

Iodine status in pregnancy

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The iodine status of 429 pregnant women in different trimesters from the lower socio-economic strata of the urban slums of Bombay was assessed using clinical and biochemical parameters. The total goitre rate (TGR) of 45% and a visible goitre rate (VGR) of 3.04% was observed. There was an evident increase in the TGR during the months of pregnancy. The urinary iodine excretion pattern revealed mild iodine deficiency. 55% of the women had urinary iodine excretion less than 5 mcg/dl with 13.2% having less than 2 mcg/dl. Elevated T₃ and T₄ levels were observed in 64 and 40% respectively of the women surveyed, while only 1.8% of them had TSH levels higher than the normal range. No significant difference in the levels of thyroid hormone (T₃ or T₄) was noted between the euthyroid and goitrous subjects. The mean TSH levels in euthyroid women were however significantly higher than those with signs of goitre.

Introduction

The effects of iodine deficiency during pregnancy on the growth and development of the foetus are of immense concern, the most important being the effect on the brain¹. It is now well recognized that thyroid hormones are essential for the development of the central nervous system. The lack of thyroid hormones during the critical period of maturation of the CNS can result in morphological, physiological and biochemical abnormalities. These effects also include perinatal mortality and increased congenital anomalies². Iodine deficiency probably accounts for 90 000 still births and neonatal deaths in India³. The need for monitoring maternal iodine status and neonatal iodine status to prevent irreversible brain damage has been emphasized. High incidence of neonatal chemical hypothyroidism (NCH) has been reported from the endemic goitre regions of Asia, Africa, South America and Europe⁴. In India the observed incidence of NCH in endemic areas like Delhi, Kerala and Bombay was reported to be six per 1000 births, one per 1000 births and one per 2481 births respectively^{5,6}. There is a lacunae of Indian studies with regards to the iodine status and iodine deficiency disorders (IDD) in pregnant women. Thus the present study was conducted with the following objectives:

- To find out the prevalence of IDD in pregnant women from the urban slums of Bombay.
- To assess the maternal iodine status during pregnancy.

Materials and methods

The study comprised of a random sample of 429 pregnant women in different trimesters, belonging to the lower

socio-economic strata of urban slums of Bombay. The subjects of the study comprised of every third pregnant woman attending the antenatal clinics in the Department of Obstetrics and Gynecology of a municipal hospital in the suburbs of Bombay. The iodine status was assessed by clinical and biochemical parameters. UNICEF-WHO-ICCIDD classification for grading goitre was followed⁷. Random casual urine samples were collected in wide-mouthed polythene bottles, to which toluene was added as a preservative. Urinary stable iodine estimation was carried out by the modified Alkali Ash method described by Barker and associates⁸. A 5 ml blood sample was drawn from each woman. The isolated serum was used for estimation of thyroid hormones T₃ and T₄ by RIA and the level of TSH by IRMA using diagnostic kits obtained from the Board of Isotope and Radiation Technology Bombay.

Results

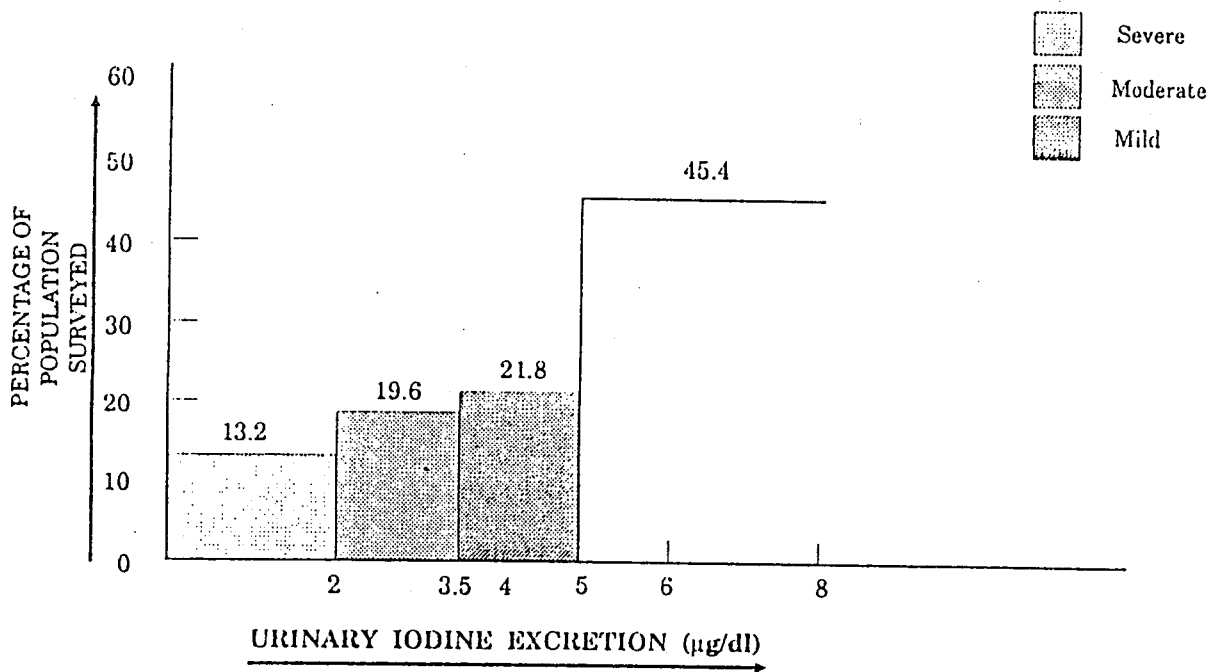
The prevalence of goitre in pregnant women is given in Table 1. The total goitre rate (TGR=1a+2+3) was found to be 45% and the visible goitre rate (VGR=2+3) of the women fell in grade 1a and 1b where the gland needs to be palpated and enlargement is not apparent. There was an evident increase in TGR and VGR during the months of pregnancy. Goitre rate based on grade 1b was found to be 10%.

A total of 341 random casual urine samples were analysed for urinary iodine excretion. The distribution pattern (Fig. 1) shows 94% of the women having urinary iodine excretion less than 10 mcg/dl, 54% less than

Table 1. Goitre prevalence in pregnant women.

Month of pregnancy	Grade of goitre					TGR (%)	VGR (%)
	0	1a	1b	2	3		
<4 (n=30)	19 (63.3)	08 (26.6)	03 (10)	-	-	11 (2.5)	-
5 (n=43)	21 (48.8)	09 (20.9)	06 (13.9)	02 (4.6)	-	17 (3.9)	02 (0.5)
6 (n=64)	37 (57.8)	12 (18.7)	13 (20.3)	02 (3.1)	-	27 (6.3)	02 (0.5)
7 (n=230)	124 (53.9)	54 (23.4)	44 (19.1)	08 (3.4)	-	106 (24.8)	08 (1.9)
8 (n=59)	32 (54.2)	15 (25.4)	10 (16.9)	01 (1.6)	-	26 (6.08)	01 (0.2)
9 (n=7)	02 (28.5)	04 (57.1)	01 (14.2)	-	-	05 (1.17)	-
Total (n=427)	235 (55.0)	102 (23.8)	77 (18.03)	13 (3.04)	-	192 (44.96)	13 (3.04)

Note: () = Percentages.



*55% of the pregnant women had urinary iodine excretion <5 µg/dl.

Figure 1. Distribution pattern of urinary iodine excretion.

5 mcg/dl and 13% less than 2 mcg/dl. Figure 2 shows the urinary iodine excretion for the different grades of goitre. It was observed that 49% of the women who did not show any thyroid enlargement had urinary iodine excretion less than 5 mcg/dl. The majority of women in grade 1a (68%) and grade 1b (67%) also showed deficient urinary excretion, while 14% of women in grade 2 goitre had urinary iodine excretion of moderate to severe iodine deficiency, ie >3.5 mcg/dl.

Table 2 shows the thyroid hormone levels in the different months of pregnancy. Elevated T₃ and T₄ levels were observed in 64% and 40% respectively of the women surveyed. (Normal range: T₃=0.7–2 mcg/ml; T₄=5.5–13.5 mcg/dl.) In contrast only 1.8% of the subjects had TSH levels higher than the normal range (0.2–5.1 micro µ/ml). No significant difference in the levels of thyroid hormone (T₃ or T₄) were noted between

euthyroid and goitrous subjects. The mean TSH levels in euthyroid women were however significantly higher than those with signs of goitre (Table 3).

Discussion

The total goitre rate of 45% observed in the study is high and is of concern. No published data about IDD prevalence in Indian pregnant women were available for comparison. However, the overall goitre rate as studied by an Indian Council of Medical Research task force in Indian women⁹ was reported to be an average of 26.8% in a cross-country survey covering 25 states of India. Thus the goitre prevalence observed in the study is not unexpected, since during pregnancy the thyroid is subjected to increased demands, which is associated with a tendency to cause endogenous iodine deficiency. Gesta-

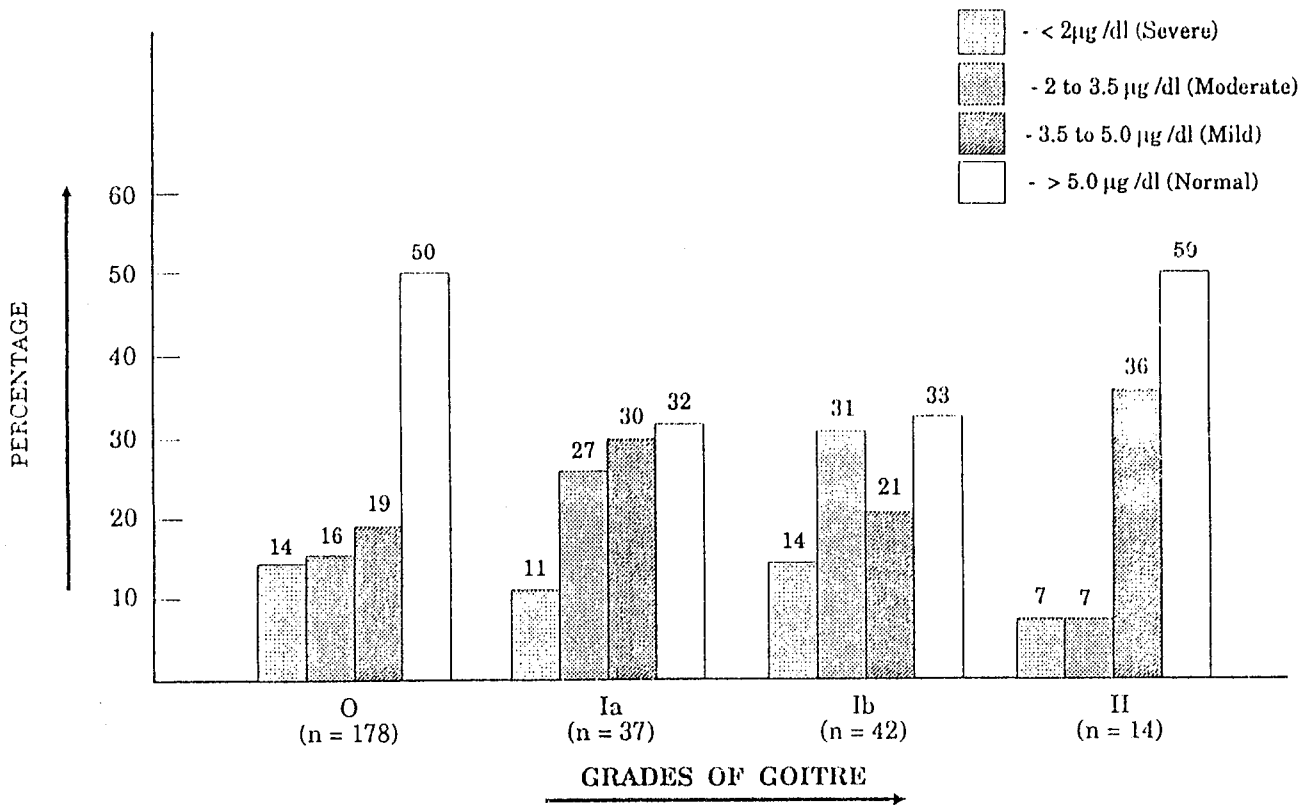


Figure 2. Urinary iodine excretion and grades of goitre in pregnant women.

Table 2. Thyroid hormone levels in different months of pregnancy.

Month of pregnancy	T ₃ (ng/ml)	T ₄ (µg/dl)	TSH µV/ml
<4 (n=31)	2.32±0.76	12.62±3.62	0.97±0.906
5 (n=38)	2.51±0.68	12.23±2.19	1.41±1.204
6 (n=67)	2.36±0.72	12.83±2.50	1.32±1.276
7 (n=227)	2.28±0.71	12.98±2.62	1.38±0.91
8 (n=58)	2.18±0.68	12.82±2.42	1.16±0.70
9 (n=8)	1.89±0.61	12.03±2.11	0.98±0.26
Normal range	0.7-2.0	5.5-13.5	0.2-5.1

Table 3. Thyroid hormone levels in euthyroid and goitrous pregnant women.

Grade	T ₃ (ng/ml)	T ₄ (µg/dl)	TSH µV/ml
0(n=233)	2.30±0.67	12.69±2.75	1.49±1.16
1a(n=105)	2.20±0.75	12.58±2.93	1.12±0.71
1b(n=79)	2.44±0.09	13.19±2.59	1.06±0.64
11(n=12)	2.19±0.66	13.16±2.69	1.17±1.26
Normal range	0.7-2.0	5.5-13.5	0.2-5.1

tional changes in the thyroid have been recognized for centuries and the ancient Egyptians relied on thyroid enlargement as a sign of pregnancy.

An evident increase in the total goitre rate during the months of pregnancy can be attributed to the increased demands of foetal growth. Goitre rate based on grade 1b of 18% observed in the present study is much above the criteria of 5% set by WHO¹¹ in pre- and peri-adolescent

age groups, for the problem to be considered of public health significance.

In normal pregnancy the thyroid gland undergoes changes in both structure and function. By the end of the first trimester renal reabsorption of iodine falls and this results in an increased urinary iodine excretion and a relative deficiency in plasma iodine¹². There was an evident increase in the mean urinary iodine excretion during the months of pregnancy in the present study though it was lower than 5 mcg/dl, a level associated with normal iodine status except for the eighth month of pregnancy where the mean iodine excretion was found to be 5.6 mcg/dl.

The urinary iodine excretion pattern observed in the population surveyed is closer to the distribution pattern expected in a population with mild iodine deficiency¹³. This level of iodine deficiency is usually not accompanied by hypothyroidism and cretinism¹⁴. The majority of women (68% and 67%, respectively) with grade 1a and 1b goitre had low urinary iodine excretion. Lower urinary iodine excretion in goitrous as compared to non-goitrous pregnant women has been reported¹⁵. A high percentage of women (49%) with no apparent signs of goitre also showed low urinary iodine excretion with 14% having less than 2 mcg/dl, a level associated with severe iodine deficiency, thereby suggesting these women to be at risk to hypothyroidism.

The subjects studied had T₃ and T₄ levels higher than the normal values. 64% of the women had high T₃ and 40% had high T₄ levels. Only 1.8% of the subjects had TSH levels higher than the normal range. Elevated T₃

and T_4 levels and normal TSH levels during pregnancy have been reported by other workers¹⁶, which was also observed in the study. The hormonal profile of the pregnant women studied was consistent with the normal physiological changes in the thyroid during pregnancy. The thyroidal activity is enhanced during gestation as a result of the increased glandular adjustments to the lowering of the free hormones, the direct stimulation by HCG (early gestation) and TSH (late gestation) and the reduced availability of iodine¹⁷. When thyroid hormone levels of women in different months were compared, it was observed that TSH levels were significantly lower in the early months as compared to the later part of gestation. This could be attributed to partial pituitary blunting due to increased levels of HCG in early gestation. No significant difference in the levels of thyroid hormones (T_3 or T_4) was noted between euthyroid and goitrous subjects. Similar observations have been made by other workers¹⁵. It is known that compensatory enlargement of thyroid gland ensues following the physiological demand for thyroid hormones during pregnancy and other stages like puberty and even menstruation¹⁷.

Thus to conclude, the results of the present study suggest that mild to moderate iodine deficiency is a public health problem in pregnant women from the urban slums of Bombay. This is reflected by: (i) high total goitre rate of 45% and grade 1b goitre rate of 18%; (ii) 54% of the women with urinary iodine excretion less than 5 mcg/dl which is related to iodine deficiency; (iii) 67% to 68% of the women with grade 1a and 1b goitre having urinary iodine excretion less than 5 mcg/dl. Thus pregnant women from the urban slums of Bombay are at risk of hypothyroidism which is of concern as it is associated with the potential risk of irreversible damage to the foetus.

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Asia Pacific Journal of Clinical Nutrition 1993, 2: 119-123**妊娠期碘的營養狀況
摘要**

作者用臨床和生化指標評估了孟買 (BOMBAY) 市貧民區低社會經濟階層中的429名不同妊娠期孕婦的碘營養狀況。他們觀察到甲狀腺腫的總發病率 (TGR) 為45%，而可見性甲狀腺腫率 (VGR) 為3.04%。有證據顯示TGR隨妊娠月數而增加。尿液碘排出模式呈中等度缺碘，55%的孕婦每100毫升尿液碘排出少於5微克，其中有13.2%少於2微克。在調查的孕婦中，T3和T4濃度升高的分別為64%和40%，其中只有1.8%孕婦促甲狀腺素 (TSH) 高於正常人的水平。在甲狀腺功能正常和甲狀腺腫病人之間並未發現有甲狀腺激素 (T3或T4) 的明顯差異。但是，甲狀腺功能正常的婦女中，其促甲狀腺素 (TSH) 濃度明顯高於甲狀腺腫的病人。

