Research Article

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PREVALENCE OF THYROID DYSFUNCTION IN RAYALASEEMA REGION-POST IODIZATION SCENARIO

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Abstract: Rayalaseema is an endemic area for iodine deficiency. Also consumption of sea food is deficient in this region. Hence, it raises a question of thyroid dysfunction prevalence in this region. There are no recent scientific reports on the prevalence of thyroid disorders in Rayalaseema region in Andhra Pradesh. The present study was designed with an objective to assess the prevalence of thyroid dysfunction in post iodization phase. 700 subjects (373 females, 327 males) who have fulfilled the selection criterias were taken into current study. The subjects were analyzed for levels of tri-iodothyronine (T3), tetra-iodothyronine (T4), and thyroid stimulating hormone (TSH). Based on their TSH levels subjects were divided into four groups: 60% euthyroid, 10.57% hypothyroid, 22.14% subclinical hypothyroid and 7.28% were hyperthyroid. Prevalence of thyroid dysfunction was 40% includes 62.28% females and 30.71% males. In the thyroid disorders, prevalence of overt hypothyroidism was 24.42%, subclinical hypothyroidism 55.35% and overt hyperthyroid 18.21%. The prevalence of thyroid dysfunction was 40% in Rayalaseema region, post iodization scenario. Subclinical hypothyroidism was the highly prevalent thyroid dysfunction in Rayalaseema region. Subclinical hypothyroidism was highly prevalent thyroid dysfunction in Rayalaseema region. This study recommends sensitive estimation of TSH level as a routine parameter in clinical check-up of Rayalaseema region population. This will help to detect thyroid dysfunction in most the cost effective way at an early stage and eradicate associated comorbidities in this region.

Keywords: Iodine, Prevalence, Rayalaseema, T3, T4, TSH.

INTRODUCTION

Thyroid gland secretes two hormones, thyroxine (3, 5, 3'5'-L-tetraiodothyronine) and triiodothyronine (3, 5, 3'-L triiodothyronine), commonly known as T_4 and T_3. Dietary iodine is the basic element involved in the synthesis of thyroid hormones. Hypothyroidism and Hyperthyroidism are the primary pathological conditions of thyroid gland. It is estimated that in India 42 million people suffer from thyroid disorders. Factors that contribute for development of thyroid disorders are quantity of iodine intake, gender, age ethnic and geographical factors.

Rayalaseema is an endemic area for iodine deficiency. There are no recent scientific reports on the prevalence of thyroid disorders in Rayalaseema region in Andhra Pradesh. The present study was designed with an objective to assess the prevalence of thyroid dysfunction in post iodization phase scenario.

MATERIAL AND METHODS

This was a cross sectional study, conducted in Department of Clinical Biochemistry, Santhiram Medical College and General Hospital (SRMC & GH) Nandyal. 700 subjects were selected randomly among those who visited outpatient department of SRMC & GH from October 2012 to December 2012. The following criterias were applied for the selection of subjects.

Inclusion criteria:

Non-smokers, non-alcoholics or not on any medication.

Exclusion criteria:

Subjects with renal, hepatic or pancreatic disorder, diabetes mellitus or undergone thyroidectomy, patients with history of thyroid disorders, any exposure to radioiodine or familial hypercholesterolemia.

Sample collection:

Under aseptic conditions, 5ml of venous blood was collected by venipuncture as per the standard protocol. The samples were allowed to clot and then centrifuged at 2500 rpm for 10 minutes.

Assay of thyroid function panel:

Triiodothyronine (T3), Tetra-iodothyronine (T4) and Thyrotrophin (TSH) was estimated on Chemiluminescence Immuno Assay (CLIA).

Criteria for thyroid dysfunction:

Based on TSH values the subjects were divided into four groups. FT_4 levels were analyzed in subclinical hypothyroid group to confirm it as subclinical (Table.1).

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Table 1: Classification of thyroid dysfunction

TSH IU/ml	GROUPS
< 0.35	Overt Hyperthyroid
0.36-5.4	Euthyroid
5.5-10	Subclinical Hypothyroid
>10	Overt Hypothyroid

Statistical analysis:

Biostatistical Analysis was done by using Microsoft Office Excel with Windows operating system.

RESULTS

Out of 700 screened subjects, 373 (53.71%) were females (♀) and 327(42.71%) were males (♂). Their age ranged from 1 to 60 years. Based on their TSH levels, 74 (10.57%) subjects (58 ♀, 16♂) had overt hypothyroidism, 155 (22.14%) subjects (97 ♀ +58♂) showed subclinical hypothyroidism, and 51 (7.28%) subjects (39 ♀ + 12♂) exhibited overt hyperthyroidism. Prevalence of thyroid dysfunction was 40%, includes 26.42% hypothyroidism, 18.21% hyperthyroidism, 55.35% subclinical hypothyroidism.

Table.1: Shows criteria for classification of thyroid dysfunction based on TSH levels

Table.2: Shows prevalence of thyroid dysfunction at various places of India and other countries.

Table 3: Shows iodine content in dietary salt of Rayalaseema population in 2012 and 2001.

Table.4: Shows gender wise distribution of thyroid dysfunction among diseased subjects.

Table.5: Show the distribution of thyroid dysfunction among various age groups. Maximum number of the affected subjects lies between 15-45 years age. Hypothyroidism and subclinical hypothyroidism were highly prevalent than hyperthyroidism.

Table.6: Shows the mean and standard deviation of T3, T4, and TSH in all the four study groups: Hypothyroid, Hyperthyroid, Subclinical hypothyroid and Euthyroid.

Table.7: Shows comparison of difference of means between Euthyroidism and other thyroid dysfunctions. It gives an impression that only TSH levels will be changed in subclinical hypothyroid.

DISCUSSION

Thyroid hormones (T_3 and T_4) have many important biological functions. The major function is to control basal metabolic (BMR) rate and calorigenesis and to stimulate neural development, adrenal activity and carbohydrate, protein and lipid metabolism. Iodine is the major element in the synthesis and secretion of these hormones, deficiency of iodine lead to e dysfunction of thyroid gland.

In the present study, it was found that the prevalence of thyroid dysfunction in Rayalaseema region is about 40%: 10.57%-hypothyroid, 22.14%-subclinical hypothyroid and 7.28%-were hyperthyroid. In thyroid dysfunction, 26.42% had overt hypothyroidism, 55.35% showed subclinical hypothyroidism and 18.21% exhibited hyperthyroidism. The studies of Anuradha *et al.*,[1] Ravi Shekar et al.,[2] Madhukar *et al.*,[3] Lincy K Skaria *et al.*,[4] A. Regmi *et al.*,[5] Yu –Shan *et al.*,[6] Rebecca *et al.*,[7] Colorado study, [8] at various places differs with the current study (Table.2).

Table.2: Prevalence of thyroid dysfunction at various places

Author	Area	Year	Prevalence of TD (%)	Hypo thyroid	Hyper thyroid	SCH
Anuradha K *et al.*,	SEC& HYD	2012	30.0	7.6	9.5	12.9
Ravi Shekar *et al.*,	Costal Andhra	2012	17.2	31.3	18.7	50.0
Madhukar *et al.*,	Nepal	2012	25.0	8.0	9.0**	8.0
Lincy KS etal	Chattisgharh	2011	79.4	59.37	7.33	12.66
Regmi A *et al.*,	Nepal	2011	25.7	3.7	7.9*	14.1
Mao YS *et al.*,	Mainland	2010	4.5	0.2	0.7***	3.4
Rebecca *et al.*,	Pondicherry	2009	15.8	2.00	4.3	9.5
Gas JC *et al.*,	U S	2001	11.7	0.4	0.1	9.0
In current study	Rayalaseema	2013	40.0	10.57	7.28	22.14

Hyper + Subclinical hyperthyroidism: *3.3+4.6; **6+3;***0.3+0.4; SEC &HYD: Secunderabad and Hyderabad; SCH: subclinical hypothyroidism; US: United States

Two geographical factors, soil erosion and high fluoride levels in water are likely to cause for thyroid dysfunction in this region. Soil *erosion* causes paucity of iodine from superficial layer of soil, consumption of foodstuffs grown in such iodine deficient soils may lead to Thyroid dysfunction. Fluoride is used as an anti-thyroid drug [9]. Prolonged consumption of fluoride in water can interfere with uptake of inorganic iodine, thyroid iodine-concentrating mechanism and, thereby decreasing the thyroid hormone synthesis [10].

Minimum 15 ppm iodine content in dietary salt is required to meet RDA of iodine (150µg /day) in adults. In this study 137 salt samples collected from subjects

and were analyzed for iodine content, using National Institute of Nutrition kit for iodated salt [Table.3]. Also, it has been observed that consumption of sea food was very less in this region. It was found that more than 40.14 % salt samples had iodine content >5 ppm. It gives an impression that insufficient iodine intake and imbalance between iodine and fluoride consumption may be the prominent causes for thyroid dysfunction in this region.

Table.3: Iodine content of salt samples collected from diseased subjects

Iodine content of salt (ppm)			
>5	**5-15**	**15-30**	**>30**
55(40.14%)	49(35.76%)	30(21.89)	3(2.18)

ppm: part per million

In the present study, out of the 40% of thyroid dysfunction noted, females reported to have 62.28% whereas in males, it was 30.71% [Table.4].

Table.4: Gender wise distribution of Thyroid dysfunction

Gender	Hyper-Thyroid %	Hypo- Thyroid %	Sch %	Total %
Female	13.2	20.71	34.64	69.28
Male	4.28	5.71	20.71	30.71
Total	18.21	26.42%	55.35	100

Similar findings are reported by Aminorroaya *et al.*, [11] 13% vs. 5% and Usha MV *et al.*, [12] 11.4% vs. 6.2%. Females were affected more than males. This may be due to sex difference in the prevalence of autoimmune disease (Hashimoto's thyroiditis). Thyroid dysfunction in females causes first trimester abortion, still birth and prematurity.

From this study it was observed that 8.18% children below 14 years of age suffered from thyroid dysfunction [Table.5].

Table.5: Age wise distribution of thyroid dysfunction

Age Group	Hyper-Thyroid (%)	Hypo-Thyroid (%)	Sch (%)	Total (%)
<14 years	1.07	1.4	5.71	8.18
15-30 years	7.14	6.42	21.07	34.63
31-45 years	6.07	8.92	14.64	29.63
>45 and above	3.92	9.64	13.92	27.48
Total	**18.57%**	**26.07%**	**55.71%**	**100%**

SCH: Subclinical hypothyroid

Chauchan VK *et al.*, [13] noted 11.92% thyroid dysfunction among school children of Delhi in the year 2009. This may be associated with iodine deficiency and goitrogens rather than autoimmunity which can ultimately lead to impairment of physical growth and mental retardation.

Subclinical hypothyroidism is the prominent thyroid dysfunction in Rayalaseema region- a major finding in the current study. The potential risk factors associated with subclinical hypothyroidism include progression to overt hypothyroidism, cardiovascular diseases, hyperlipidemia, and neuropsychiatric disorders. The patients associated with subclinical hypothyroidism have slightly elevated TSH levels in conjugation with normal thyroid hormone (T3, T4) estimates [Table.6 - 7].

Table.6: Mean and standard deviation

THYROID DYSFUNCTION	T3	T4	TSH
Hypothyroidism	0.84±0.34	6.72±2.34	54.92±19.32
Hyperthyroidism	6.02±2.48	22.14±4.16	0.08±0.10
SCH	1.08±0.31	8.15±2.31	8.14±1.12
Hyperthyroidism	1.10±063	8.86±1.76	2.31±1.26

SCH: subclinical hypothyroidism

Table.7: Comparison of means between euthyroid and other disorders

EUTHYROIDISM (420) Vs	T3	T4	TSH
Hypo thyroidism (92)	0.0001	0.0001	0.0001
Hyper thyroidism (73)	0.0001	0.0001	0.0001
Sub. hypothyroidism (115)	0.741*	0.67*	0.0001

*Not significant

This study recommends sensitive measurement of TSH level as a routine parameter in clinical check-up of Rayalaseema region population. This will help to detect thyroid dysfunction in most the cost effective way at an early stage and eradicate associated comorbidities in this region.

CONCLUSION

In post iodization scenario, the prevalence of thyroid dysfunction has not declined in this region. Further advanced studies among larger population are required to generate more reliable data on status of thyroid dysfunction in the Rayalaseema region. In addition; the role of goitrogens and high fluoride levels in water must be extensively investigated and defined in this region.

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