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Comparison of thyroid status of school children between the low & high socioeconomic groups.

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Abstracts:
Thyroid disorders, specially iodine deficiency disorder is a global health problem with an endemic prevalence in Bangladesh. The relative frequency of thyroid disorders varies in different countries of the world and also in the different regions of the same country as well as in different socioeconomic status. This cross sectional study was carried out in the Institute of Nuclear Medicine and Allied Science, Rangpur from 2017 to 2019 to see the prevalence of goitre and thyroid status in low and high socioeconomic groups of our school children. A total number of 615 school children aged 7 to 14 years were included in this study. Out of those 312 were selected from the different schools located in the slum areas of Rangpur city for low socioeconomic group. Other 303 were selected from three schools in the elite regions of Rangpur city for high socioeconomic group. Mean age of low socioeconomic group was 10.48±2.30 years and high socioeconomic group 10.55±2.31 years respectively. Prevalence of goitre in the study population was 13.70%. In low socioeconomic group it was 20.80% and in high socioeconomic group is was 6.60%. Serum T_3 (Mean± SD) in low vs high socioeconomic group were 1.63±0.64 and 2.52±0.61 nmol/l respectively. Serum T_4 was 109.41±32.80 in low socioeconomic group and 121.23±35.61 nmol/l in high socioeconomic group. Serum TSH was 2.51±1.36 in low socioeconomic group and 2.0±0.96 mIU/l in high socioeconomic group of study population. This study shows that the prevalence of goitre is significantly higher in low socioeconomic group, but T_3 and T_4 level are significantly lower in low socioeconomic group of school children. There was no significant difference in serum TSH level.

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I. Introduction:

Thyroid disorders are the second most common endocrine problem in Bangladesh. Thyroid disorders may occur in form of abnormality in size, shape, histological structures and function of the gland. Poverty and undernutrition are closely interrelated, although occasionally they might not coexist. Economic growth does not automatically improve the undernutrition, though it is a crucial factor. Amongst the least developed countries (LDC), our nation truly represents all the characteristic features of underdevelopment and is naturally blessed with undernutrition and malnutrition.

Malnutrition is rampant in our country and ranges between 60 to 95 percent among the children. Protein-calorie malnutrition often is present in low socioeconomic condition and may contribute to thyroid disorders, as malnutrition causes various alteration in thyroid structures and function. In a 1982 survey, it was found that 80 percent of children below 12 years of age were suffering from second and third degree of malnutrition. This high prevalence of malnutrition is due to poor and inadequate food intake as well as consequences of recurrent infections.

Thyroid disorders are global health problem. No country is entirely free from this problem. At least 110 countries have gone under away of these disorders. Reportedly, Southeast Asia (which includes Bangladesh, India and Indonesia) and Western Pacific (including China) together account for more than 50 percent of the world's population at risk of thyroid disorders including iodine deficiency disorders (IDD). The deficiency of iodine has several important health consequences which are collectively known as IDD.

The relative frequency of thyroid disorders may vary in different countries of the world and also in the different regions of the same country, as well as in different socioeconomic status.

II. Aims And Objectives:

1) General Objective:

- To compare the thyroid status in low and high socioeconomic group of school going children.

2) Specific Objective:

- To find out the relationship between the thyroid disorders and the socioeconomic condition.
- To observe the effect of universal salt iodization program.

III. Materials And Methods:

This prospective study was carried out at the Institute of Nuclear Medicine and Allied Sciences (INMAS), Rangpur, during the period of October 2017 to June 2019. A total number 615 school going children, aged between 7 to 14 years were included in this study. Out of these, 312 were selected from different schools located in the slum areas of Rangpur city for the low socioeconomic group and other 303 were selected from three schools located in the elite regions of Rangpur for high socioeconomic group.

IV. Observations And Results:

In low socioeconomic group a total of 65 children had goitre(20.8%) and in high socioeconomic group 20 children had goitre(6.6%).
Overall a total 85 (13.7%) children had goitre in the study population.
Striking difference was found in the prevalence of goitre grade in between the low and high socioeconomic group of school children. Goitre prevalence is significantly high in low socioeconomic group.

Mean (±SD) serum T_3 were 1.63±0.64 and 2.52±0.61 nmol/L in low and high socioeconomic group of study population, respectively.
Mean (±SD) serum T_4 were 109.41±32.80 and 121.23±35.61 nmol/L in low and high socioeconomic group of study population, respectively.
Mean (±SD) serum TSH were 2.15±1.36 and 2.00±0.96 mIU/L in low and high socioeconomic group of study population, respectively.

Table-I. Age and sex distribution of the study population.

Age group (years)	Low socioeconomic group			High socioeconomic group		
	Male N(%)	Female N(%)	Total N(%)	Male N(%)	Female N(%)	Total N(%)
7-8	43 (27.0)	37(24.2)	80(25.6)	38(23.3)	36(25.7)	74(24.4)
9-10	39(24.5)	36(23.5)	75(24.0)	39(23.9)	33(23.6)	78(23.8)
11-12	42(26.4)	38(24.8)	80(25.6)	42(25.8)	36(25.7)	78(25.7)
13-14	35(22.0)	42(27.5)	77(24.7)	44(27.0)	35(25.0)	79(26.07)
Total	159(50.96)	153(49.04	312(100.0)	163(53.8)	140(46.2)	303(100.0)

Table-II. Distribution of thyroid disorders in the study population:

Thyroid status	Low socio- economic group (n = 312)		High socio- economic group (n = 312)	
	N	%	N	%
Euthyroid	281	90.1	277	91.4
Hypothyroid	7	2.2	5	1.7
Hyperthyroid	5	1.6	8	2.6
Subclinical hypothyroid	15	4.8	9	2.9
Subclinical hyperthyroid	4	1.2	4	1.3

Table-III. Prevalence of goitre in different socioeconomic groups.

Socioeconomic group	Number of patients with goitre	Percentage
Low (n=312)	65	20.8
High (n=303)	20	6.13.76
Total (n=615)	85	

Table-IV. Values of T_3 in different socioeconomic groups.

Socioeconomic group	T_3 (nmol/L) (Mean±SD)	P value[a]
Low (n=312)	1.63 ± 0.64	<0.001
High (n=303)	2.52 ± 0.61	

Table-V. Values of T_4 in different socioeconomic groups:

Socioeconomic group	T_4 (nmol/L) (Mean±SD)	P value[a]
Low (n=312)	109.41 ± 32.80	
High (n=303)		

Table-VI. Values of TSH in different socioeconomic groups:

Socioeconomic group	TSH (mIU/L) (Mean±SD)	P value[a]
Low (n=312)	2.15 ± 1.36	$>0.05^{NS}$
High (n=303)	2.00 ± 0.96	

V. Discussion:

Bangladesh is an endemic country for iodine deficiency disorders (IDD). IDD play a major role in the rate and prevalence of the thyroid disorders in a population[1]. In this study the low socioeconomic group of school children 2.2% had hypothyroid, 1.6% hyperthyroid, 4.8% subclinical hypothyroid and 1.2% subclinical hyperthyroid. In high socioeconomic group, 1.7% had hypothyroid, 2.6% has hyperthyroid, 2.9% had subclinical hypothyroid and 1.3% had subclinical hyperthyroid. The type of distribution of thyroid disorders in low and high socioeconomic groups was not significant statistically (P>0.50). These findings are consistent with the study report of Laurberg *et al*[2], which showed that, hyperthyroidism is common in both mild iodine deficient and iodine sufficient areas and hypothyroidism was more common in mild iodine deficient areas. In this study, the overall goitre rate was 13.7% with incidence of 20.80% in low & 6.60% in high socioeconomic groups. It is consistent with the study reports done by Kapil *et al*.[3] where prevalence was 12.1% in boys and 11.80% in girls in school children of Kangra district of Himachal Pradesh. Meanwhile, the study result of Sohat *et al*.[4] showed that 14% school children had goitre in district Solan of Himachal Pradesh. The goitre prevalence of low socioeconomic group of school children was similar with the findings of the study done by Islam *et al*.[5], where they showed that 25.97% school children of Mymensingh district had goitre and also significant difference were existed in children of rural and urban areas. Another study by Fernando *et al*.[6] showed goitre prevalence was 18.8% in school children of Sri Lanka which also correlate with the present study. A study done by Mohiduzzaman *et al*.[7], showed prevalence of goitre 27.1% in school children of Savar, which also similar to the present study. The incidence of goitre in low socioeconomic group of school children in this study is not consistent with the findings of Monika *et al*.[8] which reflects prevalence 38.18% in school children of Tarai region of North India, which constitutes the foothills of the Himalayas that is in hyperendemic region. Goitre prevalence of high socioeconomic group of school children are consistent with the goitre prevalence in urban school children of Thailand. In that study, goitre prevalence was found as 6 percent (girls 8%, boys 4%) and the prevalence increased with age in girls[9]. Goitre prevalence in low socioeconomic group of school children was higher in the present study, may be due to effect of iodine deficiency which worsen when combined with poverty causing general malnutrition, poor sanitation and intake of food goitrogens[10]. Alteration in nutritional state, whether short-term or chronic, and whether the result of underfeeding, overfeeding or merely a change in substrate mix, affect various aspects of thyroid hormone economy, especially peripheral hormone metabolism[11]. In this study, mean T_3 concentration was found significantly lower in low socioeconomic group of school children. Protein calorie malnutrition often is present in iodine deficient areas and may contribute to thyroid abnormalities. Malnutrition causes various alteration in the thyroid structures and function.[12] Chronic malnutrition, as in protein-calorie malnutrition, and undernutrition, as in anorexia nervosa, are also associated with a decrease in serum T_3 and T_4 concentration [13]. This is consistent with the reports of other studies. Turkay *et al*.[14], showed that circulating T_3 and T_4 levels were all reduced in malnutrition group of children due to effects of protein energy malnutrition in the circulating thyroid hormones. Low level of thyroid hormone binding protein in low socioeconomic groups thought to be due to malnutrition, resulting from decreased protein intake due to poverty and reduced hepatic biosynthesis of these protein in liver [14.] Ingenbleek and Becker[13] observed a low level of serum T_3 in undernutrition and malnutrition children and postulated that a partial inhibition of conversion of T_4 to T_3, starting early in the process of calorie deficit. Kiy[15] also opinioned that diminished peripheral conversion of T_4 to T_3 could be the main factor leading to decreased T_3 concentration in undernourished children. Mean serum T_4 in low socioeconomic group of population was significantly lower, and this is consistent with the observation of Graham and Blizzard[16] who observed that the total T_4 level in undernourished children was significantly lower than healthy control group. Mean TSH level in low socioeconomic group was relatively higher, but within normal limit and statistically not significant, this may be due to compensatory mechanism to maintain the euthyroid state. A normal serum TSH concentrations and their exogenous response to TRH in malnutrition and undernutrition[11,14].

LIMITATIONS OF THIS STUDY

This is a study with small number of children, but it carries immense socioeconomic importance. For that, in future, it can be continued as an epidemiological study.

VI. Conclusion And Recommendation

Goitre prevalence was found significantly high in school children belonging to low socioeconomic group. Serum T_3 and T_4 were found significantly higher in high socioeconomic group of school children than children of low socioeconomic group. No significant difference was found in serum TSH in either group of school children.

No difference was also found in thyroid size on palpation when both groups of school children were compared. Inadequate intake of food, mainly due to poverty in people of slum areas, makes an individual more prone to infection and decreases his resistance to overcome it. Malnutrition is particularly severe among women and children. Protein calorie malnutrition often is present in iodine-deficient areas and may contribute to thyroid pathology. Since goitre is more prevalent in the low socioeconomic group of children and many of these individuals are undernourished, moreover, the low content of protein in the diet or low calorie intake or both might play a major role in pathogenesis of the goitre.

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