

131-I UPTAKE AND SERUM T3, T4 AND TSH LEVELS AMONG GOITROUS AND NON - GOITROUS SCHOOL CHILDREN IN AN ENDEMIC AND A NON - ENDEMIC AREA IN SRI LANKA

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Summary: Radioiodine uptake by the thyroid at 2 hours and 24 hours and levels of the hormones T3, T4 and TSH in blood of 112 School children over 16 years of age with clinically demonstrable goitre (grade 1B and above) have been measured. Of them 92 lived in an endemic area and 20 in a non-endemic area. They have been compared with age and sex matched clinically non-goitrous controls from the same schools in the two areas.

The results show that the hormone levels are of little use in diagnosing iodine deficiency, Radioiodine uptake is a more sensitive test of iodine deficient goitre. Results also indicate that there may be factors other than iodine deficiency responsible for the development of goitre.

Key Words: Iodine deficient goitre, radioiodine uptake, T3, T4 and TSH levels

INTRODUCTION

Goitre due to iodine deficiency has been shown to be endemic in the wet zone of Sri Lanka (1) as well as in some areas in the dry zone (2). It has been estimated that three million people are at risk of developing endemic goitre in Sri Lanka (3).

The compensatory enlargement of the thyroid gland that occurs in iodine deficiency is accompanied by increased uptake of iodine by the gland, and uptake of radioiodine is used as a diagnostic test for endemic goitre (4). Previous studies in Sri Lanka have shown that the 131-I uptake of subjects living in endemic areas is higher than the uptake of those living in non-endemic areas. (5, 6, 7, 8).

Levels of the hormones Triiodothyronine (T3), Thyroxine (T4) and Thyroid Stimulating Hormone (TSH) are considered to reflect the degree of physiological activity of the thyroid gland and those levels are also widely used for diagnostic purposes (9, 11, 13). Sri Lankan studies, however, have cast doubt regarding the usefulness of such tests in the diagnosis of iodine deficiency (7, 8). These studies showed no difference in hormone levels between goitrous and non-goitrous subjects and between those living in endemic and in non-endemic areas. However, matched controls were not used for these studies.

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In the present study iodine uptake and the hormone levels have been estimated in goitrous school children and in matched non-goitrous controls, in both endemic and non-endemic areas.

SUBJECTS AND METHODS

112 school children aged over 16 years with clinically demonstrable goitre (grade IB and above) were selected as the goitrous group for the study, 92 from Kandy, an endemic area, and 20 from Naula in the Matale District, a non-endemic area. Each subject with goitre was matched for age and sex with one control (non-goitrous) child, i.e., without clinically demonstrable goitre, from the same school.

5 ml of venous blood were drawn using sterile techniques for the estimation of T₃, T₄ and TSH, by the conventional RIA technique (12, 13, 14).

For carrying out iodine uptake measurements in the field, a Nuclear Enterprise portable scaler ratemeter DSRS was used. This instrument was standardised using the conventional uptake machine. A small quantity, about 148 KBq (4 μ Ci) of I - 131 in the form of sodium iodide (obtained from Radiochemical Centre, Amersham) was administered orally to both goitrous subjects and controls, and iodine uptake measured after 2 and 24 hours.

Informed consent was obtained from the subjects before administering 131 - I and drawing blood. Ethical clearance was obtained from the ethical committee of the Faculty of Medicine, Peradeniya.

RESULTS

Table 1 shows the iodine uptake values and the hormone levels of goitrous and non-goitrous subjects, in both the endemic and non-endemic areas. In Table 2 the values for goitrous subjects in both areas have been pooled and compared with pooled values of the controls.

The T₃ and T₄ levels of the goitrous subjects in the endemic areas do not differ significantly ($p > 0.05$) from that of goitrous subjects in the non-endemic area or from values obtained for the non-goitrous subjects in either area (Table 1). This is further emphasized in Table 2. The TSH levels show a similar pattern. However, in the non-endemic area the goitrous subjects have slightly lower levels of T₄ and TSH than the controls (Table 1). The pattern of distribution of the hormone levels is almost identical for goitrous and non-goitrous subjects (Fig. 1).

On the other hand the mean iodine uptake, at 2 hour and 24 hour are both significantly ($p < 0.01$) higher in the goitrous group (Table 1) than in the control group, in both endemic and non-endemic areas. The control

Table 1. Results of thyroid function tests on goitrous subjects and non-goitrous control subjects in endemic and non-endemic areas

	Endemic (n = 92)				Non-Endemic (n = 20)			
	Goitrous subjects		Control subjects		Goitrous subjects		Control subjects	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
2 Hr. % Uptake	21.1	10.9	17.7	8.1	14.7	6.7	11.9	5.4
24 Hr. % Uptake	66.8	12.4	60.0	12.5	52.1	19.4	47.1	10.6
T ₃ ng/100 ml,	134.8	41.4	127.4	33.1	134.7	28.0	135.9	26.6
T ₄ µg/100 ml	7.7	2.1	7.6	1.9	7.6	1.7	7.9	1.2
TSH mµ/L.	1.8	1.1	1.9	1.1	1.7	0.57	2.0	0.70

group in the non-endemic area has the lowest uptake while the highest uptake is seen among the goitrous group of the endemic area. The 24 hour uptake is higher in the endemic than in the non-endemic area, irrespective of the state of gland. It is also higher in the controls in the endemic area than in the goitrous subjects in the non-endemic area.

The frequency distribution of the uptake values (Fig. 2) shows that a larger proportion of the goitrous subjects have higher values than the controls. However a considerable fraction of the values of the controls overlap with values of the goitrous subjects.

DISCUSSION

The control subjects in the study were selected on the absence of a clinically demonstrable goitre. It is likely that at least some of them may have a subclinical iodine deficiency. This may account for the absence of a significant difference in the thyroid hormone levels between cases and

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Table 2. Pooled results of thyroid function tests on goitrous subjects and non-goitrous controls in both endemic and non-endemic areas

	Goitrous subjects n = 112 Mean s. d.		Control Subjects n = 112 Mean s. d.	
2 Hr. % Uptake	20.1	10.6	16.4	8.0
24 Hr. % Uptake	65.7	12.6	58.7	11.4
T3 ng/100 ml.	129.0	29.0	129.3	31.9
T4 μg/100 ml.	7.6	1.7	7.7	1.7
TSH mμ/L	1.9	1.10	1.9	1.0

controls. his finding throws some doubt on the usefulness of determining hormone levels for the diagnosis of iodine deficiency in countries like Sri Lanka, where goitre is endemic in some regions. However it may still be useful in monitoring the effect of therapy.

Iodine uptake on the other hand appears to be a more sensitive test even in endemic areas. The higher iodine uptake seen in goitrous subjects in endemic and non-endemic areas suggest that iodine deficiency is an important aetiological factor for goitre in Sri Lanka. It is interesting to note that the 24 hour uptake of the control group in the endemic area is 60% while that of the goitrous subjects in non-endemic areas is only 52%, which suggests that the clinically normal subjects of the endemic area show evidence of iodine deficiency.

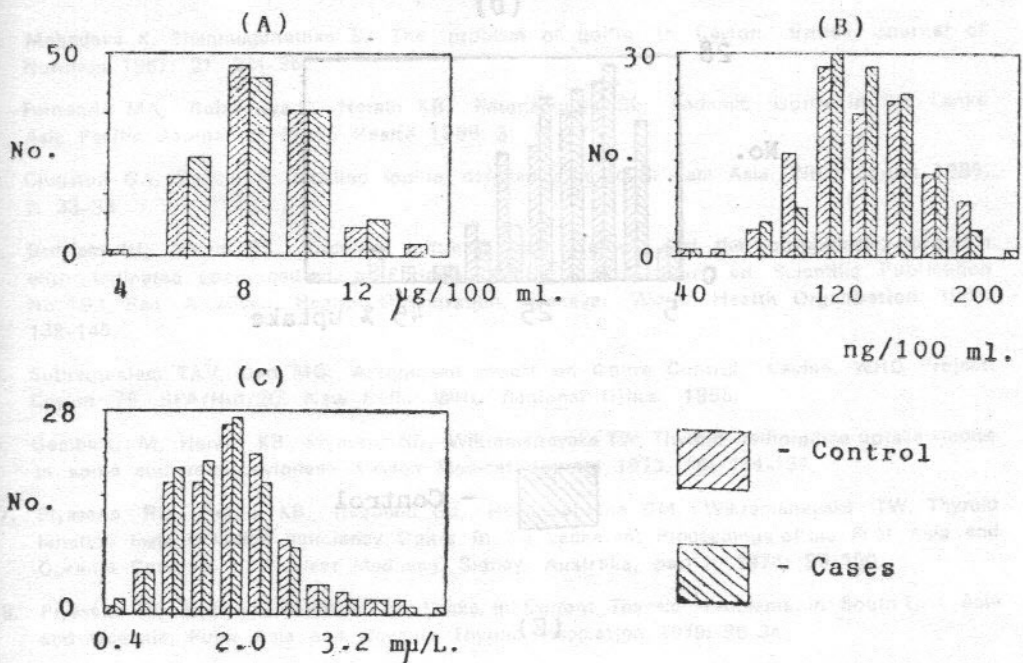


Fig 1. Frequency distribution of hormone values in control subjects and in goitrous subjects.

(A) = T₄

(B) = T₃

(C) = TSH

This study shows that the levels of hormones, T₃, T₄, and TSH do not discriminate between the goitrous and the non-goitrous school children. On the other hand radioiodine uptake by the thyroid at 2 hours and 24 hours, are different between these two groups.

If we assume that the iodine uptake is an index of the available iodine in the blood, in this study it is observed that the uptake among the goitrous in the non-endemic area is less than the uptake among the non-goitrous in the endemic area, indicating there may be factors other than simple iodine deficiency responsible for the development of clinical goitre.

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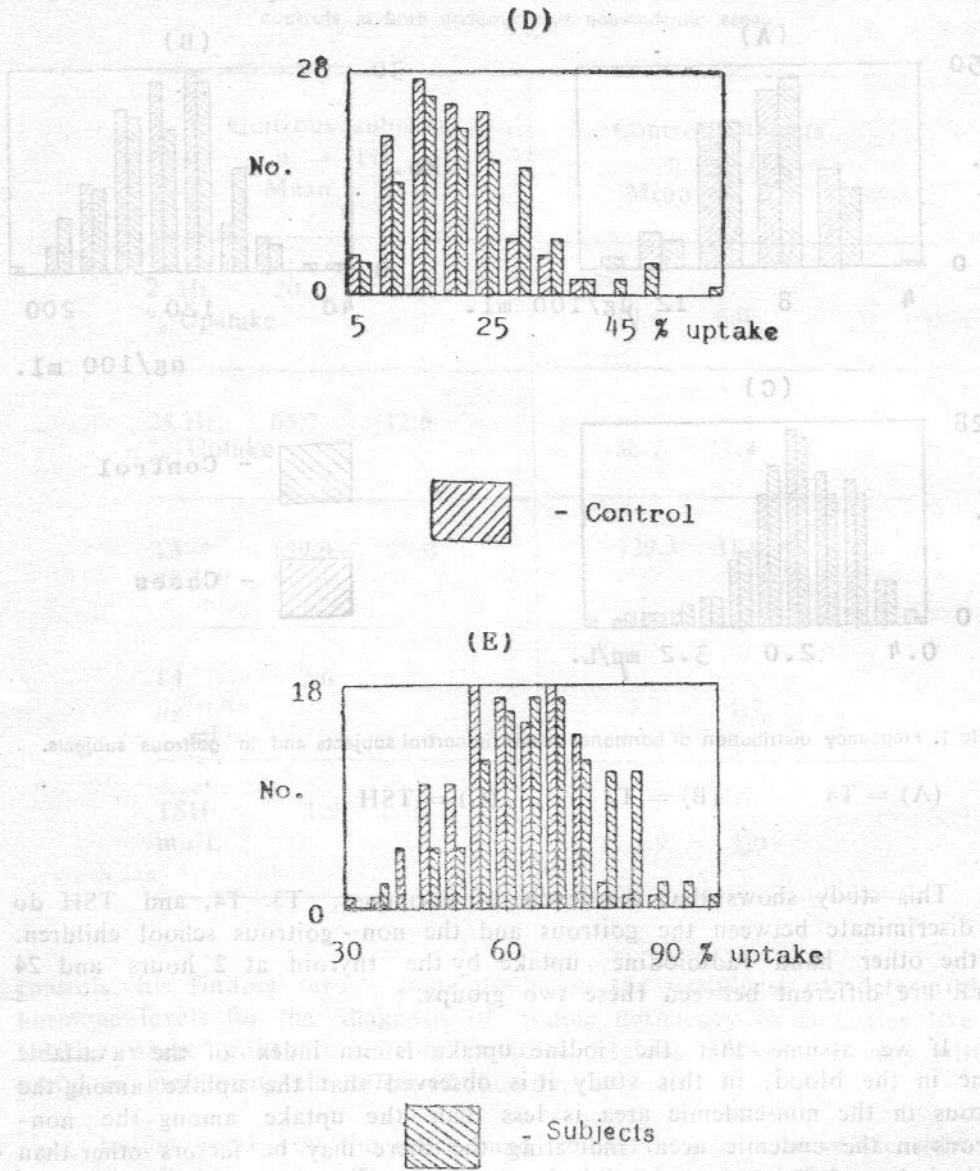


Figure 2: Frequency distribution of radioiodine uptake values at 2 hours

(D) and at 24 hours (E) and of goitrous subjects and controls.

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