

Emergence of Underactive and Overactive Thyroid Disorders: A Tertiary Care Experience

Fatima Shahid¹, Marifa Parveen², Mariya Asghar³, Maqsood Ahmad⁴

Muhammad Ilyas⁵, Abdul Wadood Khalid⁶

Author's Affiliation

¹Lecturer Biochemistry Wah Medical College Wah Cant

²Women Medical Officer, Rural Health Centre, Warburton, Nankana Sahib.

³Women Medical Officer, Rural Health Centre, Warburton, Nankana Sahib

⁴Medical Lab Technologist Punjab Institute of Cardiology Lahore

⁵Student 4th-year Bsc Hons Medical Lab Technology, Allama Iqbal Medical College Lahore ⁶Senior Consultant Pathologist Department of Pathology, Punjab Institute of Cardiology Lahore

Author's Contribution

^{1,3}Conception, planning of research and writing of manuscript, Discussion

^{2,4,7}Interpretation, Statistical Analysis, Data Collection, ⁵help in references

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Address of Correspondence

Maqsood Ahmad

Maqsoodahmad64@yahoo.com

ABSTRACT

Objective: The present study was planned to assess gender and age group wise frequency of thyroid disorders.

Place and Duration: Punjab Institute of Cardiology Lahore from 1st January 2016 to 25th May 2017

Methodology: A total of 968 suspects of thyroid disorders were enrolled, 04 ml blood sample was collected from each individual and analyzed for TFT by using Electrochemiluminescence technique on fully automated special chemistry analyzer.

Results: Out of 968 study subjects, male and females were 321 (33.2%) and 647 (66.8%) respectively, mean age was 41.4±16.9 years. Overall thyroid disorder was detected in 26.3% suspects (22.1% male and 28.4% females). Females were 6.3% more prevalent with the most frequent disorder subclinical primary hypothyroidism 7.7%. Primary & subclinical hypothyroidism was four times more common in females as compared to males. Moreover, T3 toxicosis three times more prevalent in females

Conclusion: The emergence of thyroid disorders is the alarming situation, female are at higher risk as compared to males.

Keywords Thyroid disorders, Hypothyroidism, Hyperthyroidism

Introduction

The spectrum of thyroid disorders manifests in the form of hypothyroidism or hyperthyroidism because of under or over-secretion of thyroid hormone from the thyroid gland.¹ These disorders may occur in both genders at any stage of age, with different occurrence rate in different geographical extents.²

The emergence of endocrine disorder affects >300 million individuals around the globe. Catch point is this that more than half of these patients are not aware of their disease³. The burden of this silent disorder is increasing speedily in Asia⁴. Estimated prevalence of thyroid

disorders is 5-10%⁵

The thyroid gland plays a major role in the body and controls the metabolism, growth, and internal environment. It elaborates two key hormones Tri-iodothyronine (T3) and Thyroxine (T4). Both are under the control of Thyroid Stimulating Hormone (TSH) of the anterior pituitary gland which in turn is under the effect of Thyrotrophic Releasing Hormone (TRH) of the hypothalamus. Thyroid function tests (TFT) include measurement of TSH, FT4, and FT3. This TFT is usually prescribed for the assessment of function of thyroid

gland.⁶

Hyperthyroidism is characterized by below normal levels of TSH and above normal levels of FT3 & FT4. This condition is more prevalent in women.⁷ Prevalence of hyperthyroidism is about 2% in general population of Pakistan⁸. More than 90% cases of hyperthyroidism are associated with Graves's disease, toxic adenoma, toxic multinodular goiter and very few cases of Sub-acute thyroiditis are also responsible.⁹ Hyperthyroidism is usually accompanied by palpitation, weight loss, anxiety, heat intolerance, fatigue and menstrual irregularities in women. Patients present with lid lag, tachycardia, warm with moist skin and tremors.¹⁰

Hypothyroidism is a clinical condition due to deficiency of (FT3 & FT4) and above upper normal limits of TSH. This is the commonest metabolic disorder in general population. It is more prevalent in females than males. Generally caused by iodine deficiency, with an overall prevalence of 2– 5% around the globe.¹¹ Previous studies reported overall rate hypothyroidism 4.1 and subclinical hypothyroidism 5.4% in Pakistan¹² In India this is 25%¹²,¹³. In the United States, this is 5%¹⁴,¹⁵. TSH is 98% sensitive and 92% specific for the screening and for early detection of sub-clinical hypothyroidism. According to a prime report on 2800 subjects, the prevalence of sub-clinical thyroid dysfunction was 5% out of which more than 2% had hypothyroidism.¹⁶

Symptoms of hypothyroidism include reduced metabolism, slow growth and weakened development, impaired mental actions and swelling in certain portions of the skin. The major factor responsible for this state is lack of iodine in drinking water. In case of sufficient iodine intake, Hashimoto's thyroiditis appears to be the most common cause of hypothyroidism. The presence of excess iodine in patient's body is also a cause of hypothyroidism including patients with a history of autoimmune thyroiditis, radioactive therapy, and subtotal thyroidectomy; Certain medications like interferon alpha, sta-vudine, thalidomide lithium are also included.¹⁴

Sub-clinical hypothyroidism and hyperthyroidism signify the earliest stages of thyroid dysfunction and commonly known as sub-clinical thyroid disorders. Raise in serum TSH with normal FT4 concentration is defined as subclinical hypothyroidism.¹⁷

Among subclinical thyroid disorders, Subclinical hypothyroidism is more common than subclinical hyperthyroidism.¹⁸ However, primary detection and treatment of sub-clinical thyroid disorders are potentially beneficial, especially for children and pregnant women.

Methodology

It was tertiary care hospital-based retrospective study, conducted in the Department of Chemical Pathology, Punjab Institute of Cardiology Lahore Pakistan during the period of 1st January 2016 to 25th May 2017. A total of 968 samples were collected randomly under the supervision of concerned lab technologist and processed for TFT. Demographic data (age and gender) and current medical history were recorded. Patients with Ischemic Heart Disease (IHD) Neurological and cerebrovascular diseases, Diabetes Mellitus (DM), chronic renal impairment, psychological illness, history of thyroid disease or thyroxin therapy and pregnancy were excluded. Strong thyroid disorder suspects with age from 0-100 years were included.

04 ml heparinized blood sample was collected from every individual and plasma was separated after 20 minutes from the collection. Every specimen was analyzed for TFT on fully automated chemistry analyzer using Electrochemiluminescence technique. All three levels (abnormally low, physiologically normal and abnormally high) of quality control sera were also run with each batch after performing calibration of the analyzer. SPSS 21.0 was used for data analysis.

The study protocol was approved from institution board and ethical approval was also taken from institutional ethical review committee from Punjab Institute of Cardiology Lahore.

Data presentations

All individuals were classified in following age groups;(00 – 24) (25 – 49) (50 – 74) (75 – 100) and were labeled as Group-A, Group-B, Group-C, and Group-D. These groups were further classified according to the biochemical

changes of TFT. All participants were screened for TFT and segregated as Primary hypothyroidism, Primary hyperthyroidism, Subclinical primary hypothyroidism, Subclinical primary hyperthyroidism, T₃ toxicosis and Euthyroid state according to biochemical changes in TFT, according to standard diagnostic criteria for patterns of thyroid disorders given in "Fundamentals of Clinical Chemistry by Tietz, 5th edition".

Table I: Patterns of thyroid dysfunction criteria

Disease	TSH 0.3– 5.5mIU/L	FT4 7.8 - 14.4pmol/L	FT3 2.5 – 3.9pg/ml	T3 80 – 200ng/dl
Primary Hypo	>5.5	<7.8	Not required	Not required
Primary hyper	<0.3	>14.4	Not required	>200
Subclinical primary hypo	>5.5	7.8---14.4	Not required	Not required
Subclinical primary hyper	<5.5	7.8---14.4	Not required	80---200
T3 Toxicosis	<0.3	7.8---14.4	Not required	>200
Euthyroid State	0.3 – 5.5	7.8 – 14.4	2.5 – 3.9	80 – 200

Results

Out of 968 thyroid disorder suspects, 647 (66.8%) were female and 321 (33.2%) were male. Overall thyroid disorder was 255 (26.3%), Thyroid disorder was detected in 22.1% male and 28.4% female patients. Females were most frequently involved in thyroid disorder 6.3% higher than male and most frequent disorder was subclinical primary hypothyroidism 7.7% (50/647). While in males primary hypothyroidism was most common disorder. Subclinical hyperthyroidism was least frequent in males 4(1.2%) as well as in females 14(2.2%) (Table: II)

Primary thyroid disorder was detected in 3.8% more prevalent in males while subclinical primary thyroid disorder and T₃ Toxicosis were 2.5% and 1.3% higher in females respectively. Over all thyroid disorder was 44.4% more frequent in females. (Table: III)

Table II: Gender-based patterns of thyroid disorders

Patterns of Thyroid Disorders	Total n=968	Female n=647	Males n=321
	f (%)	f (%)	f (%)
Primary hypothyroidism	70 (7.2%)	47 (7.3%)	23 (7.1%)
Primary hyperthyroidism	56 (5.8%)	42 (6.5%)	14 (4.4%)
Subclinical primary hypothyroidism	69 (7.1%)	50 (7.7%)	19 (5.9%)
Subclinical primary hyperthyroidism	18 (1.9%)	14 (2.2%)	4 (1.2%)
T ₃ Toxicosis	42 (4.3%)	31 (4.8%)	11 (3.4)
Total Disordered Cases	255 (26.3)	184 (28.4)	71 (22.1%)

Table III: Gender-based Pattern of thyroid dysfunction in diseased cases

Patterns of Thyroid Dysfunction	Total	Female	Male
	f(%)	f(%)	f(%)
Primary thyroid disorder	126 (49.4%)	89 (48.3%)	37 (52.1%)
Subclinical primary thyroid disorder	87 (34.1%)	64 (34.8%)	23 (32.3%)
T ₃ Toxicosis	42 (16.4%)	31 (16.8%)	11 (15.5%)
Total	255 (100%)	184 (100%)	71 (100%)

Primary & subclinical hypothyroidism was four times most common in females, than males. T₃ toxicosis was also more prevalent almost thrice in females. Table: IV

Table IV: Showing various ratios of thyroid disorders.

Females to males Ratio of thyroid Disorder	f	Ratios
Primary hypothyroidisms to primary hyperthyroidisms	70/56	1.7: 1.4
Subclinical Primary hypothyroidisms to subclinical primary hyperthyroidisms	69/18	4.6: 1.2
Females to males ratio in Primary hypothyroidisms	47/23	2.3: 1.1
Females to males ratio in primary hyperthyroidism	42/14	4.2: 1.4
Females to male's ratio in subclinical Primary hypothyroidisms	50/19	3.3: 1.2
Females to male's ratio in subclinical primary hyperthyroidism	14/4	3.5: 1.0
Females to male's ratio T ₃ Toxicosis	31/11	3.1:1.1

Mean age was 41.4 ± 16.9 years. Age group wise classification showed (01 – 24, n= 158) (25 – 49, n=480) (50 – 74, n=300) (75 – 100, n=30). Out of which and were further classified according the biochemical changes of thyroid function Test (TFT). (Figure 1 &2)

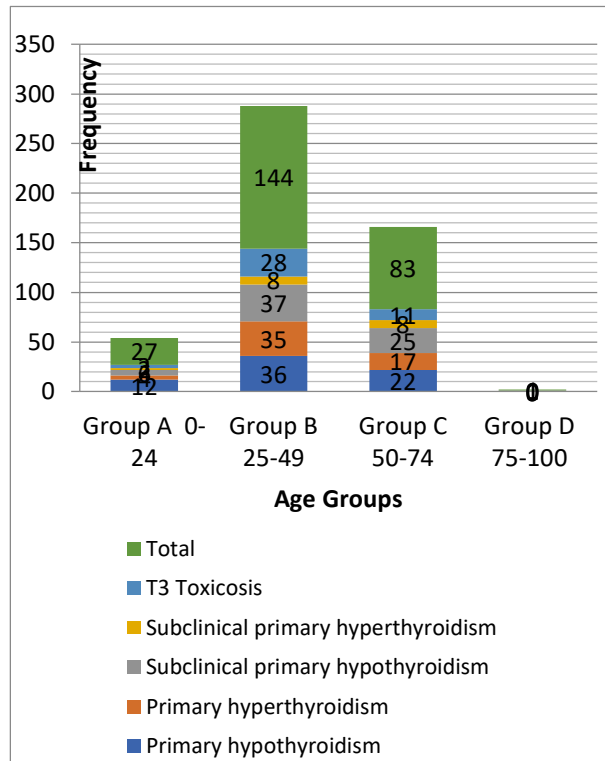


Figure 1. Age group wise distribution of thyroid dysfunction

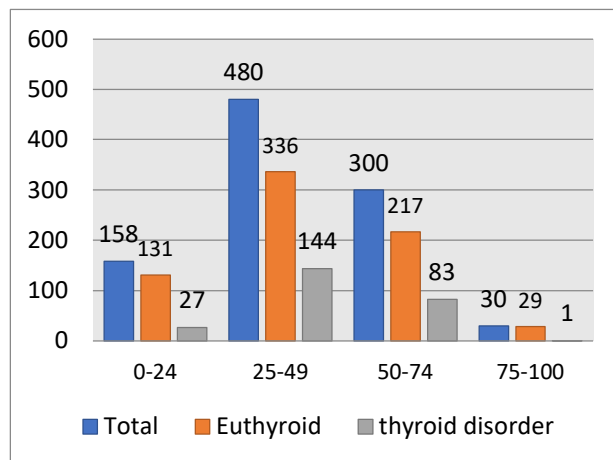


Figure 2. Age group wise frequency of euthyroid and thyroid disorder

Discussion

Thyroid disorders multifactorial most prevalent endocrine disorders. Environmental and nutritional factors play a vital role in causing thyroid diseases.¹⁹ The utility of iodine is one of the major factors.²⁰ Both iodine deficiency and excess are supposed to disturb the function of thyroid gland. It is believed that iodine deficiency is the commonest cause of thyroid disorders around the globe as about one-third of total world population belong to in iodine-deficient regions.²¹

In this study, of 968 participants 321 were male and 647 were female. From 321 male individuals, 7.1% (23/321) were found suffering from Primary Hypothyroidism 4.4% (14/321) with primary hyperthyroidism, 5.9% (19/321) with subclinical primary hypothyroidism, 1.2% (4/321) with subclinical primary hyperthyroidism and 3.4% (11/321) were found with T₃ thyrotoxicosis. In 647 female participants, 7.3% (47/647) were carrying Primary Hypothyroidism, 6.5% (42/647) with Primary Hyperthyroidism, 7.7% (50/647) with Subclinical Primary Hypothyroidism, 2.2% (14/647) with Subclinical Primary Hyperthyroidism and 4.8% (31/647) were found with T₃ Toxicosis. (Table:II)

From total study population, only 26.3% (255/968) thyroid disorder suspects were carrying thyroid disorder. Of them 72.2% (184/255) were female and 27.8% (71/255) were male. In male population Primary Hypothyroidism was more frequent thyroid function disorder followed by Subclinical Primary Hypothyroidism, Primary Hyperthyroidism, T₃ Toxicosis and least frequent disorder was Subclinical Hyperthyroidism. In female subjects most frequent thyroid disorder was Subclinical Primary Hypothyroidism followed by Primary Hypothyroidism, Primary Hyperthyroidism, T₃ Toxicosis and minimum frequency was observed for Subclinical Hyperthyroidism Table-2.

Anjum et al from Abbottabad, a high altitude region of Pakistan, reported hyperthyroidism 15%,¹¹ higher than the present study. This higher prevalence may attribute to environmental changes. Rubina et al declared prevalence of primary hypothyroidism 63.2%, Primary hyperthyroidism 28.0%, Subclinical hypothyroidism 4.3%, Subclinical hyperthyroidism 1.4% and for T₃ Toxicosis 0.7%.²² These findings were slightly different than the present

study. These differences are because of difference in sample size, study population and study duration.

The present study reported primary thyroid disorder 49.4% (126/255), Subclinical primary thyroid disorder 34.1% (87/255) and T₃ Toxicosis 16.4% (42/255) Table-3. In Thyroid, the disorder was 44.4% more prevalent in females than males. The most probable cause could be lactation and pregnancy, As basal metabolic rate (BMR) is raised because of the body requirement increases than the normal, leading to stimulation of thyroid gland to produce more hormones.²³

Another study²⁴ reported 17.21% (21/122) female patients from 122 presented subclinical thyroid disorders, true (primary) thyroid disorder was found in 35.24% (43/122) participant and 47.54% (58/122) showed euthyroid state. In male population, 11.25% (9/80) patients presented subclinical thyroid disorders, true (primary) thyroid disorder was found in 22.5% (18/80) participant and 66.25% (53/80) showed euthyroid state. These findings were different from our results because they conducted this study before six years using small specimen size (202) and on different population which resided near the shore of the sea.

The present study reported that primary and sub clinical hypothyroidism was four-time more common in females as compared to male patients.²²

Reported that as compare hyperthyroidism all subtypes of hypothyroidism were two to three times more common in the female. Furthermore in case of primary disorders (hypothyroidism and hyperthyroidism) females were predominantly effected.

The present study reported of 255 total diseased cases frequency of thyroid disorder was higher in the age group 25-49 years. Which carried 56.4% (144/255) of all diseased cases. In this group subclinical primary hypothyroidism, 7.7% (37/480) was most frequent followed by primary hypothyroidism 7.5% (36/480), primary hyperthyroidism 7.3% (35/480), T₃ Toxicosis 5.8% (28/480) and subclinical primary hyperthyroidism 1.7% (8/480). It showed that younger population is most commonly involved. This prevalence among younger age group may be due to different geographical distribution, iodine intake and sensitivity of thyroid function test techniques.

Similarly, another study reported²² maximum frequency of thyroid disorder in the age group 16 – 40 years. In males, Primary hypothyroidism was 6.0%, Primary hyperthyroidism 2.6%, Subclinical Hypothyroidism 0.8%, Subclinical Hyperthyroidism 0% and T₃ Toxicosis 0.8%. In females, Primary hypothyroidism was 40.8%, Primary hyperthyroidism 16.5%, Subclinical Hypothyroidism 2.6%, Subclinical Hyperthyroidism 0.8% and T₃ Toxicosis 0%.

Subclinical hypothyroidism defined as an elevation in serum thyroid stimulating hormone (TSH), above the upper limit of reference range with normal serum FT4 levels, whereas subclinical hyperthyroidism is defined as a decrease in serum TSH, with normal FT3 and T3 levels.²⁴

Similarly, from Islamabad, a study²² reported hypothyroidism more frequent in age group <40 years while primary hyperthyroidism was much prevalent in the age group 16-40 years whereas subclinical hypothyroidism and T₃ toxicosis were less common in this group. But a present study reported maximum frequency in the age group 16-40.

It is well-established fact that subclinical hypothyroidism and primary hypothyroidism have similar etiology (Chronic lymphocytic thyroiditis such as goiter, Hashimoto thyroiditis, and atrophic thyroiditis).²⁵ Other causes include special therapies like radioactive iodine treatment and external radiation therapy (especially head and neck area) destroy thyroid tissue. Risks of Subclinical Hypothyroidism include cardiovascular and neurological complication and dyslipidemia.²⁶ Subclinical hyperthyroidism is usually caused by excessive thyroxine replacement therapy in hypothyroid patients or TSH suppressive therapies in benign and malignant thyroid diseases. Subclinical hypothyroidism is commonly associated with autonomous thyroid functions occur in multinodular goiter, solitary autonomously functioning thyroid nodule (AFTN), Grave's disease. A study conducted by Alam et al Alam, Baig et al. 2010) reported 21.2% (28/132) subclinical thyroid disorder (13.6% SHypo, 7.5% SHyper) in females. In case of males Subclinical thyroid disorder was 15.3% (SHypo 9.18% and Super 6.1%), multiple studies^{4, 27, 28} reported SHypo 04 – 10 % of general population, particularly in old age women.

Conclusion

The emergence of thyroid disorders is the alarming situation, females are at higher risk as compared to males, because of different hormonal leaps, their body is very sensitive to hormonal changes, and react to them sharper than the "calm" male body. Taking into consideration that thyroid disorders more common in women's, Multiple possible measures are required for the prevention like consumption of iodized salt, women after 40 years shall go from time to time undergo ultrasound screening of thyroid gland– the earlier the problems will be detected, the easier will be the treatment.

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