THE ThyroMOBIL: INDONESIAN EXPERIENCE[1]

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ABSTRACT

ThyroMobil project in Indonesia supports the finding of previous national IDD survey that iodine deficiency has been eliminated in large parts of Indonesia. However in many places iodine deficiency has been replaced by iodine excess especially in Central Java particularly Sukoharjo. This should alert us to conduct regular monitoring and bilogical monitoring urinary iodine at the population levels should be reinforced and maintained.

The normative thyroid volume for Indonesian SCA aged 6-12 years is now availale and may be used for epide-miological purposes in mild endemia when USG is used. However when this is not possible, palpation method if performed properly may still be used reliably.

Keywords: IDD, thyroid, thyromobil

INTRODUCTION

The ThyroMobil project was first launched in Europe early 1990s in an attempt to evaluate the possible changes in the status of iodine nutrition from the situation previously reported by European Office of the WHO in 12 countries.[1] Compilation of earlier data showed that based on iodine excretion in the adults, adolescents and newborns and on the iodine content of breast milk indicate a high prevalence of iodine deficiceny (moderate in many cases and severe in a few) in many European coun-tries. These cases may manifest as subclinical hypo-thyroidism in neonates and goiter in adolescents and adults. Although iodinated salt is available theoretically in most countries where it is needed, its quality and share of the market are often un-satisfactory. In many countries where only house-hold salt is iodinated the iodine content has been set too low owing to an overestimation on house-hold salt consumption. Governments were urged to pass legislation and provide means for efficient iodination of salt whatever this is necessary.[2]

Reevaluation of country program, legislation, salt iodization conducted by WHO Regional Office for Europe last year resulted in an improvement of the condition.[3]

INDICATORS FOR ASSESSING THE IDD STATUS

The two major categories for the utcome indi-cators are clinical (e.g,.thyroid size) and bioche-mical (e.g., urinary iodine, UEI Inspection and pal-pation are the traditional methods used to deter-mine thyroid size, but by this definition what constitute goiter is inexact, in mild endemicity where goiter are

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small interobserver variation can be as high as 39-40%.[4,5] Ultrasonography (USG) to detect thyroid volume is a safe non invasive technique that provides a fairly precise measurement of thyroid volume. While many reports relate thyroid volume simply to age, correlation with body sur-face area allows for variation in body size within age groups as well as uncertainties about age. The upper limit of normal is taken as the volume at the 97th percentile of the corresponding iodine suffi-cient group. It was also mentioned that urinary iodine excretion is the most useful impact indi-cator.[6]

From 13-91 years old the thyroid volume in males is greater significantly than females. It corre-lates with body weight and age, however the influence of weight is about 3 times that of age.[7]

ThyroMOBIL PROJECT

[5]adopted and recommended the ThyroMobil data published by[1] for the 'normative values for thyroid volume in children aged 6-15 years'. In the ThyroMobil survey of 12 European countries, a subgroup of 3474 schoolchildren (out of 5709 schoolchildren aged 6-12 yrs from these countries of which USG and UEI were available) born and living in areas where iodine intake is normal fur-nishes data from which to derive thyroid volume reference values. The aim of the first ThyroMobil project has been to ensure homogeneity in the me-thod used and to decrease the inter-observer varia-bility. A mobile unit ('ThyroMobil van') equipped with a ultrasonographic device, a computer for pro-cessing the thyroid measurements on the spot and facilities for the collection and storage of urine samples, visited the schools in all sites under inves-tigation. UEI, thyroid volume obtained by USG, BSA (body surface areas), and age were analyzed. Body Surface Area (BSA m^2) was calculated using the formula: $BSA = W^{0.425} \times H^{0.725} \times 71.84 \times 10^{-4}$ where W is weight in kg and H height in cm. The thyroid volume was the sum of the volumes of both lobes. The volume of the isthmus was not included.

It was concluded that this work produced updated recommendations for the normal volume of thyroid as a function of age, sex and BSA and set the criteria for defining goiter based on USG from iodine-replete schoolchildren in Europe, Further-more, this can be used on a continental basis. The results are depicted in Table 1.

In the meantime this recommendation was tested in the field by some researchers. Some supports and some questioned its global validity. Local normative values were compared with the WHO normative standard. In Switzerland represen-tative national sample of 600 Swiss children aged 6-12 years were examined. The median UEI was 115 ug/L. Applying the WHO/ICCIDD standard (based on age or BSA) resulted in 0% prevalence. Their upper limits were 20-56% lower than the corresponding standard.[8] In Malaysia Foo et al (1999) showed that using WHO/ICCIDD criteria underestimated the problem and lack the cong-ruency with the urinary iodine concentration. They found also that the reference lack of normative values for children with BSA (<0.8 m^2) commonly found in developing countries.

Since the aim of using ultrasound in surveys is to obtain more accurate prevalence, particularly in mild endemia, some studies were done to compare the prevalence either by 1960 (a four-grade goiter classification) or 1994 (a simplified two-grade sys-tem) WHO criteria. In Marocco it was found that the 1994 criteria, like the 1960 criteria overestimate goiter prevalence in areas of mild IDD .compared with ultrasound, however the 1994 criteria provide an accurate estimate of severe IDD, and may be an acceptable and affordable alternative to thyroid ultrasound in these areas.[9]

Table 1.

Upper limit of normal thyroid volumes measured by USG in iodine-replete children aged 6-15 yrs as a function of age and body surface area.[1,5]

Age (years)	Thyroid volume (ml)		Body surface area (m^2)	Thyroid volume (ml)	
	Boys	Girls		Boys	Girls
6	5.4 - 3.8	5.0 - 3.6	0.8	4.7 - 3.3	4.8 - 3.4
7	5.7 - 4.0	5.9 - 4.2	0.9	5.3 - 3.8	5.9 - 4.2
8	6.1 - 4.3	6.9 - 4.9	1.0	6.0 - 4.2	7.1 - 5.0
9	6.8 - 4.8	8.0 - 5.7	1.1	7.0 - 5.0	8.3 - 5.9
10	7.8 - 5.5	9.2 - 6.5	1.2	8.0 - 5.7	9.5 - 6.7
11	9.0 - 6.4	10.4 - 7.4	1.3	9.3 - 6.6	10.7 - 7.6
12	10.4 - 7.4	11.7 - 8.3	1.4	10.7 - 7.6	11.9 - 8.4
13	12.0 -	13.1	1.5	12.2 - 8.6	13.1 - 9.3
14	13.9 -	14.6	1.6	14.0	14.3
15	16.0 - *	16.1 *	1.7	15.8 *	15.6 *

* these rows indicate the updated provisional WHO/ICCIDD reference values (IDD-NL 2001)

Study in Tanzania concluded that WHO's 1960 palpation criteria remains the method of choice for thyroid size classification in low-income countries. Further conclusion was that 10% goitre seems appropriate as an indication of iodine-deficiency-disease control until it has been shown that the method recommended yields less than 10% false positives.[10]

These arguments lead to reorientation of the normative values. Delange (1999) stressed that the concept of universal normative values for thyroid volume measured by ultrasonography in iodine-replete schoolchildren can be questioned. In March 2000 WHO in collaboration with ICCIDD, organized a meeting entitled "Standardization of methods for surveillance of iodine status in the context of IDD control programs", which included a workshop on thyroid ultrasound. After adjusting the interob-server and/or interequipment variability they issued an update normative values as depicted in Table.1. second figures.[11,12]

ThyroMOBIL INDONESIA

After discussion with Prof F Delange (Executive Director of ICCIDD) and Merck Gmbh in Graz Austria during a Merck Thyroid Meeting, Indonesia had the opportunity to conduct a similar study using the same methods protocol and ThyroMobil van. This survey began in 1998. The ultrasound studies were performed by 5 experienced Indone-sian doctors trained by Dr Jan Podoba, who had performed all the initial USG during ThyroMobil study in Europe. UEI was examined by IDD-Lab Se-marang, whose results compared well with ICCIDD lab in Brussels (coefficient κ 0.80). Investigated were 7447 schoolchildren (3672 boys, 3775 girls) aged 6-12 years from West

Sumatra, West Java, Central Java, Yogjakarta and Bali province. The successive surveys in Indonesia during the last 10 years allowed us to identify iodine replete areas in Central Java. This area is made of a group of 32 sites where the prevalence of goiter has remained permanently below 5% during the time interval including during this survey. The median of UEI during the last 3 years was constantly above 100 ug/l. Reference thyroid volumes were computed from schoolchildren of these areas, consisting of 1288 boys and 1374 girls.

The objective of the study has been to perform an updated evaluation of the status of iodine nu-trition in Indonesia by using standardized methods for the measurement of thyroid volume by ultra-sounds and the concentration of urinary iodine in schoolchildren as recommended by WHO/ICCIDD 1994. We had the opportunity also to compare the goiter prevalence using classical palpation method (WHO 1960) and ultrasonography. The original results had been published in.[13]

The results of this survey are as follows:

1. Iodine deficiency has been eliminated in large parts of Indonesia, in accordance with the latest national evaluation survey[14,15,16], but Bali is still affected by mild iodine deficiency.
2. In many places iodine iodine deficiency has been replaced by iodine excess, occasionally poten-tially toxic. In Java plus Sumatra the median UEI was 195 µg/L. Frequency between 100-200µg/L was 34%, below 100 µg/L was 17.2% but 48,8% were above the upper limit of normal 200µg/L, including 18.2% above 300µg/L and 0.7% above 1000µg/L. Extremely high values, up to almost 3000 µg/L were found only in Central Java, more precicely in Sukoharjo. To prevent 'iodine-in-duced hyperthyroidism' in Indonesia[17] the level of salt iodization must be reevaluated, possibly should be decreased and the biological moni-toring of urinary iodine at the population level should be reinforced and maintained.
3. The WHO/ICCIDD normative values for thyroid volume measured by ultrasound in SAC are not valid for Indonesia. The normal thyroid volumes for Indonesian SAC aged 6-12 years is now available. In Table 3. this can be compared with those found in Switzerland[8], Marocco[9], Tanza-nia[10] and in Malaysia.[18,19] It showed also that in areas where history of long-lasting iodine defi-ciency, the prevalence of goiter does not ne-cessarily revert entirely to normal in spite of (over) correction of iodine deficiency. Com-paring the goiter prevalence using the palpation method and ultrasonography using WHO/ ICCIDD standard or the Indonesian standard allow us to conclude that when performed properly, the palpation method can reliably eva-luate the goiter prevalence determined by USG using local reference values. (Table 2.)

Table 2.

Comparison of the prevalence of goiter in 7447 Indonesian schoolchildren of both sexes, based on palpation or on ultrasound (US) when using the Indonesian or WHO European (1997) normative values for age and BSA.

Normative values By US	Prevalence of goiter (%)		
	By ultrasonography		By palpation
	BSA	Age	
Indonesia	6,8	8.6	9.0
Europe/WHO 1997	13.2	2.8	

Table 3.

The upper limit of Indonesian schoolchildren thyroid volumes from iodine replete areas by age. (compared to those according to WHO/ICCIDD 2001 and Malaysia (Foo 1999))

	Upper limit in boys (ml)			Upper limit in girls (ml)		
	WHO 2001	Indonesia	Malaysia	WHO 2001	Indonesia	Malaysia
Age						
6	3.8	2.4	n.a	3.6	4.0	n.a.
7	4.0	3.9	4.1	4.2	4.1	4.2
8	4.3	4.6	4.5	4.9	6.1	4.7
9	4.8	5.9	5.0	5.7	6.7	5.5
10	5.5	6.8	5.7	6.5	7.5	6.6
11	6.4	7.8	n.a	7.4	8.0	n.a.
12	7.4	8.1	n.a	8.3	9.9	n.a.

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