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The Spectrum of Biochemical Changes in Thyroid Function Tests, Performed at Sahiwal Medical College, Sahiwal

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ABSTRACT

Background: Thyroid disorders are among one the leading causes of endocrine problems worldwide. Hypothyroidism is very common and usually is more prevalent in females. Thyroid function tests (TFTs) play a vital role in the diagnosis and monitoring of thyroid diseases.

Methodology: This cross-sectional study was conducted at Sahiwal Medical College, Sahiwal after approval from the Institutional review board. The results of 2281 specimens tested for TFTs in the Pathology laboratory between August 2018 to December 2020 were included. Samples were analyzed by immunochemiluminescent assay method on an Access 2 analyzer by Beckman Coulter. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25. A chi-square test was applied. P-value <0.05 was considered significant.

Results: A total of 2281 patient data was included in the study. The mean age of participants was 38.86±15.30 years and the majority were females. 64.1% of results were within the normal limit (euthyroid) while the remaining 35.9% had abnormal thyroid profiles. Hyperthyroidism was the most common abnormality (9.5%) followed by subclinical hypothyroidism (8.9%). Chi-square test revealed a statistically significant difference in age groups, with p-value of 0.004.

Conclusion: Thyroid diseases are quite common. Hyperthyroidism is slightly more prevalent than hypothyroidism in our community.

Key words: Hypothyroidism, Hyperthyroidism, Thyroid disorders, Subclinical thyroid disease.

Authors' Contribution:
[1,2]Conception; Literature research; manuscript design and drafting; [2,3] Critical analysis and manuscript review; [5,6] Data analysis; Manuscript Editing.

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Introduction

Endocrine disorders, particularly thyroid gland abnormalities, are quite common.[1,2] Thyroid disorders account for 30 to 40 % of patients in the endocrine practice, thereby significantly adding to the global burden of endocrine diseases.[3]

The thyroid gland, one of the vital glands, produces hormones; triiodothyronine (T3) and thyroxine (T4), which regulate the metabolism, growth, and various vital functions of the body. Any imbalance in thyroid

hormones has an impact on the entire body and also affects the growth and well-being of an individual.[4,5] Along with clinical examination, Thyroid function tests (TFTs) play a vital role in diagnosing and monitoring thyroid disease.[6,7.]

Thyroid dysfunctions can broadly be classified as hyperthyroidism or hypothyroidism. Patients can present either with subclinical or overt disease.[4] Hyperthyroidism is a catabolic state in which there is elevated T3 and T4, while in hypothyroidism there is an insufficient level of thyroid hormones. Both of these conditions are associated with many sclinical effects on the body like coronary artery disease, dyslipidemia, arrhythmias, and many more.[1,4.]

American Association of Clinical Endocrinologists reported that around 13 million or 4.78% of people have an overt or subclinical thyroid disorder. In a global scenario, Hypothyroidism is more common than hyperthyroidism.[3] Iodine deficiency is the commonest cause of thyroid dysfunction while in areas with sufficient iodine supplementation, autoimmune thyroiditis, and Hashimoto thyroiditis are common causes of hypothyroidism[1]. According to one estimate, iodine deficiency affects over 2.5 billion individuals globally, with 313 million residing in Southeast Asia, including Pakistan.[5] Common causes of hyperthyroidism are Graves's disease, multinodular goiter, and toxic adenoma. Rarely, it may be due to subacute thyroiditis.

It is also evident from studies that thyroid issues are more common in females than in males in Pakistan and around the world.[1,3]

Current evidence highlights the need to understand the prevalence and the factors governing it. There is a paucity of national data about biochemical changes in thyroid function tests (TFTs). The purpose of this study was to examine the frequency of abnormalities in thyroid function tests, in the people of Sahiwal district presented to Sahiwal Medical College laboratory for evaluation of thyroid hormones and to also determine the gender distribution of these disorders. This will help to know the frequency of these disorders in the local population and will raise awareness among clinicians dealing with these issues.

Methodology

The cross-sectional study was conducted at SLMC, Sahiwal after approval from the Institutional review board of Sahiwal Medical College. In total 2281 specimens tested for TFTs in the laboratory between August 2018 to December 2020 were included in the study. Serum concentrations of thyrotropin, total triiodothyronine, and total thyroxine were measured using the immunochemiluminescent assay method on the Access 2 analyzer.

For interpretation, the results of the thyroid function tests were classified into six categories: Euthyroid, subclinical hypothyroidism, overt hypothyroidism, sub-clinical hyperthyroidism, overt hyperthyroidism, and Equivocal.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were applied to determine the frequency and percentages of qualitative variables like age groups, gender, and biochemical diagnosis. Mean and SD was calculated for numerical variables. A chi-square test was applied. P-value <0.05 was considered significant.

Results

A total of 2281 patients' data was included in the study, among which majority were females (84.7%). Most of the patients were adults with a mean age of 38.86±15.30 years. The age distribution is shown in Figure 1 below. Data from 64.1% of patients revealed a normal thyroid profile(euthyroid) while the remaining 35.9% had an abnormal thyroid profile. The cumulative frequency of hypothyroid disease was slightly higher than that of hyperthyroid disease, as shown in Table no 1. The results of the

cross-tabulation of age with the biochemical diagnosis is illustrated in Table 2 which indicated that thyroid disorders were more prevalent in the age group 18-50 years. Hyperthyroidism was the most common abnormality (9.5%) followed by subclinical hypothyroidism (8.9%). The Chi-square test revealed a statistically significant difference in age groups, with a P-value of 0.004. Thyroid disorders were also evaluated concerning gender. difference between males and females was found to be statistically non-significant (table 3).

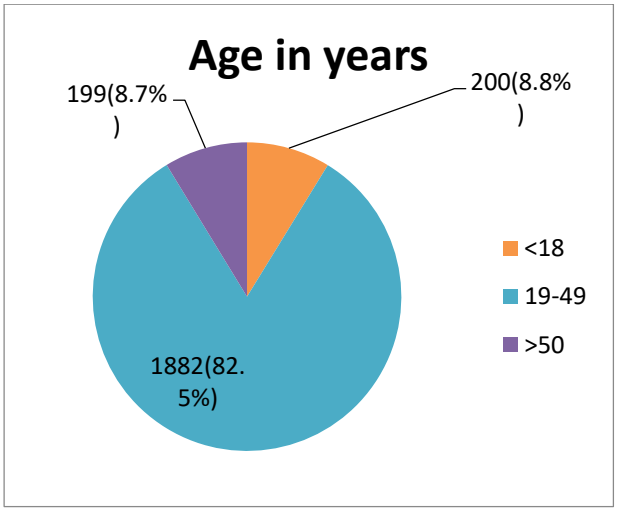

Figure 1: Age distribution of the study population.

Table I: Distribution of Thyroid Disorders

Biochemical Diagnosis	Frequency	Percentage
Euthyroid	1462	64.1
Subclinical Hypothyroidism	202	8.9
Hypothyroidism	147	6.4
Subclinical Hyperthyroidism	180	7.9
Hyperthyroidism	217	9.5
Equivocal	73	3.2
Total	2281	100

Table II: Cross-tabulation of Age in Years and Diagnosis

Diagnosis	Age in Years			Total	*P* value
	<18 n (%)	18-50 n (%)	>50 n (%)		
Euthyroid	143 (6.3)	1207 (52.9)	112 (4.9)	1462 (64.1)	0.004
Subclinical Hypothyroidism	26 (1.1)	157 (6.9)	19 (0.8)	202 (8.9)	
Hypothyroidism	7 (0.3)	123 (5.4)	17 (0.7)	147 (6.4)	
Subclinical Hyperthyroidism	5 (0.2)	158 (6.9)	17 (0.7)	180 (7.9)	
Hyperthyroidism	15 (0.7)	178 (7.8)	24 (1.1)	217 (9.5)	
Equivocal	4 (0.2)	59 (2.6)	10 (0.4)	73 (3.2)	
Total	200 (8.8)	1882 (82.5)	199 (8.7)	2281 (100)	

Table III: Crosstabulation of Diagnosis and Gender

Diagnosis	Gender n (%)		Total	P value
	Male	Female		
Euthyroid	235 (10.30)	1227 (53.8)	1462 (64.1)	0.638
Subclinical Hypothyroidism	28 (1.2)	174 (7.6)	202 (8.9)	
Hypothyroidism	18 (0.8)	129 (5.7)	147 (6.4)	
Subclinical Hyperthyroidism	22 (1)	158 (6.9)	180 (7.9)	
Hyperthyroidism	34 (1.5)	183 (8)	217 (9.5)	
Equivocal	11 (0.5)	62 (2.7)	73 (3.2)	
Total	384	1933	2281	

Discussion

Thyroid disturbances are fairly common but the data about their prevalence in the Sahiwal district is quite limited.[8] They frequently remain undiagnosed because of variable clinical manifestations and lack of uniform recommendations on the screening and diagnosis of thyroid problems.[9] Thyroid function tests play a vital role in diagnosing and monitoring thyroid disorders.[6]

The current study included the data of 2281 patients. The majority of the participants were females, and the occurrence of abnormal thyroid function tests was also higher in females as compared to males. These findings agree with a few studies conducted locally and in neighboring countries like India.[1,10] Various studies conducted in Saudi Arabia and India also revealed concordant results. [11,12,13]

Most of the participants belonged to the adult age group (18 to 50 years). It was reported that both hypothyroidism and hyperthyroidism are more common in adults than in extreme ages.[14] Similar findings were observed in a study conducted in Europe.[15]

When the results of TFTs were studied, the most common biochemical abnormality was Hyperthyroidism. 9.5% of subjects had hyperthyroidism followed by subclinical hypothyroidism (8.9%), subclinical hyperthyroidism (7.9%), and hypothyroidism (6.4%), respectively. In Indian research, 2.5% of the participants were overtly hyperthyroid, whereas 5.97% were subclinically hyperthyroid.[8] Similarly, according to a study in Pakistan, hyperthyroidism and subclinical hyperthyroidism were found to be present in 5.1% and 5.8% of the population, respectively.[16] These results are slightly lower than what we found in our research. In our study prevalence of subclinical hypothyroidism is 7.9%, while overt hypothyroidism is 6.4%. A study from India reported subclinical hypothyroidism in 9.44% of patients. These are quite like the present study.[8]

When the sum of overt and subclinical disease was calculated, 17.4% had hyperthyroidism while 15.3% cases had hypothyroidism, though the difference was not statistically significant. In contrast to current results, Hypothyroidism is a more frequent thyroid disorder. A study conducted in India by Maurya H reported that hypothyroidism was observed in the maximum number of patients.[17] Two more studies from India by Jaikhai et al and Deokar et al also reported similar findings.[8,10] Studies from Pakistan also indicated that hypothyroidism is more prevalent in Pakistan. A study reported that around 60% of the cases of thyroid disorder are of hypothyroidism.[14] Whereas results of some studies are not comparable e.g. Abdullah et al showed a slight predominance of hyperthyroidism.[1] Another study from Gujranwala also had similar findings, with hyperthyroidism being more common.[5] An Indian study also has similar findings.[10] A study from Peshawar reported 13.17% of cases had hyperthyroidism followed by 11.3% cases of hypothyroidism.[1] Findings reported in a study conducted in Peshawar's study is in agreement with the current study. Variability in results may be due to regional variation, diet differences, and iodine supplementation. As observed from the literature, thyroid disorders have regional variation and their prevalence is also affected by diet, iodine supplementation, medication, and exposure to radiation, etc.[18] An association of thyroid problems with different illnesses has been established by many studies like coronary artery disease, lipid disorder, arrhythmia, heart disease, and skin disorder.[3]

One important finding in the current study was that out of 2281, the results of 1462 (64.1%) patients tested for TFTs were within normal limits. Similar findings were seen in an Indian study that showed 59.64% of total patients had a normal thyroid profile.[10] However another prevalence study in India reported 84.65% of the result as euthyroid.[19] This

high percentage of normal TFTs, though is in concordance with previously reported results but is not in agreement with the current study.[9] It is suggested that when referring a patient for thyroid evaluation, symptom complexity should be kept in mind, considering one or two symptoms may result in undue testing and normal results. It will not only add financial burden but will also create disease anxiety in patients.

Conclusion

Thyroid disorders are not infrequent in our community. Females are more affected than males. Hyperthyroidism is a slightly more common disorder in Sahiwal. There is a dire need to redefine the case description of thyroid disorders and a rational and cost-effective approach should be employed in ordering TFTs.

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