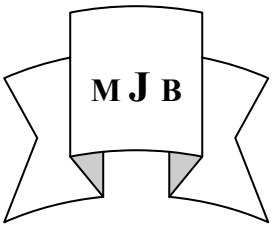
Assessment of Thyroid Hormones Profile among Medically Referred Individuals in Sulaimania

Abdul Hussein Alwan Farage
College of Medicine/ University of Sulaimani, Sulaimani,Iraq.
Email: algenabi@yahoo.com



Abstract

Background: Thyroid disorders are common problems with significant public health implications. Early detection and treatment of these disorders can prevent serious morbidity. The frequency of abnormal thyroid hormones profile and its relationship to traditional thyroidal symptoms particularly in individuals with subclinical thyroid dysfunction remain unclear.

Objective: To determine the abnormal thyroid hormone profile in a large number of individuals referred to a consultant laboratory in Sulaimania.

Material and methods: A total of 9795 individuals referred to Alshahid – Hadi Consultant Hormonal Laboratory in Sulaimania were invited to participate in the study with a questionnaire and blood samples.

Results: Patients with previously diagnosed hypo- and hyperthyroidism were 11.2% and 4.9% in females and 8.4% and 4.0% in males respectively. In females, the percentage of both hypo- and hyperthyroidism increased with age while in males, the percentage of thyroid dysfunction increased with age reaching the peaks at 6th decade for hypothyroidism and 5th decade for hyperthyroidism after which they tend to decline. Abnormalities of thyroid hormones profile among the previously diagnosed patients treated by thyroidectomy, carbimazole and thyroxine were 20.9%, 8.9% and 19.3% respectively. Thyroid hormones profile confirmed the initial clinical diagnosis of hypo-and hyperthyroidism in 16.3% and 14.5% respectively. The frequency of both elevated and suppressed TSH levels in individuals without former or present thyroid disorders were higher in females (6.5% and 1.0%) than males (3.8% and 0.68%) respectively and were higher at an older age group (> 45 years).

Conclusions: The present study showed that abnormal thyroid hormones profile occurs frequently in patients at older age groups. Clinical and laboratory follow up may be essential to prevent disease progression in those who have abnormal TSH level alone without obvious cause. Abnormal thyroid hormones profiles were recorded in a large number of patients taking thyroid medications or have had thyroidectomy.

تقييم مرتسم هرمونات الدرقية بين أشخاص محالين طبيا في السليمانية

الخلاصة

الخلفية: يعتبر خلل الدرقية من المشاكل الشائعة وذات تأثير هام على الصحة العامة. وان التشخيص والعلاج المبكرين لهذه الحالات قد يمنع حدوث اصابات خطيرة. ان مدى حدوث خلل في صورة هرمونات الدرقية وعلاقته مع علامات المرض التقليدية و خاصة عند الاشخاص الذين يعانون من خلل وظائف الدرقية الأدنى من السريري في مجتمعنا غير واضح.

الغرض: تعيين الخلل في مرتسم هرمونات الدرقية لعدد كبير من الاشخاص المحالين لمختبر الشهيد هادي الاستشاري في السليمانية.

الطرق و المواد: مامجموعه ٩٧٩٥ شخصا محالين طبيا الى مختبر الشهيد هادي الاستشاري في السليمانية دعو للمشاركة في هذه الدراسة مع ملى ورقة معلومات وأخذعينة دم.

النتائج: أظهرت الدراسة ان نسب انخفاض و ارتفاع هرمونات الدرقية المشخصة سابقا كانت ١١,٢% و ٤,٩% عند الاناث و ٨,٤% و ٤,٠% عند الذكور على التوالي. وان نسبة كل من انخفاض و ارتفاع هرمونات الدرقية عند الاناث قد ازداد مع تقدم العمر بينما عند الذكور فان نسبة الخلل ازدادت مع تقدم العمر لتصل اعلى مستوى لها عند العقد السادس و العقد الخامس لحالات انخفاض

وارتفاع هرمونات الدرقية على التوالي وبعدها عاد الى الانخفاض ثانية. وان خلل صورة هرمونات الدرقية عند المرضى المشخصين سابقا والمعالجين بواسطة عملية استئصال الدرقية أوبالكاربيمازول أو بالثايروكسين كانت ٢٠,٩% و ٨,٩% و ١٩,٣% على التوالى كما واظهرت الدراسة بان صورة هرمونات الدرقية طابقت التشخيص السريري لانخفاض و ارتفاع هرمونات الدرقية عند ١٦,٣ % و ١٤,٥ % على التوالي. وان مدى ارتفاع و انخفاض الهرمون المحفز للدرقية كان اعلى عند الاناث (٦,٥ % و١,٠%) بالمقارنة مع الذكور (٣,٨ % و ٠,٦٨ %) على التوالي وقد سجلت اعلى نسب عند كبار السن (أكثر من ٤٥ عاما).

الاستنتاج: بينت الدراسة الحالية بان خلل صورة هرمونات الدرقية اكثر حدوثا عند كبار السن من المرضى. وان هذا الخلل قد سجل عند نسبة كبيرة من المرضى المشخصين و المعالجين بواسطة عقاقير الدرقية او المجراة لهم عملية استئصال الدرقية .وان المتابعة السريرية و المختبرية ربما تكون ضرورية لمنع تفاقم المرض عند الأشخاص الذين ظهرلديهم خلل في مستوى الهرمون المحفز للدرقية فقط مع عدم وجود سبب واضح لذلك الخلل.

كلمات المفتاح: صورة هرمونات الدرقية، خلل وظيفة الدرقية العلاجي، خلل مستوى الهرمون المحفز للدرقية

Introduction

Thyroid abnormalities affect a considerable portion of the population and may therefore constitute a health challenge to the community [1-3]. In addition, the frequency of thyroid dysfunction has increased with time and its results vary among different studies [1-6]. The difficulty with many of these studies lies in variable definitions of disease states, the poorly defined and diverse populations studied and the insensitive measures of thyroid function. Generally, the total frequency of hypo- and hyperthyroidism in adolescents and adults is estimated to be 1 – 4% and it is higher in women than men and increases with advancing age [1, 2, 4,7].

In addition, abnormal thyroid function has important public health consequences. Hyperthyroidism has been associated with osteoporosis and an increased risk of atrial fibrillation. Hypothyroidism, on other hand, contributes to elevated serum levels of cholesterol and subsequent risk of atherosclerosis [8]. Moreover, several studies suggest that these complications may also be true with subclinical thyroid dysfunctions [9,10] . However, the impact of various degrees of subclinical thyroid dysfunctions remains unsettled, but large population studies have suggested that the frequency of subclinical hypothyroidism is much higher in women than men and increases with age [1-3, 11-13]. In contrast, the frequency of subclinical hyperthyroidism varies amongst the reports. It was reported to be 0.7% to 3.9% [3, 12,13].

On the other hand, few data were available about the frequency of iatrogenic thyroid dysfunctions which occur due to over- or under- treatment with thyroid medications or following thyroid surgery [3, 11, 14, 15]. This type of abnormality may carry a risk of complications similar to overt thyroid abnormalities. In one of such studies Canaris et al [3] reported an elevated and suppressed TSH levels in 18.3% and 21.6% among patients on thyroid medications.

Furthermore, there have been no detailed reports in the literature on the abnormalities of thyroid hormone profile in Iraq, especially in Kurdistan region, other than a short report from Basrah [16]. Therefore, the present study was designed to evaluate such abnormalities in relatively large number of medically referred individuals in Sulaimania and may be of value in this regard to give an idea about this health problem and to be a base for larger studies in future.

Material and Methods

The study was approved by the regional committee for ethics in Medical Sulaimania College. Sulaimania is a town in north of Iraq / Kurdistan region. During the period October 2004 - October 2007 all individuals referred to Alshahid – Hadi Hormonal Laboratory were invited to participate in this study. In addition to clinical measurements, the participants were asked to complete a self-assessment questionnaire that included thyroid-related questions, race, complete medical history, drug history, age, sex and pregnancy (Table 1).

Study groups:

A total of 9795 persons invited to participate in the study; of these, 8221 (83.9%) were females and 1574 (16.1%) were males. Thyroid hormone profile test abnormalities were evaluated in 3 groups of individuals: Group I (patients with former thyroid disease) includes individuals answered yes to at least one of the thyroid-related questions in the questionnaire (Table 1), indicating a history of thyroid dysfunction; Group II (patients with present thyroid disease) includes individuals in whom thyroid hormone profile confirm the initial diagnosis of thyroid dysfunctions; Group III includes individuals with no former or present thyroid disease but they have abnormal TSH levels.

Thyroid hormone profile:

The thyroid stimulating hormone (TSH), triiodothyronine (T3) and thyroxine (T4) levels of serum samples were analyzed at the Hormone Laboratory of Alshahid – Hadi Consultant Clinic/ Ministry of Health in Sulaimania. Serum total T3 (reference range 0.92 – 2.33 nmol/l), total T4 (reference range 60 – 120 nmol/l) and TSH (reference range 0.25–5.0 mIU/l) were measured by enzyme linked immunofluoresent assay (ELFA) all from Biomereiux, France. Serum was separated and freeze until assays which performed within one week. Freezing –thawing were avoided.

Data analysis

The data analysis was performed with SPSS (version 15.0). For continuous variables, non-parametric tests (2-tailed Mann-Whitney U tests) were used. Group differences between the numbers of subjects were analyzed using Chi-squared test. P values < 0.05 were considered statistically significant.

Results

Thyroid hormone profile in patients with former thyroid disease

Table 2 showed the self - reported previously diagnosed thyroid disease and treatment. In all, percentages of hypo- and hyperthyroidism were reported in 11.2% and 4.9% of females and 8.4% and 4.0% of males with sex ratios females: males 1.23 and 1.33 respectively. In females, the percentage of both previously reported hypo- and hyperthyroidism increased with age while in males, the frequencies of thyroid dysfunction increased with age reaching the peaks at 6^{th} decade for hypothyroidism and 5^{th} decade for hyperthyroidism after which they tend to decline toward that of younger age groups (table 2).

The number of patients who had been treated with thyroidectomy, carbimazole or thyroxine with duration of three months and more were shown in Table 3. Among the 869 participants answered yes to thyroidectomy or carbimazole treatment, the overall percentage of elevated TSH level with or without low levels of T3 and T4 levels was 133 (14.8%). Of the 464 patients treated with thyroidectomy, thyroid hormone profile abnormality was recorded in 20.9% (age range 18 – 65 years and female/ male ratio of 86/11). In contrast, post carbimazole elevation of

TSH level was observed in 36 out of 405 (8.9%) with age range 13 - 67 years and females to male ratio of 31/5. Significant statistical differences were observed in the number and thyroid hormone levels between the two groups (P< 0.05). Table 3 also showed the percentage of suppressed TSH levels; among 848 of formerly diagnosed patients treated with thyroxine, the overall percentage of abnormal TSH level was 19.3% of which 14.8% had suppressed TSH levels only (age range 11-70 years and female/ male ratio of 114/12) and the remaining 4.5% had suppressed TSH levels associated with high T3 and/or T4 levels that were consistent with overt hyperthyroidism (age range 5 – 73 years and female/ male ratio of 30/8). A significant difference was observed between the two groups (P< 0.05).

Thyroid hormone profile in patients with present thyroid disease:

Table 4 presents the hormonal profile of newly diagnosed patients from a total of clinically suspected cases. In only 832 (16.3%) and 406 (14.5%), hormonal analysis confirmed the clinical suspicion of hypo- and hyperthyroidism respectively. In 727 (17.1%) of female patients and 105 (12.2%) of male patients, thyroid hormone profiles confirm the initial diagnosis of hypothyroidism. Comparatively, the figures for newly diagnosed hyperthyroidism were 352 (15.2%) and 54 (11.2%) respectively.

Thyroid hormone profile in individuals without former or present thyroid disease:

Tables 5 and 6 represent respectively the percntage of elevated and suppressed TSH levels in subjects without former or present thyroid disease. Apart from abnormal serum TSH levels, all of these subjects had T3 and T4 within the reference ranges (i.e. 0.93 – 2.33 nmol/l for T3 and 60 - 120 nmol/l for T4). As shown in table 5, an elevated TSH level (> 5.0 mU/l) in both females and males were higher in subjects aged ≥ 45 years compared to those aged < 45 years (10.5% vs. 4.5% for females and 5.1% vs. 2.9% for males). The comparative figures for suppressed TSH levels (<0.2 mU/l) were 1.9% vs. 0.65% and 1.13% vs. 0.38% respectively (Table 6). Regardless of age, the frequency of both elevated and suppressed TSH levels were higher in females (6.5% and 1.0%) than males (3.8% and 0.68%) respectively. As shown in tables 5 and 6, the frequencies of TSH ≥10 mU/l and TSH ≤0.05 mU/l were reported in 2.5% and 0.25% in females and 1.37% and 0.23% in males respectively.

Discussion

Abnormal thyroid function has multiple implications for public health. However, numerous studies from various countries differ in their frequency estimates for hypo- and hyperthyroism [1-4, 11-14, 16]. The present study results showed that the proportion of subjects with thyroid dysfunction was greater among women than men and increased with advancing age (table 2), both of which are supported by several previous studies [1-3, 11, 12]. However, the frequency of previously diagnosed hypo- and hyperthyroidism in the present study was greater than previously reported by Vandepump et al. [13] from UK and Bjoro et al.[11] from Norway. Diverse study population and designs and various definitions of thyroid disease may account for this difference.

The present study also showed that nearly 15% of patients treated by thyroidectomy or carbimazole have an elevated TSH level and more than 19% treated by thyroxine have a suppressed TSH level below normal (table 3).

These observations are consistent with those of Canaris et al. [3] and Ross et al. [14]; however, they were higher than the range previously reported by others [11, 15]. Of interest, most of the present study patients had seen by different physicians in the past years which may results in irregular treatment and follow- up and may explain the presence of high percentage of patients who are not in normal range of thyroid hormone profile. Such patients may be at risk for organic consequences of over- or under- treatment [8-10]. Clinicians may therefore consider monitoring patients on thyroid medications more frequently which is highly recommended to occur in a special endocrine center prepared for management of thyroid disorders.

As shown in table 4, the hormonal tests confirmed the initial clinical diagnosis of hypothyroidism in 16.3% of patients (17.1% of females and 12.2% of males) and that of hyperthyroidism in 14.5% of patients (15.2% of females and 11.2% of males) and in both conditions the percentage of newly diagnosed cases were common in females than males. These results are consistent with the results reported by previous studies [2-4, 12, 13]. However, the study which has been conducted in Al-Basrah city [16] reported higher frequencies for both hypothyroidism (44.7%) and hyperthyroidism (48.6%). This variation may be due to smaller sample size used in their study (N=1007 individuals) as compared to the present study (N=7903 individuals) or could be due to difference in the types of the study design, the present study was designed to separate between an isolated abnormality of TSH level and overt thyroid disorders as well as between formerly and newly diagnosed cases of hypothyroidism and hyperthyroidism while in that of Al-Basrah study no such distinction has been made which could attributed to the overestimate values in their study. However, given the combination of differences in ethnic groups, geographical locations and methodologies, the present study cannot exclude the possibility that there is an ethnic, a geographical or an analytical component to variations in frequency of thyroid dysfunctions.

Of the individuals who have no former or present thyroid dysfunctions and who did not reported taking thyroid medications, the percentage of an elevated TSH level alone (>5.0 mU/l) in this study of 6.5% for females and 3.8% for males is within the range reported in literature and consistent with findings of the previously reported studies [3, 11, 13]. In contrast, the study of Sawin et al. [2] reported a higher percentage of elevated TSH (13%) in females as compared to the present study (6.5%); however, there is no information regarding former diagnosed thyroid disorders in their report. In the present study, the percentage of abnormal TSH values is from subjects without former thyroid disorders or use thyroid medications. In addition, an elevated TSH level alone was substantially higher in both males and females at older age groups (over 45 years) compared to younger age groups and that the proportion of subjects with elevated TSH level was greater among women than men (Table 5), both of which are extend and support the suggestions reported by large population studies [3,11,113].

Although the current study is cross-sectional and does not determine either the clinical effects of an elevated TSH level alone or the risk for progression of this abnormality to overt hypothyroidism, such a progression has been reported in some longitudinal studies [12, 17]. There is

also a strong association between positive thyroidal autoantibodies and elevated TSH from one hand and progression to overt hypothyroidism on the other hand [18]. Unfortunately, only few patients with elevated TSH levels alone in the present study have been sent for reassessment of their thyroid hormone profiles by using free thyroid hormone levels, which are mandatory in such situations to exclude or confirm overt hypothyroidism, and none of them have been sent for detection of thyroid autoantibodies, which are important prognostic factors for assessment of progression to overt hypothyroidism [18]; therefore, it is highly recommended to evaluate both these tests in such patients in order to prevent disease progression.

In contrast, among those who have no former or present thyroid dysfunctions and who did not reported taking thyroid medications; the present study revealed a suppressed TSH levels alone (<0.2 mU/l) in only few individuals (1.0% for females and 0.68% for males). These results are in accordance with that of Hollowell et al. [12]; however, it is lower than the results of other investigators [13]. This discrepancy may be due to different inclusion criteria used by various studies. In the present study, any patient with known thyroid disorder or those on thyroxine therapy were categorized as a special entity and therefore were excluded, while in Vanderpump et al [13] study they included such patients which might explain the higher percentages of this abnormality in their reports. The rate of progression to overt hyperthyroidism has estimated to be 3.9 to 5.0% per year and it has been found that subjects with initial suppressed but detectable TSH levels and those with negative thyroid antibodies tend to return to normal on follow-up while those with undetectable TSH and those with positive thyroidal autoantibodies remain unchanged with small risk of progression to overt hyperthyroidism [19]. In fact the precise pathophysiology and natural history of such finding is unknown however, suppressed TSH level may occasionally results from non-thyroidal causes such as euthyroid sick syndrome, acute psychiatric disease and some drugs e.g. glucocorticoids, aspirin, fenclofenac and furosemide [20] which can give false impression about the presence of such abnormality.

The present study has several limitations. First, total serum thyroid hormone level was measured in this study so that thyroid status is less certain than if free thyroid hormone level was available. Second, the study is cross- sectional and hence does not include individual changes over time. Finally, the presence of thyroid disease or use of thyroid medications was self reported. But despite these limitations, the present study confirms the magnitude of thyroid dysfunctions and showed that abnormal thyroid hormone profile, particularly hypothyroidism; occur frequently in patients at older age groups. Those who have an isolated abnormality of TSH levels, especially women and elderly, may require both clinical and thyroid hormone profile follow- up to prevent disease progression. Results from this study also demonstrated a large number of patients taking thyroid medications who were not in the therapeutic range. Clinician may therefore consider monitoring patients on thyroid medications more frequently. However, large randomized studies in our community are needed to determine the frequencies of thyroid dysfunctions among individuals at high risk from these disorders (women

and elderly patients) as well as other studies are required to determine the likelihood that treatment will improve quality of life in otherwise healthy individuals who have mildly elevated TSH levels.

References

1. Tunbridge M, Everd C, Hall R, Appelton D, Breavis M, Clark F. The spectrum of thyroid disease in the community; the whickham survey. Clinical Endocrinology 1977; 7:481-493.
2. Sawin T, Castelli P, Hershman M, McNamara P, Bacharach P. The aging thyroid, thyroid deficiency in the Framingham study. Archives of Internal Medicine 1985; 145:1386-1388.
3. Canaris J, Manowitx R, Mayer G, Ridgway C. The Colorado thyroid disease prevalence study. Archives of Internal Medicine 2000; 160:526-534.
4. Bulow Pedersen I, Knudsen N, Jorgensen T, Perrild H, Ovesen L, Laurberg P. Large differences in incidences of overt hyper-and hypothyroidism associated with a small difference in iodine intake: a prospective comparative register – based population survey. J clin endocrinol Metab 2002; 87:4462-4469.
5. Volzke H, Christian S, Henri W, Marcus D. The association of thyroid dysfunction with all cause and circulatory mortality: Is there a casual relationship. J Clin Endocrinol Metab 2007; 92.
6. Camargo A, Tomimori K, Neves C, rubio S, galrao L, Knobel M. Thyroid and the environment: exposure to excessive nutritional iodine increases the prevalence of thyroid disorders in Sao Paulo Brazil. Eur J endocr 2008; 159: 293-299.
7. Weissel M. Disturbances of thyroid functions in elderly. Wein Klin Wochenschr. 2006; 118: 16-20.
8. Jameson J, Weetman A. Disorders of the thyroid gland. In: Kasper D, Fauci A, Longo D, Bruanwald E, Hauser S, Jameson J, eds. Harrison's Principle of Internal Medicine. 16th ed. New York, McGraw-Hill. 2005; 2104-2126.
9. Lesley R, Helen P, Andrea R, Jayne F, Sue W, Richard H, James V. Is subclinical thyroid dysfunction in elderly associated with depression or cognitive dysfunction? Ann Intern Med 2006; 145: 573-581.
10. Nicolas O, Reto A, Douglas B, David N, Jacobijn G, Jacques C, Nicollas R. Meta-analysis: Subclinical thyroid dysfunction and the risk for coronary heart disease and mortality. Ann Intern Med 2008; 148: 832-845.
11. Bjoro T, Holman J, Kruger O, Midthjell M, Hunstad K, Schreiner T, Standens L, Brochman H. Prevalence of thyroid disease, thyroid dysfunction and thyroid peroxidase antibodies in a large unselected population. The Health Study of Nord-Trondelag (HUNT). European Journal of Endocrinology 2000; 143: 639 – 647.
12. Hollowell G, Staehling W, Flanders D, Hannon H, Gunter W, Spencer A. Serum TSH, T4 and thyroid antibodies in the United States population (1988 – 1994): National Health and Nutrition Examination Survey (NHANES). J Clin Endocrinol Metab 2002; 87: 489 – 499.
13. Vanderpump J, Tunbrige M, French M, Appleton D, Bates D, Clark F, Grimly Evans J, Hasan M, Rodgers H, Tunbridge F, Young T. The incidence of thyroid disorders in community: a twenty year follow-up of the Whickham survey. Clinical Endocrinology 1995; 43: 55-68.
14. Ross S, Daniel H, Gouveia D. The use and limitations of chimluminescent thyrotropin assay as a single thyroid function test in an outpatient endocrine clinic. J Clin Endocrinol Metab 1990; 71: 764-769.

15. Watsky J, Koeniger M. Prevalence of Iatrogenic Hyperthyroidism in a Community Hospital. J Am Board Family Practice [Abstract]
16. Ajlaan S, Baqir Y. Evaluation of Thyroid Hormone Profile in Patients with Suspected Thyroid Dysfunction in Basrah. Medical Journal of Babylon 2004; 1: 197-203.
17. Flynn R, MacDonald T, Morris A, Jung R, Leese G. The Thyroid Epidemiology, Audit and Research Study: Thyroid Dysfunction in the General Population. J Clin Endocrinol Metab 89 (8); 3879-3884.
18. Huber G, Staub J, Meier C, Mitrache C, Guglielmetti M, Huber P, Braveman E. Prospective study of the spontaneous course of subclinical hypothyroidism: prognostic value of thyrotropin, thyroid reserve and thyroid antibodies. J Clin Endocrinol Metab 2002; 87 (7):3221-3226.
19. Parle V, Franklyn A, Cross W, Jones C, Shepard C. Prevalence and follow up of abnormal thyrotropin (TSH) concentrations in the elderly in the United Kingdom. Clinical Endocrinology 1991; 34: 77-83.
20. Surks I, Ocampo E. Subclinical thyroid disease. Am J Med 1996; 100(2): 217-223.

Table 1 The information and questionnaire paper

Name: Age: Sex: Race:
Present and past medical history:
Drug history: Duration:
Pregnancy: Positive/negative
Thyroid related questions:

- Have you ever been diagnosed with hyperthyroidism?
- Have you ever been diagnosed with hypothyroidism?
- Are you on thyroxine medication?
- Are you on Carbimazole medication?
- Have you ever had an operation on your thyroid gland?
- If the answer was yes for any of the above questions, please mention the duration of it?

Table 2 Self reported formerly diagnosed thyroid dysfunction and treatment.

		Diagnosis		Treatment		
Age (years)	Total Number*	Hypothyroidism n (%)	Hyperthyroidism n (%)	Carbimazole n (%)	Thyroxine n (%)	Thyroid Surgery n (%)
Females						
<20	1020	59 (5.5)	36 (3.5)	31(3.0)	81(7.9)	15 (1.5)
20-29	2582	282(8.8)	111(4.3)	99(3.8)	209(8.1)	103(4.0)
30-39	2213	267(12.1)	89(4.03)	96(4.3)	207(9.4)	161(7.3)
40-49	1280	165(12.9)	65(5.1)	68(5.3)	155(12.0)	92 (7.1)
50-59	717	97(13.5)	51(7.1)	41(5.7)	65(9.1)	39 (5.4)
60-69	291	37(12.7)	36(12.4)	20(6.9)	18(6.2)	8 (2.7)
≥ 70	118	15(12.7)	16(13.6)	8(6.8)	6 (5.1)	2 (1.7)
All	8221	922 (11.2)	404 (4.9)	363(4.4)	741(9.0)	420(5.1)
Males						
<20	301	13 (4.3)	7 (2.3)	4 (1.3)	24(8.0)	3(1.0)
20-29	410	30 (7.3)	14 (3.4)	7 (1.7)	30(7.3)	7(1.7)
30-39	347	26 (7.5)	13 (3.7)	10 (2.9)	22(6.3)	15(4.3)
40-49	203	24 (11.8)	10 (4.9)	6 (3.0)	12(5.9)	7(3.4)
50-59	178	22 (12.4)	13 (7.3)	8 (4.4)	12(6.7)	2(1.1)
60-69	83	12 (14.5)	4 (4.8)	5 (6.0)	6(7.2)	8(9.6)
≥ 70	52	5 (9.6)	2 (2.8)	2 (3.8)	1(1.9)	2(3.8)

Table 3 Abnormalities of thyroid hormone profile among formerly diagnosed patients treated with thyroidectomy, carbimazole or thyroxine

Thyroid Profile abnormality		Age Range (F/M)	Thyroid Function Tests Mean±SD (Median)		
Type	No. (%)		T3 nmol/l	T4 nmol/l	TSH mU/l
*1)***Elevated TSH *:**					
-Post thyroidectomy (N=464)	97 (20.9)	18-65 (86/11)	0.85 ± 0.49 (0.82)	39.7± 22.9 (46.0)	47.9 ± 17.3 (60.0)
-Post Carbimazole (N=405)	36 (8.9)	13-67 (31/5)	1.02 ± 0.36 (0.95)	49.5 ± 16.2 (55.5)	31.1 ±20.5 (22.0)
- All (N=869)	133 (14.8)	13-67 (117/16)	0.9 ±0.47 (0.83)	42.3 ± 21.7 (47.0)	43.5 ± 19.5 (59.0)
2)**Suppressed TSH** *with normal T3&T4 (N= 848)*	126 (14.8)	11-70 (114/12)	1.79± 0.32 (1.8)	100± 15.2 (99)	0.085± 0.06 (0.045)
with high T3&/or T4 (N=848)	38 (4.5)	5 – 73 30/8	2.6± 0.62 (2.6)	145± 26 (143)	0.064± 0.035 (0.05)
- All (N=848)	164 (19.3)	5 – 73 144/20	2.06± 0.68 (1.9)	115± 34 (106)	0.08± 0.04 (0.05)

** With normal or low T3 and/or T4 levels; No. : Number of affected patients; F/M ratio: female/male; N: number of total patients on thyroid related therapy*

Table 4 Thyroid hormone profile abnormalities in newly diagnosed patients from the total clinically suspect cases

	Age Range	Clinical Suspect Number	Hormonal confirmed Number (%)	Thyroid function Tests Mean ±SD (range)		
				T3 nmol/l	T4 nmol/l	TSH mU/l
Hypothyroid						
Females	1month - 84 years	4244	727 (17.1)	0.64 ± 0.19 0.4 – 0.91	32 ± 17 (6 - 49)	45 ± 17 (13 - 60)
Males	2 days - 80 years	861	105 (12.2)	0.61 ± 0.2 (0.4 – 0.91)	31± 19.5 (6 - 50)	48 ± 15 (14 - 60)
All	2 days - 84 year	5105	832 (16.3)	0.63 ± 0.2 (0.4 – 0.91)	32 ± 17.8 (6 - 50)	46 ± 16.5 (13 - 60)
Hyperthyroid						
Females	4 months -83 years	2315	352 (15.2)	3.96 ± 1.98 (1.18 - 9.0)	186±69 (72 - 320)	0.059±0.03 (0.05– 0.22)
Males	1 year- 72 years	483	54 (11.2)	4.5±2.8 (1.16 - 9.0)	194±76 (70 - 320)	0.057±0.027 (0.05– 0.21)
All	4 months 83 years	2798	406 (14.5)	4.1±2.06 (1.16 - 9.0)	187 ±70 (70 - 320)	0.058±0.029 (0.05– 0.22)

Table ٥

	Total Number	All n (%)	TSH mU/l (n (%)*	
			≥ 10	> 5 and < 10
Females:				
20-44 years	2941	132 (4.5)	47 (1.6)	85 (2.9)
≥ *45 years*	1452	152 (10.5)	62 (4.3)	90 (6.2)
All	4393	284 (6.5)	109 (2.5)	175 (4.0)
Males:				
20-44 years	521	15 (2.9)	4 (0.77)	11 (2.1)
≥ *45 years*	355	18 (5.1)	8 (2.6)	10 (2.8)
All	876	33 (3.8)	12 (1.37)	21 (2.4)

** None of the patients had T3 and T4 levels out of the manufacturer reference ranges (i.e. T3:0.92 – 2.33 nmol/l and T4:60 – 120 nmol/l)*

Table 6 Percentage of suppressed TSH levels (with normal T3 and T4) in individuals without present or former thyroid disorders.

	Total Number	All n (%)	TSH mU/l (n (%)	
			> 0.05 and < 0.2	≤ 0.05
***Females*:**				
20-44 years	2941	17 (0.65)	13 (0.44)	5 (0.17)
≥ *45 years*	1452	27 (1.9)	20 (1.4)	7 (0.48)
All	4393	44 (1.0)	33 (0.75)	11 (0.25)
***Males*:**				
20-44 years	521	2 (0.38)	1 (0.19)	1 (0.19)
≥ *45 years*	355	4 (1.13)	3 (0.85)	1 (0.28)
All	876	6 (0.68)	4 (0.46)	2 (0.23)

** None of the patients had T3 and T4 levels out of the manufacturer reference ranges*

(i.e. T3:0.92 – 2.33 nmol/l and T4:60 – 120 nmol/l)