



PATTERNS OF THYROID DISORDERS AND ASSOCIATED METABOLIC CHANGES IN NORTHERN SAUDI ARABIA

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ABSTRACT

Objective: the aim of the present study was to find out the common pattern of thyroid disorders in northern Saudi Arabia and its associated metabolic changes. **Methodology:** Seventy seven referred Saudi patients diagnosed as having thyroid disorders based on clinical information, laboratory and radiological testing were included. **Results:** Of the 77 patients, 14/77(18.2%) were diagnosed as having hyperthyroidism and 63/77(81.8%) were diagnosed as having hypothyroidism. Of the 14 patients with hyperthyroidism 10/14 (71.4%) were males and 4/14(28.6%) were females. **Conclusion:** Hypothyroidism is prevalent pattern of thyroid disorder in northern Saudi Arabia, particularly and females.

KEYWORDS: Thyroid Disorders, Saudi Arabia, hyperthyroidism, hypothyroidism.

INTRODUCTION

Thyroid hormone act as an vital factor of development and growth, and in adults plays a critical part in the regulation of the function and metabolism of virtually every organ system.^[1,2] Tissue-specific modulation of the thyroid hormone action is achieved by a complex and redundant control system that includes thyroid hormone secretion, plasma transport, trans-membrane transport, activation or inactivation, and interaction with nuclear receptor isoforms and their co-regulators.^[3] Thyroid hormone was long believed to cross the plasma membrane through simple diffusion, but latest studies have recognized a number of thyroid hormone transporters including members of the mono-carboxylate transporter family (MCT) and the organic anion transporting polypeptides (OATP), which are important for keeping the intracellular concentrations of thyroid hormones.^[4] Thus, the exact circulating levels of thyroid hormones achieved during mono-therapy, with higher serum T₄ and lower serum T₃ levels than the naturally euthyroid state, are obtainable to the thyroid hormone transporters, which are then responsible for modulating intracellular levels of T₃.^[3]

Hypothyroidism is a common thyroid disorder that is simply treated in the bulk of cases, when readily diagnosed; however, presentation of a combined of its symptoms is often clinically disregarded or attributed to another disease and can potentially be fatal. Now it is prevalent in older women, its occurrence in younger

patients is increasing as a result of radiation therapy, radioactive iodine therapy, and innovative antineoplastic agents used to manage various malignancies. Thyroid dysfunction can be easily overlooked in cancer patients because of the complexity of cancer's clinical picture, particularly in the pediatric population. At minimum, quality of life is adversely affected. Untreated hypothyroidism can lead to heart failure, psychosis, and coma and can reduce the effectiveness of potentially life-saving cancer therapies, whereas iatrogenic causes can provoke atrial fibrillation and osteoporosis.^[5]

Hyperthyroidism and thyrotoxicosis are hypermetabolic disorders that responsible of significant morbidity and mortality. The diagnosis can be difficult because symptoms can mimic several other disease conditions leading to inaccurate or inconvenient diagnoses and management. Thyroid storm is the most severe form of thyrotoxicosis, hallmarked by changed sensorium, and, if untreated, is associated with significant mortality. Thyroid storm should be considered in the differential of any patient presenting with changed mental status.^[6]

However, there a lack of literature regarding thyroid disorders that associated with the states of hypothyroidism or hyperthyroidism, therefore, the aim of the present study was to find out the common pattern of thyroid disorders in northern Saudi Arabia and its associated metabolic changes.

MATERIALS AND METHODS

In the present study, study subjects were identified by a retrospective retrieval of data regarding patients who had undergone clinical, laboratory and radiological investigations at King Khalid Hospital, Northern Saudi Arabia, for the diagnosis of thyroid disorders. All referred patients suspected as having thyroid disorders based on clinical information, laboratory and radiological testing were included. In addition to the clinical assessment, laboratory measures including thyroid hormones (T3, T4, MSH), AST, ALT, Urea, Creatinine and blood parameters were obtained. Clinical parameters, laboratory results together with demographical data were identified and analyzed using SPSS software (version 16) to identify frequencies and to cross tabulate different parameters.

RESULTS

This study investigated 77 patients with thyroid disorder, their ages ranging from 7 to 75 years with a mean age of 35 years old. Of the 77 patients, 14/77 (18.2%) were males and 63/77(81.8%) were females, giving males’ females’ ration of 1.00:4.50. Of the 77 patients, 14/77(18.2%) were diagnosed as having hyperthyroidism and 63/77(81.8%) were diagnosed as having hypothyroidism. Of the 14 patients with hyperthyroidism 10/14 (71.4%) were males and 4/14(28.6%) were females. Of the 63 patients with hypothyroidism, 4/63 (6.3%) were males and 59/63(93.7%) were females as indicated in Table1, Fig1, 2. In distribution of the age by thyroid disorders, the highest frequencies were detected among 26-35 and 36-45 years for hypothyroidism and <25 and 36-45 for hyperthyroidism, as indicated in Table 1.

Table1. Distribution of the patients by sex and age

Variable	Category	Hypothyroidism	Hyperthyroidism	Total
Sex	Males	10	4	14
	Females	59	4	63
Total		69	8	77
Age				
	<25 years	11	6	17
	26-35	19	3	22
	36-45	18	5	23
	46-55	10	0	10
	56+	5	0	5
Total		63	14	77

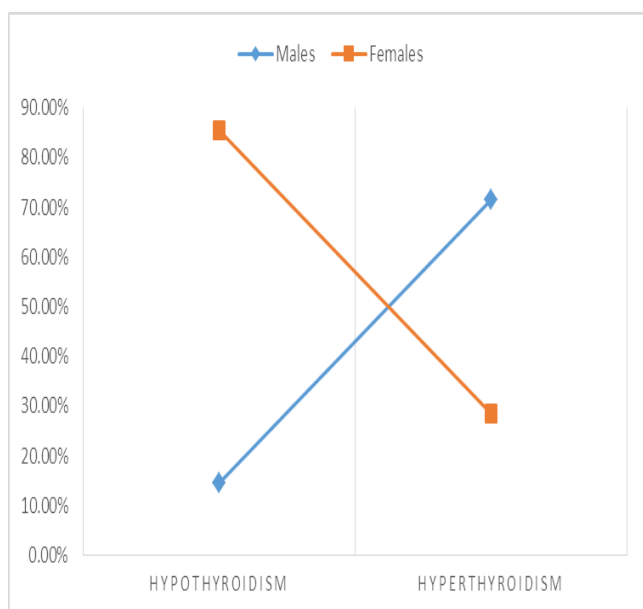


Figure 1. Thyroid disorder pattern by Sex

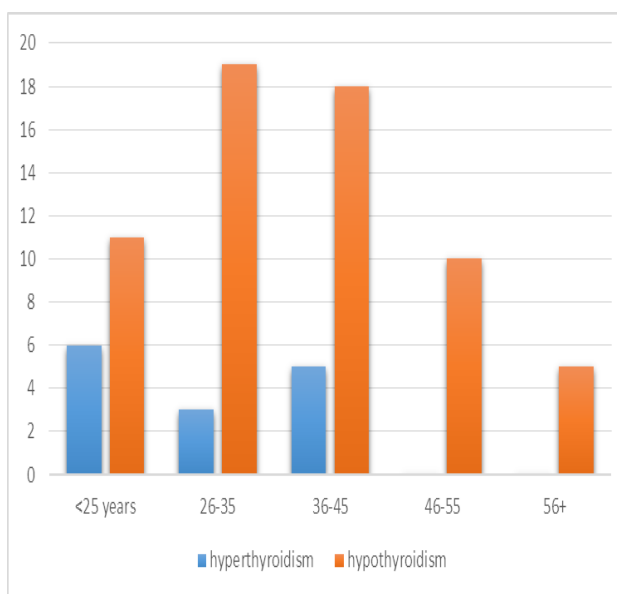


Figure 2. Thyroid disorder pattern by age

As summarized in Table 2. Most of the levels of thyroid hormones were normal, since they were monitored by treatment. However, for the AST, 10/63(15.9%) of the patients were found with high levels, as well as, 5/63(7.9%) of patients were detected with high ALT, as indicated in Fig3, Fig 4.

Table2. Distribution of thyroid disorders by hormones levels

Variable	Hypothyroidism			Hyperthyroidism		
	Low	Normal	High	Low	Normal	High
T3	4	56	3	2	7	5
T4	16	43	4	2	10	2
TSH	6	36	21	1	10	3
AST	1	52	10	0	13	1
ALT	0	58	5	0	13	1

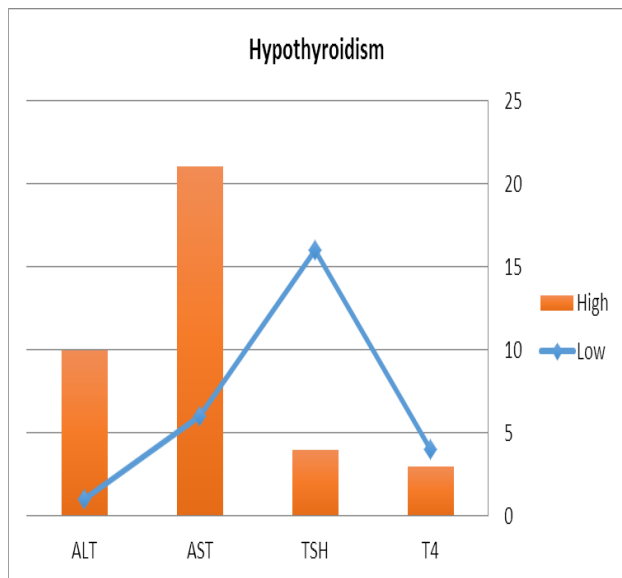


Figure 3 Description of Hypothyroidism by abnormal hormones levels

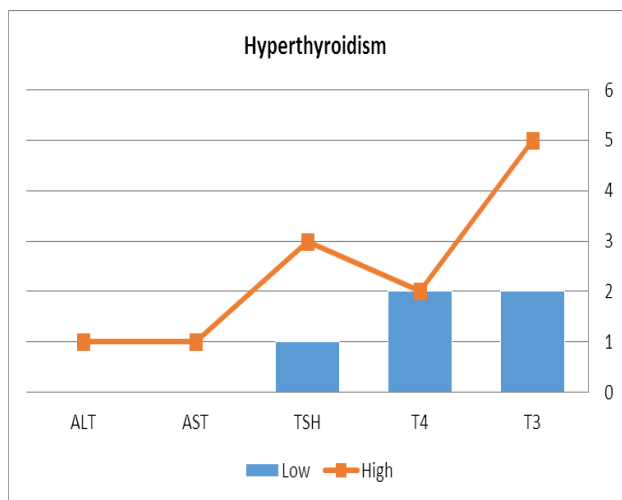


Figure 4 Description of Hyperthyroidism by abnormal hormones levels

Table 3 summarizes the distribution of thyroid disorders by Creatinine, Urea and blood parameters. For Creatinine, all cases with hypothyroidism were identified with high levels, as well as, all cases with hyperthyroidism. For urea, 4/63(6.3%) cases of hypothyroidism indicated low levels, for hyperthyroidism in addition to 2/14(14.3%) patients with low urea level, there were 5/14(35.7%) cases with high levels. For Hemoglobin (Hb), 34/63(54%) of the patients with hypothyroidism were found with low Hb levels, since for the patients with hyperthyroidism 5/14(35.7%) were also found with low Hb levels. As shown in Fig 5 and 6.

Table 3. Distribution of thyroid disorders by Creatinine, Urea and blood parameters

Variable	Hypothyroidism			Hyperthyroidism		
	Low	Normal	High	Low	Normal	High
Creatinine	0	0	63	0	0	14
Urea	4	59	0	1	12	1
HB	34	26	3	5	9	0
RBCs	4	43	16	0	9	5
WBCS	6	44	13	0	9	5
Platelets	1	61	1	1	13	0

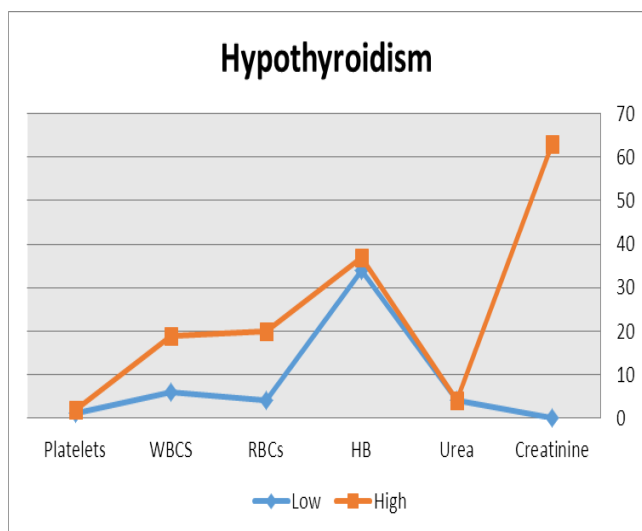


Figure 5 Description of Hypothyroidism by abnormal by Creatinine, Urea and blood parameters

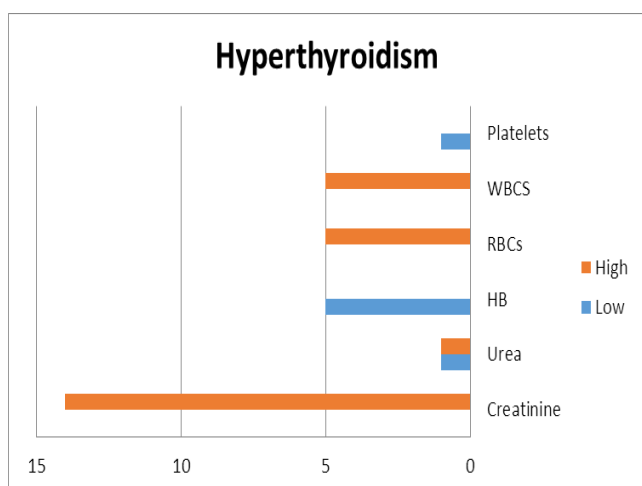


Figure 6 Description of Hyperthyroidism by abnormal by Creatinine, Urea and blood parameters

DISCUSSION

There is a well-known geographical differences in thyroid diseases due to the different environmental variations in different geographic settings.^[7] However, the incidence and pattern of thyroid disorders were previously studied in some parts of Saudi Arabia but not Hail area.^[8-12]

The present study was intended to find out the common patterns of thyroid diseases among patients in Hail area, Saudi Arabia. As indicated in the findings of the current study, hypothyroidism is the most frequent thyroid disorder affecting females in Northern Saudi Arabia. Although relatively most of the study in this context have shown high frequencies of hypothyroidism among females, but our findings seemed to be relatively higher. However, this might be attributed to the fact that most of these studies.^[11,12], considered the thyroid neoplastic changes, which were ignored in the present study. In a study of 309 cases of hypothyroidism seen at Al-Khobar, 124 (90 Saudis and 34 non-Saudis) adult patients with

spontaneous primary hypothyroidism satisfied the inclusion criteria for detailed analysis. Their male:female ratios for Saudis and non-Saudis were 1:4.6 and 1:3.9 respectively. The majority were diagnosed in their third and fourth decades. The prevalence of previously undiagnosed spontaneous and biochemically overt primary hypothyroidism in Saudis was 5.2/1000 females and 0.94/1000 males. FT4I was normal in 43 (35%) and low in 81 (65%).^[13] In a recent study investigated the relationship between Rheumatoid Arthritis (RA) and Autoimmune Thyroid disturbance, high prevalence of thyroid function disturbances in our sample of RA patients, compared to non-RA patients]. (26.3% and 7% respectively), with the patterns of thyroid dysfunction as follows: Subclinical hypothyroidism in 29 patients (19%), Hypothyroidism in 6 patients (4%), Subclinical hyperthyroidism in 4 patients (2.6%) and hyperthyroidism in 1 patient (0.7%).^[14]

Thyroid cancer is the second most common malignancy among females in Kingdom Saudi Arabia (KSA), accounting for about 11% of all newly diagnosed female cancers in the country in 2008. Over the past several decades, an increasing incidence of thyroid cancer has been reported in the KSA. There are no comprehensive clinical epidemiological data for the trends of thyroid cancer incidence compared to the global incidence. Thyroid cancer incidence rates have increased exponentially between 2000 and 2010 and there is significant geographical variation in the incidence of thyroid cancer throughout the Kingdom. Thyroid cancer has become the second most common cancer among young Saudi women with a male to female ratio at 0.3:1. Rising incidence of thyroid cancer in Saudi Arabia may be due to the increased detection and diagnosis of the thyroid cancers and not only an increase in the true occurrence of thyroid cancer. More studies are required to determine this significant difference at the molecular level.^[15]

In regard to the discrepancies between the type of thyroid disorder and the levels of thyroid hormones may be due to the fact that some of these patients were under treatment. On the other hand, AST was found to be high in 10 cases of hypothyroidism, as well as 5 cases of ALT. AST is found in the liver, heart, skeletal muscle, kidneys, brain, and red blood cells. Serum AST level, serum ALT (alanine transaminase) level, and their ratio (AST/ALT ratio) are commonly measured clinically as biomarkers for liver health. However, it is important to keep in mind that the source of AST (and, to a lesser extent, ALT) in blood tests may reflect pathology in organs other than the liver. In fact, when the AST is higher than ALT, a muscle source of these enzymes should be considered.^[16] Thyroid dysfunction may perturb liver function, liver disease modulates thyroid hormone metabolism, and a variety of systemic diseases affect both organs. Hypothyroidism may have features that mimic liver disease (pseudo-liver disease): examples include myalgias, fatigue and muscle cramps in the

presence of an elevated aspartate aminotransferase from a myopathy.^[17]

Furthermore, in the present study, all cases of thyroid disorders were found with elevated carnitine levels. Hypothyroid state is associated with significant derangement in biochemical parameters of renal function. Some studies have shown that reduced thyroid hormone levels may lead to elevated creatinine levels. And elevated creatinine levels may be associated with elevated levels of uric acid in patients with hypothyroidism.^[18-20]

Nevertheless, low levels of hemoglobin concentrations were observed in a significant number of cases of hypothyroidism in the present study. The prevalence of anemia was higher in overt hyperthyroidism, but not increased in subclinical thyroid dysfunction. Systematic measurement of thyroid-stimulating hormone in anemic patients is likely to be useful only after excluding common causes of anemia.^[21]

About 300 million people across the world suffer from thyroid gland dysfunction. Environmental factors play an important role in causation of autoimmune thyroid diseases in susceptible individuals. Genetics contributes to 70% of the risk.^[22] In order to reduce the risk, we need to understand the association of environmental agents with thyroid dysfunction. These factors are especially relevant for those at increased risk due to positive family history. The ideal study to see the impact of a thyroid toxicant consists of directly measuring the degree of exposure to toxicant in an individual with his thyroid status. Knowledge of various factors influencing thyroid dysfunction can help in interpreting the results of such studies in a better way.

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