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Thyroid Function Test as a Screening Tool for Diagnosis of Thyroid Diseases; A One Year Study Conducted at a District Hospital

Warda Hussain[1], Muhammad Usman Sajid[2], Nabila Akram[3], Muhammad Khalid[4], Saba Izhar[5], Syeda Luba Hussain[6]

[1]Assistant Professor Pathology, Nawaz Sharif Medical College, Gujrat
[2]Associate Professor Medicine, CMH Kharian Medical College, Kharian
[3]Assistant Professor Pathology, Avicenna Medical College and Hospital Lahore
[4]Professor of Medicine, CMH Kharian Medical College Kharian
[5]Assistant Professor, Department of Medicine, CMH Kharian Medical College, Kharian
[6]Senior lecturer, Watim Medical College Rawat Rawalpindi

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Address of Correspondent
Dr Warda Hussain
Assistant Professor Pathology
Nawaz Sharif Medical College, Gujrat
drwwali@gmail.com

ABSTRACT

Objective: To evaluate the prevalence of abnormalities in thyroid function tests among individuals from Gujrat district seeking evaluation at Aziz Bhatti Shaheed Teaching Hospital in Gujrat.

Methodology: All specimens tested for Thyroid Function Tests (TFTs) in the hospital laboratory between January 2023 and December 2023 were included in the study. The results of the thyroid function tests were classified into categories of hypothyroidism and hyperthyroidism based on established criteria. Hypothyroidism was defined as a TSH level above the reference range, typically greater than 4.0 milli-international units per liter (mIU/L). A typical cut-off value for diagnosing hyperthyroidism was a TSH level below the reference range, usually less than 0.4 mIU/L, in conjunction with elevated FT4 and/or T3 levels. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.

Results: The mean age of the participants was 35.39 years, The majority of participants were female, accounting for 82.3%, while males constituted 17.7% of the total sample. The most of the cases 62.0% had normal values of thyroid profile, while hypothyroidism cases were found 15.20% and 21.90% cases had hyperthyroidism. Furthermore, the analysis suggests that there is no significant association between types thyroid disorders and age groups ($p = 0.156$) or gender ($p = 0.973$).

Conclusion: In conclusion, our analysis of thyroid profiles revealed a higher prevalence of thyroid disorder (Hypothyroidism 15.20% and 21.90% hyperthyroidism) according to a one-year data. Moreover, thyroid is not significantly influenced by age and gender. These results underscore the importance of routine thyroid screening to identify and manage thyroid disorders effectively, irrespective of age or gender.

Key words: Thyroid disorder, Hypothyroidism, TSH.

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Introduction

Thyroid disorders are widely recognized as a major public health concern globally and are ranked as the second most common endocrine disorder.[1] In Pakistan, the prevalence of hypothyroidism and hyperthyroidism is 4.1% and 5.1% respectively, while subclinical hyperthyroidism and subclinical hypothyroidism are observed at rates of 5.8% and 5.4% respectively,[2-4] and the figures are on the rise over time. On a global scale, women are typically five to eight times more prone to developing thyroid disorders compared to men.[3] It's

estimated that one in every eight women will experience a thyroid disorder at some point in her lifetime.[5] The thyroid gland, situated in the front of the neck, is recognized as the largest endocrine gland in humans. It produces and releases thyroid hormones known as triiodothyronine (T3) and thyroxine (T4), which play a significant role in regulating the body's basal metabolic rate (BMR) and protein synthesis. Additionally, these hormones are essential for the neurocognitive development of children and adolescents, as well as for maintaining normal physiological functions in adults.[6]

The pathophysiology of numerous thyroid disorders is associated with thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4). TSH serves as the primary chemical indicator of thyroid function. Low levels of TSH are indicative of hyperthyroidism, while elevated levels typically signify hypothyroidism.[7]Patients may exhibit either subclinical or overt thyroid disease. In addition to clinical assessment, thyroid function tests (TFTs) are crucial for both diagnosing and monitoring thyroid disorders.[8] Thyrotoxicosis, a condition of heightened metabolism is diagnosed through the measurement of T4 and T3 levels. It results from either an overactive thyroid gland or increased synthesis and release of thyroid hormones. The incidence of hyperthyroidism is relatively lower, around 2%, compared to hypothyroidism in the general population of Pakistan.[9]Graves' disease, toxic multinodular goiter, and toxic adenoma account for approximately 90% of cases of thyrotoxicosis or hyperthyroidism.[7,8]

When the thyroid gland fails to produce T3 and T4, it triggers the pituitary gland to increase the production of thyroid stimulating hormone (TSH) through a negative feedback mechanism. This lack of thyroid hormone production initiates the process in over 95% of patients. The remaining five percent of cases experience hypothyroidism as a result of pituitary dysfunction, characterized by inadequate production of TSH by the pituitary gland. The primary cause of hypothyroidism is typically chronic autoimmune thyroiditis, also known as Hashimoto's disease. Other contributing factors include iodine deficiency, sub-acute thyroiditis, as well as surgical and radiation treatments.[8,10] In Pakistan, clinical and subclinical hypothyroidism is prevalent in up to 4.1% of adults and 5.4% of children, with a higher occurrence of both hypothyroidism and hyperthyroidism observed in females compared to males.[11]

A study conducted in 2017 indicated that the occurrence of subclinical hypothyroidism among the population of Karachi was found to be 13.6% in females, whereas it was only 9.2% in males.[12] Although most individuals with subclinical hyperthyroidism are considered clinically euthyroid, if TSH suppression persists for more than 6 to 8 weeks, it is recommended to investigate for underlying chronic thyroid conditions such as autonomously functioning thyroid nodules, toxic multinodular goiter (MNG), and Graves' disease. This is crucial as such conditions can have implications for mortality, cardiovascular health, bone density, and potentially cognitive function.[13]The increase in the number of thyroid disorders signifies the need to understand the prevalence and the factors resulting these disorders there is a paucity of national data about biochemical changes in thyroid function tests (TFTs). The aim of this study was to investigate the prevalence of abnormalities in thyroid function tests among individuals from Gujrat district seeking evaluation at Aziz Bhatti Shaheed Teaching Hospital in Gujrat. Additionally, the research sought to analyze the distribution of these thyroid disorders based on gender. This exploration is vital for understanding the frequency of such disorders within the local population and will serve to increase awareness among healthcare professionals tasked with managing thyroid-related issues.

Methodology

The cross-sectional study was conducted at ABSTH, Gujrat after approval from the Institutional review board of Nawaz Sharif Medical College. All specimens tested for Thyroid Function Tests (TFTs) in the hospital laboratory between January 2023 and December 2023 were included in the study. The study protocol adhered to ethical guidelines, ensuring patient confidentiality and privacy. Informed consent was not required since the study involved retrospective analysis of laboratory data. Specimens with incomplete or missing data for thyroid function tests, specimens from patients with known thyroid disorders who were receiving treatment at the time of testing, specimens from patients with comorbid conditions known to affect thyroid function, such as pregnancy, severe illness, or autoimmune diseases, specimens from individuals who underwent thyroid surgery or radioactive iodine therapy prior to testing, specimens from patients on medications known to interfere with thyroid function tests, such as corticosteroids or amiodarone, unless specified for analysis purposes were excluded. Serum concentrations of Thyroid-Stimulating Hormone (TSH), total triiodothyronine (T3), and total thyroxine (T4) were

measured using the chemiluminescent technique assay on the Vitros analyzer. The results of the thyroid function tests were classified into categories of hypothyroidism and hyperthyroidism based on established criteria. Hypothyroidism was defined as a TSH level above the reference range, typically greater than 4.0 milli-international units per liter (mIU/L). Diagnosis of hyperthyroidism was based on elevated serum levels of free thyroxine (FT4) and/or triiodothyronine (T3), along with low or suppressed TSH levels. A typical cut-off value for diagnosing hyperthyroidism was a TSH level below the reference range, usually less than 0.4 mIU/L, in conjunction with elevated FT4 and/or T3 levels. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were utilized to determine the frequency and percentages of qualitative variables such as gender, and biochemical diagnosis. Mean and standard deviation (SD) were calculated for numerical variables like age. A chi-square test was applied, and a p-value less than 0.05 was considered statistically significant.

Results

The mean age of the participants was 35.39 years, with a standard deviation of 14.80 years. Serum levels of thyroid-stimulating hormone (TSH) were found to have a mean of 6.28 mIU/L with a standard deviation of 17.24 mIU/L, while mean of triiodothyronine (T3) and thyroxine (T4) was 2.40 mIU/L and 66.68 mIU/L, respectively, with standard deviations of 32.71 mIU/L and 72.49 mIU/L. Regarding gender distribution, the majority of participants were female, accounting for 82.3% (n=1362), while males constituted 17.7% (n=292) of the total sample. Table.1

Table I: Descriptive statistics of baseline characteristics. (n= 1654)

Variables		Descriptive statistics	
Age		35.39±14.80 years	
TSH		6.28±17.24 mIU/L	
T3		2.40±32.71 mIU/L	
T4		66.68±72.49 mIU/L	
Gender	Female	1362	82.3%
	Male	292	17.7%
	Total	1654	100.0%

According to the prevalence of thyroid disorders among patients screened at Hospital laboratory to assess the thyroid disorder, the most of the cases 62.0% had normal values of thyroid profile, while hypothyroidism cases were found 15.20% and 21.90% cases had hyperthyroidism.

Thyroid disorders categorized by age groups and gender of the patients, with a total sample size of 1654 individuals. The table includes three types of thyroid disorders: hyperthyroidism, normal thyroid function, and hypothyroidism. Each cell within the table indicates the number of patients falling into each category, along with the corresponding percentages. The analysis suggests that there is no significant association between thyroid disorders and age groups (p = 0.156) or gender (p = 0.973). Table II

Discussion

In this study a total of 1654 participants, provide valuable insights into the demographic and biochemical

Table II: Thyroid disorders according to age and gender of the patients (n=1654)

Variables		THYROID DISORDERS				p-value
		Hyperthyroidism	Normal	Hypothyroidism	Total	
Age groups	1-5 years	2	23	7	32	0.156
		0.1%	1.4%	0.4%	1.9%	
	6-15 years	9	67	28	104	
		0.5%	4.1%	1.7%	6.3%	
	16-30 years	68	343	119	530	
		4.1%	20.9%	7.2%	32.3%	
	31-45 years	94	386	123	603	
		5.7%	23.5%	7.5%	36.7%	
	46-60 years	56	179	64	299	
		3.4%	10.9%	3.9%	18.2%	
	61-75 years	13	39	17	69	
		0.8%	2.4%	1.0%	4.2%	
	>75 years	0	3	3	6	
		0.0%	0.2%	0.2%	0.4%	
Gender	Male	44	184	63	291	0.973
		2.7%	11.2%	3.8%	17.7%	
	Female	198	856	298	1352	
		12.1%	52.1%	18.1%	82.3%	

characteristics of individuals undergoing thyroid function testing. The mean age of the participants was 35.39 years, indicating a relatively young adult population, with a standard deviation of 14.80 years. In the comparison of this study Masood N et al[14] included 100 patients in their aged between 16 and 55 years, with an overall average age of 35.3 years and a standard deviation of 7.8 years. In another Imran M et al[15] the study by two hundred and three patients participated in the study, averaging 42.19 years with a standard deviation of 10.48 years. This distribution suggests that thyroid disorders are not limited to any specific age group but can affect individuals across a wide range of ages.

Gender distribution within the study cohort revealed a predominance of females, accounting for 82.3% of the total sample, compared to 17.7% of males. Consistently Masood N et al[14] included 100 patients in their study and of whom 23 (23%) were men and 77 (77%) were women. Imran Met al[15] reported that among all of the study subjects, males were 73 (35.9%) and females were (64.1%), resulting in a male to female ratio of 1 to 1.78. This gender disparity is consistent with epidemiological data indicating a higher prevalence of thyroid disorders among females, attributed in part to hormonal influences and autoimmune mechanisms. Furthermore, our analysis revealed no significant association between specific types of thyroid disorders and age groups ($p = 0.156$) or gender ($p = 0.973$). These findings suggest that the prevalence of hyperthyroidism and hyperthyroidism disorders does not vary significantly across different age groups or between genders within our study population.

In this study the frequency of thyroid disorders among suspected patients screened at Hospital laboratory was 40.0%. With an overall average of thyroid-stimulating hormone (TSH) levels 6.28 mIU/L, mean serum levels of triiodothyronine (T3) and thyroxine (T4) were found to be 2.40 mIU/L and 66.68 mIU/L, respectively. In aligns with this study Bukhari SI et al[16] reported that the 55 cases (17.4%) were diagnosed with subclinical hypothyroidism, 27 cases (8.5%) with hypothyroidism,19 patients (6.0%) with hyperthyroidism, and 16 cases (5.0%) with subclinical hyperthyroidism. Like this study Zubair M et al[17] reported that the out of the 239 thyroid profiles analyzed, 146 (61%) were determined to be within the normal range. However, the thyroid profiles of 93 patients (38.9%) were disrupted, indicating the presence of various thyroid disorders.[17] In the line of this series Salih SM et al[18] reported that the approximately 23.8% of the total patients were diagnosed with hyperthyroidism, while about 22.7% were diagnosed with hypothyroidism. The prevalence of thyroid diseases was higher among females compared to males.[18] Few other studies also found relevant observations. The slightly higher prevalence of thyroid disorders in our study might be attributed to differences in the study population or geographic location. Our study could have encompassed patients with diverse demographic characteristics or from regions with distinct environmental influences known to affect thyroid function. Moreover, our analysis did not involve sample selection based on specific risk factors or comorbidities, nor did it rely on indications for thyroid disorder tests. This approach may have facilitated a more comprehensive representation of the general population, allowing for the detection of a wider range of thyroid disorders prevalent within the community.[19] Overall, these factors underscore the importance of considering various methodological disparities and contextual elements when interpreting and comparing the prevalence rates of thyroid disorders across different studies. Further studies should aim to include a more diverse and representative sample of the population to better understand the true prevalence of thyroid disorders across different demographic groups. Conducting prospective studies with standardized data collection methods can enhance the accuracy and reliability of the findings, reducing potential biases associated with retrospective record analysis. Investigating the influence of various factors such as diet, lifestyle, and genetic predispositions on thyroid function can provide a more comprehensive understanding of thyroid disorder prevalence and risk factors.

Conclusion

In conclusion, study revealed analysis of thyroid profiles over the course of one year demonstrated that 15.20% of cases were diagnosed with hypothyroidism, while 21.90% exhibited hyperthyroidism, indicating a significant prevalence of thyroid disorders within our population. Furthermore, findings suggest that thyroid function higher among females compared to males while not significantly influenced particular types of by age or gender, highlighting the need for universal thyroid screening across diverse demographic groups. These results emphasize the critical role of routine thyroid screening in early detection and effective management of thyroid disorders, irrespective of demographic characteristics. By implementing systematic thyroid screening protocols, healthcare providers can proactively

identify and address thyroid dysfunction, thereby improving patient outcomes and overall thyroid health.

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