Thyroid Function and Urinary Iodine Status in Primary School Age Children of the Hills and the Plains of Eastern Nepal

The aim of this study is to find out the iodine nutrition and thyroid function status of the school age children of Sunsari and Dhankuta districts. A total of 386 urine and 142 blood samples were randomly collected from four schools of above districts to estimate urinary iodine and thyroid hormones, respectively. Median UIE of Dhankuta and Sunsari were 238.00 µg/L and 294.96 µg/L respectively. Relatively higher percentage (31.8%) of subclinical hypothyroid cases was found in Sunsari than Dhankuta (29.59%).

Key words: *Iodine deficiency, Subclinical hypothyroidism, Urinary iodine excretion (UIE)*.

Iodine deficiency disorders (IDDs) are recognized as a global public health problem in developing mountainous countries like Nepal [1,2]. In 2007, a nationwide survey, showed that 9.5% and 17.9% of school age children had urinary iodine excretion (UIE) less than 100µg/L in the Eastern plains and hills, respectively [3]. Iodine deficiency affects human growth and development including fetus, neonate, children and adult population [4]. The final objective to correct iodine deficiency is not only to increase the population access to iodized salt but to normalize thyroid function tests [5]. The prevalence of subclinical hypothyroidism in Eastern Nepal in a hospital based study was 20.4% [6]. This study was undertaken to find out the iodine nutrition and thyroid function status and among school age children of Sunsari and Dhankuta districts.

Children 6-12 years age were recruited from the selected four schools of two districts of Eastern Nepal. A total of 386 urine and 142 venous blood samples were randomly collected from the 772 children after written consent of the school authority and/or parents. UIE was estimated by ammonium persulphate digestion microplate (APDM) method using Sandell-Kolthoff's reaction to find out the iodine status of the children [7]. Blood samples were analyzed for thyroid function test based on the enzyme linked immunosorbent assay (ELISA) by using commercial kits from Human, Germany.

***Table* I** shows the Iodine status of the study children. Median UIE of Dhankuta was found to be lower (238.00 µg/L) than that of Sunsari (294.96 µg/L) which indicate adequate iodine nutrition at population level. Crystalline salt consumption was significantly more in Dhankuta than in Sunsari ($P<0.001$). The proportion of iodine deficient subject in Dhankuta and Sunsari were 25.3% and 14.1%, respectively.

There was a weak negative correlation between TSH and UIE (r= -054, $P=0.30$), with positive correlations between UIE and fT_4 (r=0.162, $P=0.055$) and UIE and fT_3 (r=0.107, $P=0.14$) in Dhankuta. Week negative correlations were observed between UIE and TSH, (r= -0.110, $P=0.239$), and UIE and fT_4 (r= -0.208, $P=0.087$), and a positive correlation between UIE and fT_3 (r=0.123, $P=0.214$) in Sunsari. Relatively higher percentage (31.8%) of subclinical hypothyroid cases were found in Sunsari ($P=0.68$) than Dhankuta (29.59%). Incidentally, neither any clinical hyperthyroid nor any clinical hypothyroid case was found in the present study. The results from the present study are consistent with a study undertaken in populations of three different median UIE in China [8]. Studies have suggested that chronic iodine intakes of at least 500µg/day in children were associated with increase in thyroid size as determined by ultrasonography [9]. High iodine intake may worsen the uptake defect of iodine with decreasing thyroid hormone synthesis.

We found higher median UIE of Sunsari than Dhankuta and a slightly higher frequency of sub clinical

TABLE I DEMOGRAPHIC CHARACTERISTICS AND IODINE STATUS OF PRIMARY SCHOOL AGE CHILDREN OF DHANKUTA AND SUNSARI DISTRICTS

District	*Median UIE* (µg/L)*	*M/F*	*Iodine status, n (%)*					
			Severe iodine deficiency (<20 µg/L)	*Moderate iodine deficiency (20-49 µg/L)*	*Mild iodine deficiency (50-99 µg/L)*	*Optimum (100-199 µg/L)*	*More than adequate (200-299 µg/L)*	*Excess (>300 µg/L)*
Dhankuta (n = 194)	238.0	97/97	13(6.7)	6(3.1)	30(15.5)	36 (18.6)	30(15.5)	79(40.7)
Sunsari (n= 192)	295.0	96/96	9(4.7)	3(1.6)	15(7.8)	42(21.9)	28(14.6)	95(49.5)

**P=0.07, M/F=Male/Female.*

hypothyroidism in Sunsari compared with Dhankuta, although the small sample size and unavailability of thyroid antibody assessment limits our study.

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