



# Thyroid dysfunction and Thyroglobulin level in Iodine Deficient Children of Udayapur, Nepal

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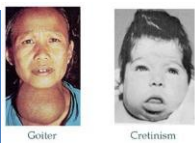
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## Introduction

- Iodine is micronutrient imperative for normal growth and development of human body.
- Iodine plays a significant role in synthesis of thyroid hormones namely tri-iodothyronine (T<sub>3</sub>) and tetra-iodothyronine (T<sub>4</sub>).
- Thyroglobulin (Tg) is a thyroid-specific protein and precursor in the synthesis of thyroid hormones.
- Iodine deficiency is one of the major culprits for thyroid disorder. Deficiency during childhood may alter somatic growth, cognitive and motor function.
- The present study was designed to investigate thyroid function and thyroglobulin level in iodine deficient children and to establish the relation between these factors.



## Objectives

- To assess the indicators of iodine status: Urinary iodine concentration (UIC) and serum thyroglobulin in school children.
- To assess the thyroid profile (FT<sub>3</sub>, FT<sub>4</sub> and TSH) in iodine deficient school children.
- To determine correlation between UIC, Thyroglobulin, FT<sub>3</sub>, FT<sub>4</sub> and TSH in iodine deficient school children.

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## Methods

- A community-based cross sectional study was conducted in selected schools of Udayapur district.
- Sampling technique: Multistage random sampling
- Ethical clearance was taken from IRC of BPKIHS
- Total of 1012 school aged children (6-14 years) were enrolled at the initial period for the assessment of urinary iodine concentration (UIC).
- Serum Urinary iodine concentration (UIC) was measured by ammonium persulfate digestion method and Tg, TSH, FT<sub>4</sub> and FT<sub>3</sub> were measured by commercial ELISA kit.
- Serum thyroglobulin (Tg), thyroid stimulating hormone (TSH), free triiodothyronine (FT<sub>3</sub>) and free thyroxine (FT<sub>4</sub>) were analyzed in 83 iodine deficient children blood samples.
- Data were presented in form of mean with SD, median with quartile and frequency. Data were ensured for normal distribution by Kolmogorov-Smirnov test, T-test, Chi-square test, Mann Whitney U test, Kruskal wallis test and Spearman's correlation were applied to see the inference. P-value of  $\leq 0.05$  was considered statistically significant at 95% confidence interval.



## Results

Table 1: The mean height, age, weight and BMI according to gender.

	Sex	Mean ± SD	p-value
AGE (years)	Female (n=530)	10.7 ± 2.31	0.050
	Male (n=482)	10.94 ± 2.32	
Height (cm)	Female (n=530)	131.46 ± 14.80	0.718
	Male (n=482)	131.82 ± 14.04	
Weight (kg)	Female (n=530)	29.53 ± 9.56	0.064
	Male (n=482)	28.54 ± 8.82	
BMI (kg/m <sup>2</sup> )	Female (n=530)	16.6029 ± 2.69	0.003
	Male (n=482)	16.1285 ± 2.05	

Table 2: Median UIC in subgroups of gender, BMI status and iodine status.

Parameters	Category	Median UIC (µg/L)	p-value
Sex	Female (n=530)	248 (165, 330)	0.108
	Male (n=482)	219 (149, 325)	
BMI Status	Underweight (n=49)	190 (136, 321)	0.546
	Normal (n=811)	237 (158, 331)	
	Risk of overweight (n=102)	256 (166, 341)	
	Overweight (n=50)	219 (151, 328)	
Iodine Status	Severe deficiency (n=9)	9 (7, 10)	0.001
	Moderate deficiency (n=32)	36 (30, 43)	
	Mild deficiency (n=71)	80 (68, 91)	
	Sufficient (n=57)	197 (156, 245)	
	Excessive (n=343)	366 (329, 404)	

Table 3: Thyroid function status in iodine deficient male and female children

TFT Status	Sex		p-value
	Female (n=43)	Male (n=40)	
Normal	39	36	0.761
Over hypothyroidism	3	2	
Subclinical hypothyroidism	1	2	

## Key findings

- The prevalence of iodine deficiency in school children of Udayapur district was 11%.
- The median UIC of school children was 236 µg/L (156, 331). The mean FT<sub>3</sub>, FT<sub>4</sub> and TSH of iodine deficient children were 22.45 ± 14.05 pg/mL, 0.96 ± 0.28 ng/dL and 3.60 ± 1.44 mIU/L respectively.
- The Median (IQR) thyroglobulin was 17.5 (12, 29.4) ng/mL. We found 6% cases of hypothyroidism and 3.6% cases of subclinical hypothyroidism in iodine deficient children.
- A significant positive correlation between thyroglobulin and FT<sub>3</sub> (r=0.273, p=0.013) was obtained.

Table 4: Correlation between UIC, Thyroglobulin (Tg) and other thyroid parameters (FT<sub>3</sub>, FT<sub>4</sub> and TSH)

Parameters	Correlation	r	p-value
UIC (µg/L)	FT <sub>3</sub> (pg/mL)	0.273	0.013
	FT <sub>4</sub> (ng/dL)	0.215	0.025
Tg (ng/mL)	FT <sub>3</sub> (pg/mL)	0.273	0.013
	FT <sub>4</sub> (ng/dL)	0.215	0.025
TSH (mIU/L)	FT <sub>3</sub> (pg/mL)	-0.273	0.013
	FT <sub>4</sub> (ng/dL)	-0.215	0.025

## Conclusion

- Iodine deficiency with thyroid dysfunction still remains a public health problem in Udayapur district of eastern Nepal.
- Though, the median UIC of primary school age children of Udayapur district was 236 µg/L which indicates sufficient iodine nutrition. The prevalence of primary school age children having UIC < 100 µg/L was 11.1% in Udayapur district.
- Excess iodine nutrition (36%) in school children is also common in the region.
- Nepal is continuously moving towards the sustainable elimination of IDD but iodine excess is seen more frequently these days. It might be due to overconsumption or consumption of improperly monitored salt. Monitoring programs should be done at the community level to ensure optimal iodine nutrition status and prevent occurrence of iodine induced thyroid disorders.

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