

Original Article

Spectrum of Thyroid Diseases, An Experience in the Tertiary care and Teaching Hospital

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Objectives: To find the prevalence of thyroid disorders in association with age and sex

Study Design: Cross sectional descriptive study.

Setting and duration of study: Chemical pathology laboratory Benazir Bhutto Hospital from September 2004 to February 2005.

Materials and Methods: The study comprised of 139 subjects including 115 females and 24 males from 5-80 years of age. History and physical examination of each patient was taken according to the predesigned Performa. The thyroid profile was tested by ELISA tech to find out the values of TSH, T4, T3.

Results: It was found that the thyroid disorders were 5 times more common in females than in males. Primary hypothyroidism was 4.5 times more common in females. Hypothyroidism was twice as compared to hyperthyroidism (2.25 times). The occurrence of thyroid disorders in order of decreasing frequency was primary hypothyroidism 63.3%, primary hyperthyroidism 28.1%, subclinical hypothyroidism was 4.4%, secondary hypothyroidism 1.4%, subclinical hyperthyroidism 1.4%, secondary hyperthyroidism 0.7% and T3 toxicosis 0.7%. The study also shows that young adult in the range of 16-40 years are more likely to suffer from thyroid illness.

Conclusion: Thyroid disorders are 5 times more common in females than males. Primary hypothyroidism is the most common thyroid disorder followed by primary hyperthyroidism. Hypothyroidism is twice as common as hyperthyroidism. Sub clinical hypothyroidism is found in 4.3% predominantly in females. T3 toxicosis was found in 0.7% predominantly in male subject. Secondary thyroid disorders are much less common than primary disorders. Younger adults in the age of 16-40 years are more susceptible to thyroid disorders.

Keywords: Hypothyroidism, Hyperthyroidism, Subclinical hypothyroidism, Subclinical hyperthyroidism.

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Introduction

Thyroid dysfunctions are common endocrine problems. Hyperthyroidism and Hypothyroidism together account for considerable morbidity in USA and other countries.¹

The total prevalence of these disorders in life time is estimated to be 5-10%.² An estimated 27 million Americans³ have thyroid disease, and more than half are undiagnosed.⁴ Often misdiagnosed, misunderstood, and frequently overlooked thyroid disease affects almost every aspect of health. Most of them remain undiagnosed as the clinical assesment alone lacks both sensitivity and specificity and can suspect only 40% of overt thyroid disorders. Only the biochemical test, can confirm the diagnosis.⁵

The normal thyroid gland controls the body metabolism, growth, development and maintenance of

the internal environment. Thyroid is an important endocrine gland and elaborates two key metabollic hormones thyroxine (T4) and tri-iodo thyronine (T3). The later is biologically more active and is produced mainly by the coversion of prohormone (T4) to (T3) by enzyme 5-deiodonase in the peripheral tissues mainly in liver and kidney.⁴ Both these hormones are under the contol of thyroid stimulating hormone (TSH) of anterior pitutary gland which in turn is controlled by thyrotrophin releasing hormone (TRH) from hypothalamus. Nature has established almost a perfect method to regulate the amount of hormones to be secreted by the thyroid gland. However thyroid disorders disrupt this mechanism.

The spectrum of thyroid disorders range from a condition of hypothyroidism (under active) to hyperthyroidism (over active.)The biochemical and

clinical classification of thyroid disorders include primary disorders due to thyroid gland dysfunction itself such as primary hypothyroidism, primary hyperthyroidism. Secondary disorders due to pituitary gland disorder include secondary hypothyroidism and secondary hyperthyroidism. Tertiary disorders due to hypothalamic diseases include tertiary hypo and hyperthyroidism.

Diagnosis of subclinical disorders, which is mainly based on elevation (TSH > 4.5 mU/L) or suppression of TSH (< 0.2 mU/L) level leading to hypothyroidism and hyperthyroidism respectively, with minor or no clinical findings and T3 and T4 levels within the normal range.⁶ T3 toxicosis due to mainly increased T3 level without increased T4 level.⁷ Euthyroid sick syndrome is the term used for non-thyroidal illness probably as a result of adaptation to new catabolic state not due to thyroid illness itself.⁸

Thyroid disorders may occur at any age and in both genders, but its occurrence is different in different geographical areas and in different age and sex groups.⁹

Therefore a study was planned to find the prevalence of various thyroid disorders in different age and sex groups in population of Rawalpindi and Islamabad.

Materials and Methods

One hundred and thirty nine patients were included in this cross-sectional study who fulfilled the following criteria to determine the spectrum of thyroid disorders in relation to age and sex.

Inclusion criteria: All patients visiting hormone clinic at Benazir Bhutto Hospital (BBH) with derangement of even single parameter in thyroid profile were selected irrespective of age and sex.

Exclusion criteria: All patient with no derangement of even single parameter in thyroid profile and no clinical history suggestive of thyroid disorders were excluded. All patients with H/O intake of drugs 1 month prior to sampling or any other than thyroid illness effecting thyroid status were also excluded.

Data Collection Procedure

Sampling technique: Purposive sampling was done. All patients visiting hormone clinic at BBH with derangement of even single parameter in thyroid profile were selected irrespective of age and sex.

Form was designed to collect the data regarding the history and clinical examination. The laboratory investigations included the whole thyroid profile TSH, T4, T3.

Specimen collection from the subjects: 3-5 ml of venous blood was collected and centrifuged to separate serum from the cells as soon as the clot was formed.

Technique for measuring thyroid hormone profile:

Serum aliquotes were stored at 4°C to be run in batches. Bilevel i.e. high and low control was run with each batch after standardising. CV was within the expected range. Test was performed with ELISA (Enzyme-linked immunosorbent assay) kit manufactured by Biotech based on the principle of "solid phase sandwich" technique for TSH and "competitive binding" technique for T3 and T4. Analysis was performed on the plate reader.

Data Analysis: The data was analysed to find out the frequency of various thyroid disorders and it was further segregated into sub-groups of age and sex to determine the prevalence of the disorders accordingly. The relative frequencies and ratios were calculated for each group of disorders by entering the data in SPSS version. Frequency bar chart and tables were prepared in Microsoft Excel software program.

Results

Table I shows the primary hypothyroidism is the most common thyroid disorder followed by primary hyperthyroidism, subclinical hypothyroidism, secondary hypothyroidism, subclinical hyperthyroidism, secondary hyperthyroidism and T3 toxicity in the decreasing order of prevalence.

Table II exhibit the ratio and comparative distribution of thyroid illness in both sexes females and males (referred to Table-I for number of subjects in each group of thyroid disorders for calculating ratios). It revealed that all sub types of hypothyroidism (primary, secondary and sub clinical) were more prevalent almost twice to thrice as compared to all subtypes of hyperthyroidism (primary, secondary and subclinical respectively). Primary (hyperthyroidism and hypothyroidism) were 39-44 times more common as compared to secondary (hyperthyroidism and hypothyroidism) respectively. Hence the primary disorders (due to thyroid gland dysfunction itself) were much more common rather than secondary disorders. Females were predominantly affected in both hypothyroidism and hyperthyroidism particularly due to primary thyroid illnesses within total subjects.

Although in primary disorders females were predominantly affected in both hypothyroidism and hyperthyroidism in total number of subjects as mentioned earlier. On further analysis of the data within each gender, revealed almost similar pattern of occurrence of sub-types of thyroid disorders as shown in Fig. II with some differences. The secondary hypothyroidism, subclinical hypothyroidism and subclinical hyperthyroidism were seen predominantly in

Table I: Spectrum of thyroid diseases in males and females (n=139)

Diagnosis	Males		Females		Total	
	Frequency	%age within total	Frequency	%age Within total	Frequency	%age Within total
Primary Hypothyroidism	16	11.51	72	51.77	88	63.27
Primary Hyperthyroidism	5	3.59	34	24.45	39	28.04
Sub-clinical Hypothyroidism	1	0.72	5	3.59	6	4.31
Secondary Hypothyroidism	-	-	2	1.44	2	1.44
Sub-clinical Hyperthyroidism	-	-	2	1.44	2	1.44
Secondary Hyperthyroidism	1	0.72	-	-	1	0.72
T3 Thyrotoxicosis	1	0.72	-	-	1	0.72
TOTAL	24	17%	115	83%	139	100%

females, whereas secondary hyperthyroidism and T3 thyro-toxicosis were seen predominantly in males. Hence it appears that females are likely to suffer more from hypo-functioning of the thyroid gland, whereas males exhibit tendency towards hyper-functioning due to secondary causes.

The age wise distribution of thyroid disorders in males as shown in table-III, revealed the prevalence of primary hypothyroidism much more common in the age group below 40 years as compared to 41 years and above. On the other hand primary hyperthyroidism is more common in the age of 16-40 years as compared to both extremes of age groups (0-15 years and 41 years and above). Secondary hyperthyroidism, sub-clinical hypothyroidism and T3 thyrotoxicosis were less common (one each in age of 16-40 years) and none below and above this age group. Secondary hypothyroidism and subclinical hyperthyroidism were not seen in any age group in males. It revealed that primary

thyroid disorders both hypothyroidism and hyperthyroidism were maximum below 40 years i.e. younger age group, where as no secondary disorder seen below 15 years of age.

IV shows age wise distribution of thyroid disorders in female. It shows similar pattern with maximum number of primary hypothyroidism (40.84%) and maximum number of primary hyperthyroidism (16.5%) in age group of 16-40 years followed by age group 41 and above (15.6% and 4.3% respectively) and lowest number (7% and 3% respectively) is found in age group of 0-15 years. Sub-clinical hypothyroidism was maximum in age 16-40 years. Sub-clinical hyperthyroidism was less common and found in one subject in each group of 0-15 years and 16-40 years. Secondary hyperthyroidism, secondary hyperthyroidism and T3 toxicosis were not seen in any age group in females.

The pattern of thyroid disorders in females varied from males as mention above however maximum numbers of subjects were found in age group of 16- 40 years. It has been also found that, secondary thyroid disorders were not seen in both genders i.e female and

Table II: Showing various ratios in different thyroid disorders. (Within total number of subjects)

Ratio of thyroid disorders	(no of subjects)	Ratio
Ratio of primary hypothyroidism to primary hyperthyroidism	(88/39)	2.25:1
Ratio of secondary hypothyroidism to secondary hyperthyroidism	(2/1)	2:1
Ratio of subclinical hypothyroidism to subclinical hyperthyroidism	(6/2)	3:1
Ratio of primary hypothyroidism to secondary hypothyroidism	(88/2)	44:1
Ratio of primary hyperthyroidism to secondary hyperthyroidism	(39/1)	39:1
Female to Male ratio in primary hypothyroidism	(72/16)	4.5:1
Female to Male ratio in primary hyperthyroidism	(34/5)	6.8:1
Female to Male ratio in subclinical hypothyroidism	(5/1)	5:1

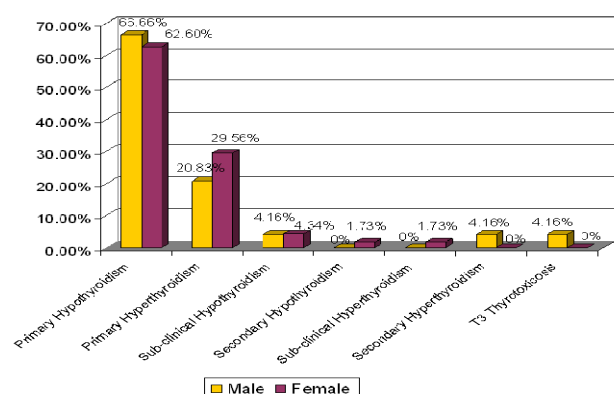
**Figure II: Comparison of Pattern of sub-types of thyroid disorders between females (n=115) and males (n=24)**

Table III: Spectrum of thyroid diseases in different age groups of males (n=24)

Diseases	0-15 years		16-40years		41 and above	
	Frequency	%age Within total	Frequency	%age Within total	Frequency	%age Within total
Primary Hypothyroidism	6	5.2	7	6.08	3	2.6
Primary Hyperthyroidism	1	0.87	3	2.6	1	0.87
Secondary Hypothyroidism	-	-	-	-	-	-
Secondary Hyperthyroidism	-	-	1	0.87	-	-
Sub-clinical Hypothyroidism	-	-	1	0.87	-	-
Sub-clinical Hyperthyroidism	-	-	-	-	-	-
T3 Thyrotoxicosis	-	-	1	0.87	-	-

Table IV: Spectrum of thyroid diseases in different age groups of females (n=115)

Diseases	0-15 years		16-40years		41 and above	
	Frequency	%age within total	Frequency	%age within total	Frequency	%age within total
Primary Hypothyroidism	7	6.08	47	40.84	18	15.6
Primary Hyperthyroidism	3	2.6	19	16.5	5	4.34
Secondary Hypothyroidism	-	-	1	0.87	1	0.87
Secondary Hyperthyroidism	-	-	-	-	-	-
Sub-clinical Hypothyroidism	1	0.87	3	2.6	1	0.87
Sub-clinical Hyperthyroidism	1	0.87	1	0.87	-	-
T3 Thyrotoxicosis	-	-	-	-	-	-

male below 15 years as shown in table III and IV.

Whereas primary disorders were present in all age groups with preponderance in age group of 16-40 years.

Result of the study showed that patients with thyroid illness were 83%(n=115) females and 17% (n=24) were males as shown in figure I exhibiting female to male ratio of 5.8:1.

Discussion

In the present study there were 139 subjects in age group of 5-80 years. Among these 115 were found to be females and 24 were males, showing female to male ratio of 5.8:1 (within total subjects), which is consistent with another study conducted in Nigeria which also reported the similar ratio of 5:1.¹⁰ The maximum number of subjects fall in the age of 16-40 years in this study, which is contrary to the previous findings that mostly thyroid disorders occur in older age and progressively increase with age.¹¹ Despite of this fact, the current finding is also supported by some recent studies that revealed there is a tendency of thyroid disorders to occur in comparatively younger age group.¹² A study reported that hypothyroidism was more prevalent (40.5%) in the age group of 36-45 years. With obvious female preponderance.⁵ Another study quoted age preponderance of 34-years and above.¹³ Some of

the studies documented that thyroid disorders are more common in younger age as is diabetes mellitus type I.^{9,12} A study in Makah on the prevalence of thyroid diseases exhibit similar age group predominance i.e 40±12 years.⁹ The prevalence in younger age group may be due to geographical distribution iodine intake and recent development of sensitive techniques for assessment of thyroid function tests.

In the present study prevalence of primary hypothyroidism was 63.3%, among patients with thyroid disorder with female to male ratio of 4.5:1 which is consistent with other studies. The female to male ratio in hypothyroidism ranges from 2:1 to 10:1 in various epidemiological surveys.^{6,14} In a study females were predominant 80.79% and 19.3% males (exhibiting the ratio of 4.3:1).¹⁵ In another study hypothyroidism was estimated to be 25.7%. Among these 78.02% were females and 21.98% were males with female to male ratio 3.8:1.⁵ Various surveys revealed that, the prevalence of hyperthyroidism ranges from 0.5–3.0%¹ and that of hypothyroidism between 1 and 10% in general population.¹⁴ The prevalence varies according to the selection of population whether diseased or healthy population.

Our finding is also in accordance with the study on the prevalence of the Colorado thyroid disease involving 25,862 participants. The study showed that 9.5% of the subjects had hypothyroidism (elevated TSH)

and 2.2% hyperthyroidism (suppressed TSH) with ratio of hypothyroidism of 4.3:1.¹³

In a survey in UK hypothyroidism was 9.3% in women and 1.3% in men in areas with high iodine uptake with female to male ratio of 7.15:1.¹⁶ In an other survey in America it was found that, 8.9% people were hypothyroid and 1.1% was hyperthyroid.³

In a large health survey in Norway, the prevalence of thyroid dysfunction in individuals 20 years and older was reported to be hypothyroidism 4.8% in females and 0.9% in males whereas hyperthyroidism was 2.5% and 0.6% respectively.¹⁷ A study conducted in India showed that 15.8% had thyroid dysfunction. Among these 11.5% were hypothyroid and 1.8 % were hyperthyroid.¹⁸

The present study showed prevalence of subclinical hypothyroidism to be 4.3%. The estimated prevalence of subclinical hypothyroidism ranges from 1-10%.⁶ Many researchers found similar figures as documented in one of the studies that subclinical hypothyroidism was 5.1% (TSH 4.1-9.9mU/l) in females and 3.7% in males.¹⁷ In a recent Indian study the prevalence of subclinical hypothyroidism was reported to be 9.5%.¹⁸ The risk of developing subclinical hypothyroidism to clinical (overt) hypothyroidism is 2.6% to 4% per year.¹¹

The prevalence of hyperthyroidism in the current study was 28.1% among the patients with thyroid disorder with female to male ratio of 6.8:1. A study reported female to male ratio in patients with prevalence of hyperthyroidism to be 4.2:1.¹⁷

The subclinical hyperthyroidism in this study was 1.44% whereas in an Indian study it was 1.2%. in another study it was found to be 4.1% and more common in females as compared to males.¹¹

The present study showed T3 thyrotoxicosis to be 0.72% (within total subjects) and 2.3% (1 in 43 subjects) among hyperthyroid patients. In some studies T3 thyrotoxicosis was found in 1-4% of patients with thyroid disorder and one of the study documented even 4.8%.¹⁹ It indicates that T3 investigation is also important in cases of hyperthyroidism. The study shows secondary thyroid disorders are comparatively rare which is also supported by most of the studies.⁴

Many people may be suffering from minute imbalances that have not yet resulted in abnormal blood tests. But they continue to have symptoms of hypo or hyper functioning of the gland. The clinical signs and symptoms consisting of mental and physical slowing, weight gain constipation, dry skin, hair loss, osteoporosis, irregular menstruation and infertility³ widely varied among individuals and often not conclusive for diagnosis of thyroid illness.⁵ Many people suffer needlessly because their symptoms go unrecognized and may end with serious complications such as myxedema coma⁶ due to hypothyroidism or

atrial fibrillation due to hyperthyroidism. Some patients may be stigmatized with mental illness are even put on antidepressant drugs.³

Hypothyroidism, the most common functional disorder of thyroid gland is an important public health issue. It raises levels of total cholesterol, LDL (the so-called bad cholesterol), triglycerides, hence leading to heart disease and triple the risk of developing hypertension²⁰, especially pregnant women, should have their blood pressure checked regularly. Also increase risk of miscarriage and children born to 60% of untreated women have impaired mental performance. Early studies reported up to 20% incidence of peri-natal mortality and congenital malformations.²¹ Untreated hypothyroidism can, with time, cause mental and behavioral impairment and, eventually, dementia and depression.³

The reasons why there is a high incidence of under-active thyroid in America and other countries are multifactorial. The major causes include iodine deficiency, autoimmune thyroid disease and thyroablative therapy. However, worldwide, iodine deficiency is the leading cause⁸ especially in less developed nations and cause varying degrees of mental retardation in millions of people. Hyperthyroidism may result from immunological, environmental and genetic factors.²²

The presentation of thyroid disorders are non-specific and high degree of suspicion is required for their early diagnosis. Population screening is expensive and requires a definite policy. The newborn screening is conducted in developed countries²³ It is recommended that the measurement of serum TSH concentration in relevant cases (having suggestive symptoms) and population at risk like pregnant women to prevent serious maternal and fetal outcome²¹ This is a simpler and practical approach to diagnose thyroid disorders. Evaluation of thyroid status could help in early detection and treatment²⁴ to prevent serious complications associated with these disorders.

Conclusion

Thyroid disorders are 5 times more common in females than males. Primary hypothyroidism is the most common thyroid disorder followed by primary hyperthyroidism. Hypothyroidism is twice as common as hyperthyroidism. Sub clinical hypothyroidism is found in 4.3% predominantly in females. T3 toxicosis was found in 0.7% predominantly in male subject. Secondary thyroid disorders are much less common than primary disorders. Younger adults in the age of 16-40 years are more susceptible to thyroid disorders.

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