

EXTRA MURAL RESEARCH

Prevalence of Thyroid Disorders in School Children In Delhi – Post Iodization Scenario An epidemiological survey conducted under the first phase of EMR project on “Effects of Homoeopathic treatment on natural history of autoimmune thyroiditis”

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Screening of 4543 children between 6-18 years of age from different schools of Delhi was done during the first phase of research study under EMR project by AYUSH, for thyroid function status-clinically, serologically & ultrasonographically. Data of 4506 children has been analyzed & it has been found that goiter is prevalent at mild endemic level in children (17%) even after two decades of iodization. Significant increase in anti TPO ab positivity (6.39%) and thyroid dysfunction (11.92%) raises suspicion about the role of environmental goitrogens and prolonged iodine supplementation.

Key words: anti thyro-peroxidase antibody (anti TPO ab), free T₃ (FT₃), free T₄ (FT₄), goiter, Iodine deficiency disorders (IDDs), subclinical hypothyroidism, thyroid autoimmunity, universal salt iodization (USI).

Introduction

Iodine is an important micro-nutrient required for human nutrition. Iodine deficiency disorders (IDDs) are one of the major world wide public health problems of today which causes wide spectrum of disabilities. It includes impairment of reproductive functions, lowering of IQ levels in school age children, goiter, deaf mutism, mental defects, weakness and paralysis of muscles as well as lesser degree of physical dysfunction¹. Many studies conducted all over India had shown high prevalence of goiter²⁻⁵. A nation wide goiter survey revealed that out of 283 studied districts of 29 states and 04 Union Territories, 235 have prevalence of endemic goiter⁶. In an attempt to eliminate iodine deficiency and to comply with the international goal of Universal Salt Iodization (USI), compulsory iodization of all table salts was introduced in India in 1983. In June 1992 the National Goiter Control Programme was appropriately redesigned as “National Iodine Deficiency Disorders Control Programme (NIDDCP)”, in recognition of the spectrum of disorders due to iodine deficiency.

Optimal thyroid function is essential for normal growth and development in young population. Autoimmune thyroiditis is becoming increasingly prevalent in children all over the world, as evident from goiter surveys. Subjects with autoimmune thyroiditis manifest clinically as euthyroidism, sub-clinical hypothyroidism, overt hypothyroidism. Presence of anti TPO ab predicts progressive thyroid failure consequently affecting growth of children.

It was proposed to study the immunomodulatory effect of homoeopathic system of medicine in autoimmune thyroiditis, well in line with the priority area regarding research on the preventive and promotive aspects of AYUSH practices and therapies.

Objectives

To evaluate the prevalence of goiter, thyroid functional status, and presence of thyroid autoimmunity among school children in Delhi.

Material & Methods

Selection of study areas: Seven schools were randomly selected covering different regions of Delhi. The cluster sampling method was done. Screening was done in three Government and four public schools after prior permission of Directorate of Education and Principals of the respective schools. Schools which are

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situated in vicinity of Dr. B.R. Sur Homoeopathic Medical College & Hospital (SHMC) & Institute of Nuclear Medicine and Allied Sciences (INMAS) were given preference to have easy accessibility for the follow ups.

Selection of population: The school children in age group of 6 – 18 years from both the sexes were screened after taking consent from the parents. Each child in every school was given a reference number and each school was coded.

Screening Module: The screening was conducted in 4543 school children. 4506 children were evaluated clinically for enlargement of thyroid (goiter) by palpation method endorsed by WHO/UNICEF/International Council for Control of Iodine Deficiency Disorders (ICCIDD)⁷.

Children were screened for thyroid disorders by thyroid function tests (FT₃, FT₄ and TSH), serological markers for thyroid autoimmunity (anti TPO ab) and echogenicity and nodularity of thyroid by ultrasonography.

All the investigations were done in children whose parents gave consent for them.

All investigations were performed at INMAS, Timarpur, Delhi.

Kits used

FT₃, FT₄ – RIA (Immunotech, Beckmen Coulter, Pragni, Czech Republic)

FT₄ normal range: 11.5 – 23 pM/L

FT₃ normal range: 2.5 - 5.8 pM/L

TSH – Immunoradiometric assay (IRMA, Immunotech)

Normal range 0.17 – 5.2 µIU/ml

Range of measurement: 0.025-150 µIU/ml

Intra assay Coefficient of Variation: <3.7%

Inter assay Coefficient of Variation: <8.6%

Anti TPO Antibodies: Electro Chemiluminescence assay (ECL, Cobas-Roche Elecsys 1010 analyzer)

Range of measurement is 5-600 IU/ml

TPO values e³⁴ IU/ml are considered + ve

Intra assay Coefficient of Variation was < 4.2%

Inter assay Coefficient of Variation < 9.2%

Ultrasound– Portable US using 7.5 MHz linear transducer to assess echogenicity and nodularity.

Results

Goiter prevalence

Total of 4506 children in the age group of 6 – 18 years are included in the study (34.73% boys, 65.27% girls).

Total goiter prevalence: 768/4506 = 17%

Goiter prevalence in boys: 152/4506 = 3.37%

Goiter prevalence in girls: 616/4506 = 13.67%

Goiter grade I: 15.90%

Goiter grade II: 1.10 %

Clinically palpable nodules: 0.11%

Incidentalomas on ultrasonography: 0.02%

Table 1: Goiter Prevalence in different age groups

Goitrous prevalence (n=739)		
Age group	Boys (n=146)	Girls (n=593)
6-11 yrs	52/146=35.61%	105/593=17.70%
11-15 yrs	65/146=44.52%	246/593=41.48%
15-18 yrs	29/146=19.87%	242/593=40.82%

Prevalence of anti TPO antibodies:

Serological test for anti TPO ab is done in 2844 children (goitrous and non goitrous).

Total number of girls undergone for the serological test for anti TPO ab= 2110

Total number of boys undergone for the serological test for anti TPO ab= 734

Table 2: Goiter Prevalence in both sexes

Total prevalence of anti TPO antibodies: (n=2844)	Total TPO ab found positive = 6.39% (182/2844)
Boys	1.05%
Girls	5.34 %

Prevalence of thyroid dysfunction in school children in Delhi

Total of 4284 children have been screened for thyroid dysfunction and 511(11.92 %) have been found to be having different thyroid disorders which have been depicted in table 4.

Table 3: Prevalence of anti TPO ab in goitrous and non goitrous subjects

	Prevalence of TPO ab in boys	Prevalence of TPO ab in girls	Total TPO ab prevalence
Goitrous subjects	10.31 % (n=146)	13.5 % (n=593)	12.93 % (n=739)
Non goitrous subjects	2.63 % (n=1311)	4.64 % (n=2234)	4.08 % (n=3545)

Table 4: Prevalence of Thyroid dysfunction in children

Total No of FT3, FT4, TSH tests done (n- 4284)		Hypothyroidism		Hyperthyroidism	
		Overt	Subclinical	Overt	Subclinical
Goitrous Subjects	739	1.89%	15.29%	0.54%	0
Non goitrous subjects	3545	0.93%	9.47%	0.14%	0.16%
Goitrous girls	593	2.19%	15.85%	0.50%	0
Non Goitrous girls	2234	0.98%	9.4%	0.22%	0.22%
Goitrous boys	146	0.68%	13.01%	0.68%	0
Non goitrous boys	1311	0.83%	9.6%	0	0.07%

Prevalence of thyroid dysfunction in goitrous subjects

Total goitrous subjects: 739

Boys with thyroid dysfunction amongst goitrous subjects: 21/146 = 14.38 %

Girls with thyroid dysfunction amongst goitrous subjects: 110/593 = 18.54 %

Total prevalence of thyroid dysfunction amongst goitrous subjects 131/739 = 17.72 %

Prevalence of thyroid dysfunction in non goitrous subjects

Total non goitrous subjects: 3545

Boys with thyroid dysfunction amongst non goitrous subjects: 138/1311= 10.52 %

Girls with thyroid dysfunction amongst non goitrous subjects: 244/2234 = 10.92 %

Total prevalence of thyroid dysfunction amongst non goitrous subjects: 380/3545= 10.71%

Discussion

The most widely accepted marker to evaluate the severity of Iodine Deficiency Disorder (IDD) in a region

is the prevalence of endemic goiter in school going children. On the basis of its prevalence, WHO/UNICEF/ICCIDD recommended the criteria to understand the severity of IDD as a public health problem in a region. According to these criteria, a prevalence rate of 5.0 – 19.9 % is considered as mild; 20.0 – 29.9 % as moderate and prevalence rate of above 30 % is considered as a severe public health problem.

Delhi was not included in the classical Himalayan endemic goitre belt described by Ramalingaswami in his various studies done in 1953⁸ & 1973⁹. In 1979 a survey for goiter prevalence in Delhi was conducted by Pandav *et al*¹⁰ with 3200 school children for goitre prevalence in the two areas of Union Territory of Delhi namely Kalkaji and Chandani Chowk. The observed prevalence of goitre in 2214 school children of Kalkaji was 54 per cent while it was 55 per cent in Chandani Chowk school children. Goitre prevalence was significantly greater in girls, so also the severity of goitre among them.

A study conducted by Chaturvedi S. *et al*, Department of Preventive and Social Medicine, University College of Medical Sciences (UCMS), Delhi on a sample size of 1075 children from schools or rural south Delhi have shown goiter prevalence of 16 % after the successful implementation of Universal Salt Iodization (USI) in Delhi.

In a country wide study conducted by Marwaha *et al* (2003) on a sample size of 14762 school children in age group of 6 – 18 years, from different states and union territories of India. Children were evaluated for goiter prevalence, urine iodine & thiocyanate excretion, functional status of thyroid as well as serological & cytopathological markers for thyroid autoimmunity. The overall goiter prevalence was 23 % (27.1 % girls and 17.8 % boys). Subjects belonging to poor socio economic strata had higher goiter prevalence. High titres of thyroid antibodies were present more in goitrous subjects than in non goitrous and more in girls (7.3 %) than boys (2.35 %). Autoimmunity was positive more in goitrous subjects with thyroid dysfunction than in euthyroid subjects. The study suggested that anti thyroidal environmental goitrogens may have a possible role for persistence of goiter. Prolonged iodine exposure may have some role in significant increase in thyroid dysfunction¹¹.

When a group of Greek school children was studied in 1994 the prevalence of autoimmune thyroid disorder diagnosed from presence of thyroid auto antibodies combined with a characteristic pattern of thyroiditis at ultrasonography of the thyroid gland was 3.3% (Zois *et al*, 2003). A new status on iodine intake and thyroid autoimmunity in school children was made in 2001 and the prevalence of autoimmune thyroid disorder had increased significantly to 9.6% (Zois *et al* 2003).

Five years after the introduction of iodized salt in Sri Lanka the prevalence of Tg antibodies was high among school children. The interpretation of the authors was that this was the result of increased iodine intake (Premawardhana *et al* 2000). Three years later when the status was re evaluated the prevalence of Tg antibodies had decreased significantly (Mazziotti *et al* 2003). Unfortunately no pre iodine data on thyroid auto antibodies was available.

In this present study conducted during the first phase of the research project on 4506 school children between the age group of 6 – 18 years, total goiter prevalence is found to be 17 % (grade I - 15.9 %, grade II - 1.10 %). Girls have 13.67% of goiter prevalence rate in comparison to boys, having prevalence rate of 3.37%. The prevalence of goiter increases with age, lowest in the age group of 6 – 11 years and maximum in the age group 11 – 15 years (pubertal age group).

Goitrous children have three times more prevalence of TPO ab than non goitrous group. The prevalence rate of auto immunity in goitrous boys is 10.31 % and goitrous girls is 13.5 % with overall prevalence of 12.93 % in goitrous subjects. In non goitrous subjects, the prevalence rate of auto immunity in girls is 4.64 % and boys is 2.63 % with overall

prevalence rate of 4.08 %.

Total prevalence of thyroid dysfunction found to be 11.92 % (17.72 % amongst the goitrous and 10.71 % in non goitrous subjects). Most common thyroid dysfunction is subclinical hypothyroidism in both the sexes.

There are many problems associated with the comparison of results obtained from different epidemiological studies on thyroid auto antibodies due to differences in the use of bio chemical/immunological methods, absence of standardization of assays, use of assays with different sensitivity and specificity and other differences in technical details of the assays applied. Moreover cut off values for TPO ab and Tg antibody are not always well documented and varied largely (Hollowell *et al*; Laurberg *et al*, 1998, Pederson *et al*, 2003)

Goiter prevalence of 17% even after iodization Programme in Delhi indicates that iodine deficiency is not the sole reason for it. Significant presence of auto immunity points towards some environmental goitrogens which may be responsible for it. Indian cyanogenic plant foods like cabbage, cauliflower, radish, turnip, mustard etc, which contains large amounts of thiocyanate precursors namely cyanogenic glucosides, thioglucosides and thiocyanates may have potent anti thyroid activity and cyanogenic effect which may be responsible for significant presence of auto immunity and goiter¹². It seems that sudden increase in iodine intake may be important for the generation of thyroid auto antibodies then exposure to a constant but high iodine level (Kahaly *et al*, 1998; Laurberg *et al*, 1998).

Role of homoeopathy in modulating the auto immunity and thyroid dysfunction in children on larger sample size is yet to be explored during second phase of the study.

Conclusions

- It has been observed that after more than two decades of universal salt iodization there is remarkable decline in the goiter prevalence but mild endemicity still persists.
- There are some other reasons responsible for goiter prevalence other than low iodine intake e.g. environmental goitrogens, which may be responsible for it. Significant presence in anti TPO ab positivity and thyroid dysfunction raises suspicion and therefore further research studies regarding the post iodization iodine status of the region need to be carried out.

- The most common form of thyroid dysfunction in school going children in Delhi is subclinical hypothyroidism.
- The above observations suggest there is a need to screen and study large sample sizes to better understand the relation of iodine and thyroid antibodies.

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