



Studies on Human “Thyroid disorders”: Based upon assay of TSH and Thyroid Hormones with different Parameters in ‘Rural and Urban population’ in Ujjain district, MP, India

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Abstract

Thyroid disorder is one of the most serious health problems due to iodine deficiency in the world, especially in the developing countries. Adults are mostly affected by thyroid disorder. Both male and female thyroid patients were studied from Nov. 2009 to May 2013, from R.D. Gardi medical college, CHL Apollo hospital, and J.K. Nursing Home. Among the selected patients 69.33% were female and 30.66% were male. The present study include following aspects- Social status of people, Nutritional status and feeding habit, Climatic condition, Genetic defects etc.

Keywords: Thyroid disorder hypothyroidism, hyperthyroidism, triiodothyronine (T3), thyroxine (T4) and thyroid stimulating hormone (thyrotropin-TSH), Goiter, cretinism, myxoedema, hashimoto's thyroidities etc.

Introduction

Thyroid disorder is a ‘Public health problem’ also in Ujjain district (M.P.). Researchers have carried out several Epidemiological surveys on Thyroid disorders in different part of India, but there is no information available in the Malwa region of Madhya Pradesh. The main role of Thyroid is to regulate Basal Metabolic Rate (BMR). Thyroid produces two hormones - 80% Thyroxine (T4), and 20% Triiodothyronine (T3). In Human being the normal range of T4 is 5 to 13.5 ug/dl (Micro grams per deci liter), and Thyrotropin (TSH) is 0.4 mU/L (mili unit/liter) ^{1,2}. In the present investigation, data were selected from exclusive “Thyrocare hospitals R.D. Gardi medical college, CHL Apollo, and J.K. Nursing Home. Investigation shows that Thyroid disorder is one of the serious health problems. Hypothyroidism is mostly described in Human population; significantly, it is more common in female, than males of different age groups. Thyroid disorder occurs mainly due to Iodine deficiency. Iodine is found in cauliflower, cabbage, germinating seeds, soya bin oil, fish oil, eggs, milk, fast food such as poha, chocolates etc³ (figure-1)

Types of Thyroid Disorders: The low and high secretion of hormone cause Thyroid Disorder, Include: i. Hypothyroidism: Cretinism, Myxoedema, Simple goiter, Hashimoto's disease (Autoimmune disease). ii. Hyperthyroidism: Toxic Goiter, Thyroiditis, Grave's disease.

Causes: Too much or too little Thyroid Hormone, Deficiency of Iodine in body, Abnormal Thyroid growth, Nodules or Lumps within the Thyroid gland, Thyroid cancer.

Symptoms: i. Hypothyroidism: Fatigue, Weakness, Weight gain, Coarse dry hair, Dry rough pale skin, Hair loss, Cold intolerance, Muscle aches, Constipation, Irritability, Memory loss, Abnormal menstrual cycles, etc. ii. Hyperthyroidism: Sensitive to heat, Hyperactive, Eat excessively, Toxic Goiter, High temperature, Increased heart beats, Large eyes (Exophthalmic goiter) etc.

Abnormalities related to Hypothyroidism: i. Goiter: Any enlargement of the Thyroid Gland is called Goiter and antithyroid substance that causes Thyroid enlargement are called Goitrogens (figure-2), ii. Cretinism: It is caused due to congenital absence or mal development of Thyroid in Infant symptoms are short status with deformed teeth and bones. Abnormal viscera are relatively large resembling pot and belly appearance. iii. Myxoedema: Hypothyroidism in adult Human being produces Myxoedema or Gulls disease. it shows following symptoms-the face becomes swollen, BMR lowered by 30-45%. Mental dullness and loss of memory, Hair tend to fall. Appetite is reduced etc. iv. Hashimoto's disease: Hashimoto's disease is an Autoimmune disease in which the thyroid gland is gradually destroyed by a variety of cell and antibody mediated immune processes. It was the first described by the Japanese specialist Dr. Hashimoto Hakaru in Germany in 1912.

Abnormalities related to Hyperthyroidism: Grave's disease and Exophthalmic goiter Grave's disease is an autoimmune. Disease where the thyroid is overactive producing an excessive amount of thyroid Hormones. Grave's disease owes its name to the Irish doctor Robert James Grave's, who described a case of goiter with Exophthalmos in 1835⁴ (figure-3)

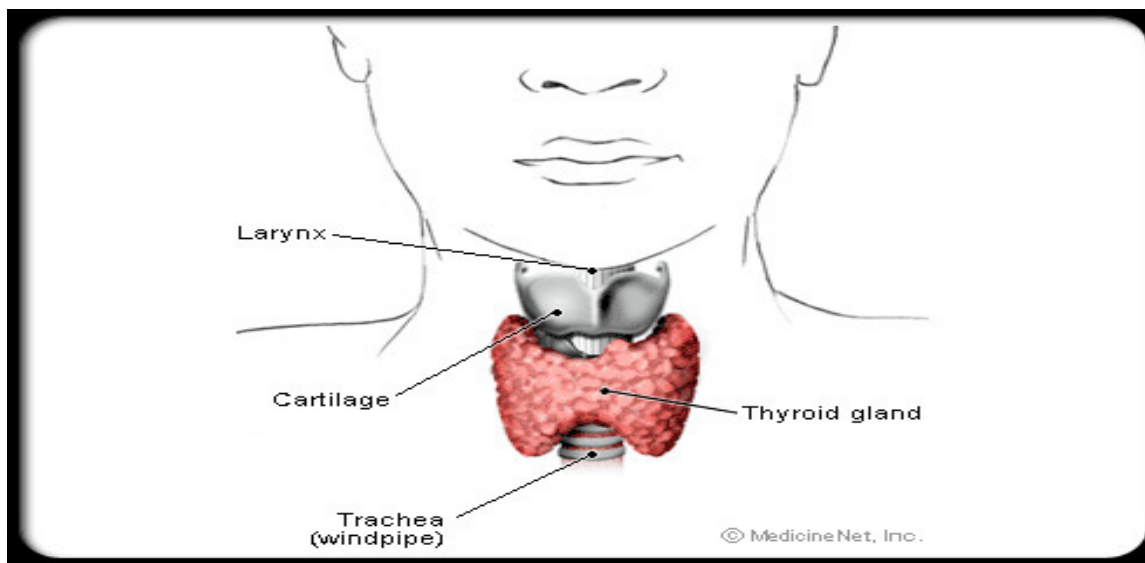


Figure-1,2,3

Shows position of Human thyroid gland, Hypothyroidism- Goitre and Hyperthyroidism: - Exophthalmic Goiter respectively

Material and Methods

This was a prospective study concluded during 35 months periods from November 2009 to May 2013. A total 4373 Human patients of both sexes were studied from exclusive Hospitals R.D. Gardi Medical College, 'CHL Apollo' and 'J.K. Nursing home' located in Ujjain (M.P.). Measurement of serum Thyroid hormones is done by elisa kit.

TSH testing is used to: i. Diagnose a thyroid disorder in a person with symptoms. ii. Screen newborns for an underactive thyroid. iii. Monitor thyroid replacement therapy in people with hypothyroidism, iv. Diagnose and monitor female infertility problems, v. Help evaluate the function of the pituitary gland (occasionally). vi. Screen adults for thyroid disorders, although

expert opinions vary on who can benefit from screening and at what age to begin.

Table-1
Summarizes test results and their potential meaning

TSH	T ₄	T ₃	INTERPRETATION
High	Normal	Normal	Mild (subclinical) hypothyroidism,
High	Low	Low or normal	Hypothyroidism
Low	Normal	Normal	Mild (subclinical) hyperthyroidism,
Low	High or normal	High or normal	Hyperthyroidism,
Low	Low or normal	Low or normal	Non-thyroidal illness; rare pituitary (secondary) hypothyroidism.

Diagnosis of thyroid Hormone is done by “Elisa Kit”: ELISA is a simple and highly sensitive method of analysis that allows for simultaneous and rapid quantification of a large no. of sample. “Enzyme immune assay” for the quantitative determination of Thyroid hormone (T_3 and T_4) and pituitary hormone (TSH) concentration in Human serum/plasma is done by ELISA KIT. This micro plate enzyme immunoassay Methodology provides the technician with optimum sensitivity while requiring few technical manipulations.

Principal: In a competitive ELA, there exists a competitive reaction between native antigen and enzyme Antigen conjugate for a limited number of insolubilized binding sites on the antibody coated on the micro well. After the antigen, antibody reaction has taken place, the fraction of the antigen in the conjugate or native antigen from the sample, which does not bind to the coated well, is washed away. The enzymatic activity in the antibody bound fraction, which is Inversely proportional

to the native antigen concentration, is measured by addition of the Substrate, by utilizing calibrators of known antigen values, a dose response curve can be generated from which the antigen concentration in a sample can be found out^{5,6}.

Results and Discussion

The study has been done on 4373 patients and their age was between 1 to 80 Years. Children (0-10), Teenagers age (11-20), Younger age (21-30) (31-40) (41-50), Older age (51-60) (61-70) and (71-80) Years (table- 2, 3 and figure 4, 5). The studies were carried out from Nov. 2009 to May 2013. A total of 3047 Females and 1326 Males were studied. A complete data set become available from Female and Male are given in the following Tables⁷. The commonest age group affected by Thyroid disorder is 21-60 years. All patients belong to Rural, Urban and Socio-economic Classes (table-4). Earliar studies by same Authors also shown more or less same pattern⁸.

Table-2
Show female thyroid disorders in “Local Human Population” based upon TSH and T4 Assay, also include Statistical analysis

Age group	Thyroid conditions and number of Female patient				Total	Female vs. male significant
	At risk 2.5 mU/L	Mild HPO TSH -4.0 mU/L	Severe HPO TSH -10.0 mU/L	HPR T4Above 11.6 mg/dl		
0-10	56	59	06	01	122	< 0.1
11-20	158	140	13	03	314	<0.025
21-30	374	285	59	04	722	<0.001
31-40	308	252	17	08	585	>0.001
41-50	344	346	25	46	761	>0.001
51-60	196	123	10	02	331	>0.01
61-70	75	47	02	03	127	<0.05
71-80	37	47	01	00	85	< 0.1
Total	1548	1299	133	67	3047	>0.001

Table-3
Show male thyroid disorders in “Local Human Population” based upon TSH and T4 assay

Age group	Thyroid conditions and number of Male patients				Total
	At risk 2.5 mU/L	Mild HPO TSH-4.0 mU/L	Severe HPO TSH -10.0 mU/L	HPR Above T4-11.6 mg/dl	
0-10	25	23	01	00	49
11-20	63	50	07	00	120
21-30	143	95	07	00	245
31-40	206	108	13	05	332
41-50	199	97	15	05	316
51-60	78	50	07	01	136
61-70	45	34	02	00	81
71-80	26	21	00	00	47
Total	785	478	52	11	1326

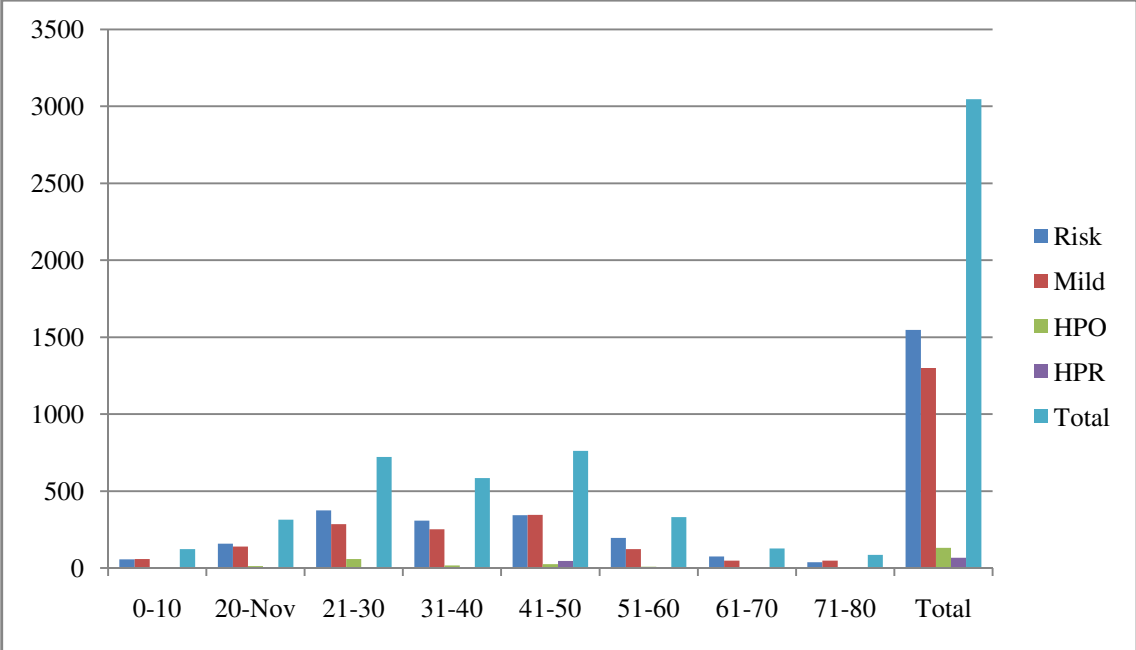


Figure-4

Show female thyroid disorders in "Local Human Population" based upon TSH and T4 Assay

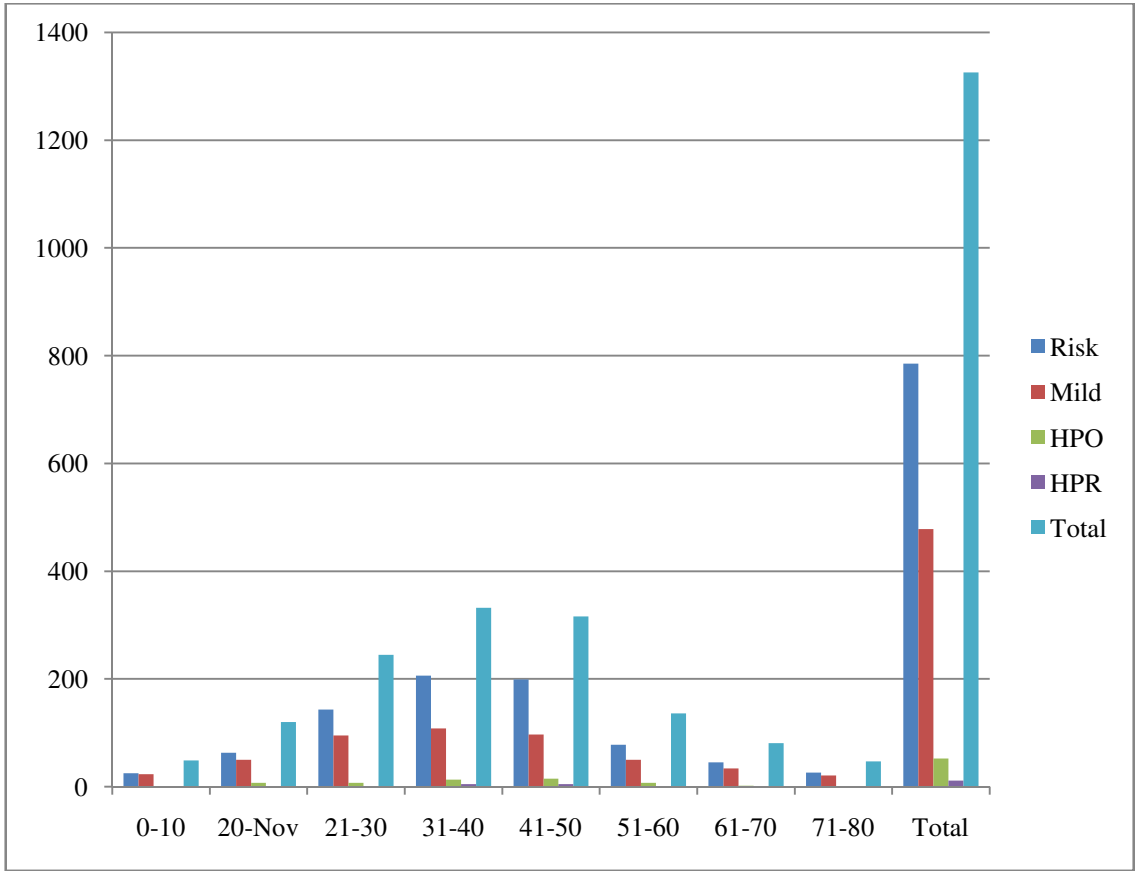


Figure-5

Show male thyroid disorders in "Local Human Population" based upon TSH and T4 assay. Here HPO-Hypothyroidism, HPR-Hyperthyroidism, TSH-thyroid stimulating hormone (Thyrotrophin), mU/L (miliunit per litre)

Table-4
Show distribution of female and male subjects (patients) by Socio demographic profile
Scio-demographic factors (A) Socio economic status

Class group	Female patients	Male patients	Female patients %	Male patients %	Total	Female vs. Male P.value
Class-I (richest)	220	60	9.03	2.46	280	>0.05
Class-II (richer)	210	77	8.62	3.16	287	>.0.025
Class-III (middle)	346	160	14.20	6.56	506	>.0.01
Class-IV (poorer)	430	240	17.65	9.85	670	>.0.01
Class-V (poorest)	483	210	19.82	8.62	693	<.0.001
Total	1689	747	69.00	31.00	2436	>.0.001

(B) Religion

Classes	Female	Male	Total
Hindu	700	356	1056
Muslim	750	250	1000
Others	239	141	380
Total	1689	747	2436

(C) Category

Classes	Female	Male	Total
Rural	1181	500	1681
Urban	508	247	755
Total	1689	747	2436

Thyroid disorder is a “Public Health Problem”, occur due to iodine deficiency. Iodine is found in water and vegetable in trace amount. Severe Iodine Deficiency result in impaired thyroid hormone synthesis and thyroid enlargement leads to Goiter. Iodine deficiency disorders (IDDs) include Endemic goiter, Hypothyroidism, Cretinism, decreased fertility rate, increased infant mortality, mental retardation⁹. To protect from thyroid deficiency iodized salt in micro quantity is needed daily.

In present times ‘TSH’ test is very accurate and sensitive and can help to diagnose even the mildest cases of Hypothyroidism¹⁰. Low concentration of the thyroid hormones T3 and T4, affect the following body activities: metabolic rates, energy production, brain activity, respiration, heart beats, nervous system functions, body temperature, skin hydration, menstrual periods and blood cholesterol levels¹¹.

Hypothyroidism is significantly more common in woman particularly those over age 50 Years¹². In the present studies 2436 Thyroid patients were studied. Data shows that Hypothyroidism is more common in Women than in Men: particularly those over age 21-60 Years. Woman developing Hypothyroidism is increased during pregnancy, after giving birth, and around the time of menopause.

Bjoro T, *et al*, Hashimoto’s Thyroiditis is the most common cause of Hypothyroidism and is detected with the help of Thyroid antibodies test: associated with a high level of Thyroid antibodies in the blood¹³. Thyroid stimulating hormone (TSH), Free Thyroxine (FT4) and Free Triiodothyronine.

(FT3) were assayed in 505 women of Puducherry, India. 15.8% had thyroid Dysfunction and 84.2% were euthyroid. 11.5% were hypothyroid (9.5% sub-clinical) and 1.8% hyperthyroid (1.2% clinical). In the present study TSH, FT4, and FT3 were assayed in 2438 thyroid patients in Ujjain (M.P.).

Conclusion

Thyroid disease in human being is growing fast in India and also in Ujjain (M.P.) for so many reasons found. There for, the present study provides important data, to the Govt. and other agencies so is to control this problem in future in India, and lunch some special programmers’ to prevent Thyroid disorder. These also help the Clinician to diagnose the mildest cases of thyroid disorders among Hospital patients, who presently affected by thyroid symptoms.

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