny and dry, which tends to keep iodine in the soil. Socio-economic standards of the island are high and food consumed is mostly imported from Turkey, where iodine is still severely to moderately deficient (Erdoğan et al, unpublished data), but a considerable part of this imported food is industrial which may provide silent prophylaxis' for the island. Sea-food consumption is not high amongst the native population.

Median Thyroid volumes of the SAC examined in the Island were found to be lower than those of the iodine-replete SAC from continental Europe (Table 1) (14). This may reflect the difference between children who are born and grow-up in a naturally iodine-sufficient area and those living in an originally iodine deficient, later repleted area. Our mean TV values are just below Vitti et al's 9 and 10 year old controls with a median UIC of 110 µg/l (İ.e. 3.6±1.3 ml and 4.0±1.5 ml, respectively) (15), proving that ultrasonography, unless performed with a standard technique, is a useful and reproducable tool for the assessment of thyroid size, for epidemiological studies, once more.

UIC of the group and the low percentage of SAC (i.e. % 12.6), showing UIC under 50 (g/l, as well as low normal thyroid size indicates adequate

iodine intake on the island. Most of the study areas, showed median UIC above 100 µg/l (Table 2), Lefke and Girne showed marginally lower median UIC, but TV in these areas were not significantly different from each other except in Yeni Erenköy which showed significantly high iodine values and smaller thyroid size compared to the other regions. This finding clearly shows iodine contamination in this area. We tested drinking water from the wells of this region, and found relatively high iodine contents. Interestingly, this village is one of the most isolated villages of Northern Cyprus, located on the Karpaz peninsula, which is located in between two coasts and consumes, relatively high amounts of Sea-food.

In conclusion, this survey showed that iodine is sufficient in Northern Cyprus at the time of the study. Marginally sufficient UIC in some areas studied is prone to increase by "silent prophylaxis" after the mandatory salt iodinization in Turkey. Periodical surveys are required especially for the regions which have marginal values and in Yeni Erenköy for possible risky iodine excess in the future.

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