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RESEARCH ARTICLE

The effect of thyroid hormone on some biochemical factors of kidney

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Abstract

The present study was conducted to study the correlation between renal function markers and thyroid hormones .

Methodology : Ninety five blood sample which include (Fifty patients suffering from thyroid dysfunction and forty five subjects used as control group). were collected from patients attending AL- Hashemia Teaching Hospital at Babil during the period from September (2013) to February (2014).Their age range between (5-70) years . Subjects were examined for the following parameters { Serum creatinine , Blood urea , Thyroid Stimulating Hormone(TSH) , Tetraidothyronine (T4) and Triidothyronine(T3)} .

Results: The results showed that the most patients were in age group between (26 – 45) years . The percentage rate of females was (34.7%) , It was more than the percentage rate of males (15.8%) . This study recorded that there was a positive correlation between serum creatinine and thyroid hormone while there was a negative correlation between blood urea and thyroid hormone .

Conclusion : There was a significant difference ($P<0.005$) between normal and abnormal values of Creatinine , while there was a highly significant difference ($P<0.001$) between normal and abnormal values of TSH,T3,T4 .

INTRODUCTION

Thyroid gland synthesized and released triiodothyronine(T3) and thyroxine (T4), which represent the only iodine containing hormones in the vertebrates. T3 is the biologically active thyroid hormone Boelaert and Franklyn (2005). These hormones are required for the normal growth, development and function of nearly all tissues, with major effects on oxygen consumption and metabolic rate Yen.,(2001). Thyroid hormone synthesis and secretion is regulated by a negative feedback system that involves the hypothalamus, pituitary, and the thyroid gland Mansourian.,(2010a), Thyroid hormones play a vital role in various metabolic pathways within the human biochemical reactions and any alteration in the amount of serum thyroid hormones, directly cause metabolic disorders, in various organs and modify the normal metabolic the ways of various organs , including kidney Mansourian.,(2010b), The thyroidal status influences kidney function both during embryonic development and in the mature functioning of the kidney, indirectly by affecting the cardiovascular system through its influence on renal blood flow (RBF), and directly by affecting glomerular function, the tubular secretory and absorptive capacities, electrolyte pumps and kidney structure. The other main functions of kidney such as renal concentration ,dilution abilities also worsen to some extend Ponsoye *et al.*,(2012) When the thyroid is either hyper- or hypo-functioning, changes in different clinical renal parameters such as glomerular filtration rate (GFR), urine specific gravity (USG), urinary protein/ creatinine ratio (UPC) and markers of tubular function can occur. Vice versa, kidney disease

influences circulating thyroid hormones. den Hollander *et al*.,(2005) The present article reviews the most important topics of the different derangements in kidney functions that occur in patients with thyroid disease, as well as changes in thyroid physiology that develops in patients with kidney disease and with varying types and degrees of kidney failure. Mansourian.,(2011)

Materials and Methods

This project was performed during the period from September (2013) to February (2014) in laboratories of AL-Hashemia Teaching Hospital at Babil city. Fifty patients suffering from thyroid dysfunction were used as a patients group while forty five healthy subjects used as a control group

Samples:

About 5ml whole blood was collected from each subject (patient and control) in an disposable plane tube ,samples clotted and centrifuged 5 minute at 3000 rpm . Sera were stored in freeze until time of analysis.
Subject were examined for the following parameters:
-Serum creatinine
2-Blood urea
3-Thyroid Stimulating Hormone (TSH)
4- Tetraidothyronine (T4)
5- Triidothyronine (T3)

Statistical analyses:

All statistical analyses were performed using SPSS ver. 18.0 and Excel application (2010). The association between (renal function markers) and (thyroid hormones) were analyzed using the Chi-square test to detect the significances between variables of our study

Note: the comparison of significant (P-value) in any tests were :
Significant difference (P<0.005)
Non significant difference(P>0.005)
Highly significant difference (P<0.001)
Graphical presentation by chart

Results

Table (1) Distribution of study groups according to their Ages

Study Groups	Age Groups			Total
	5 - 25 years	26 - 45 years	46 - 70 years	
Case	16 16.8%	23 24.2%	9 9.5%	48 50.5%
Control	12 12.6%	25 26.3%	10 10.5%	47 49.5%
Total	28 29.5%	48 50.5%	19 20.0%	95 100.0%

0.706

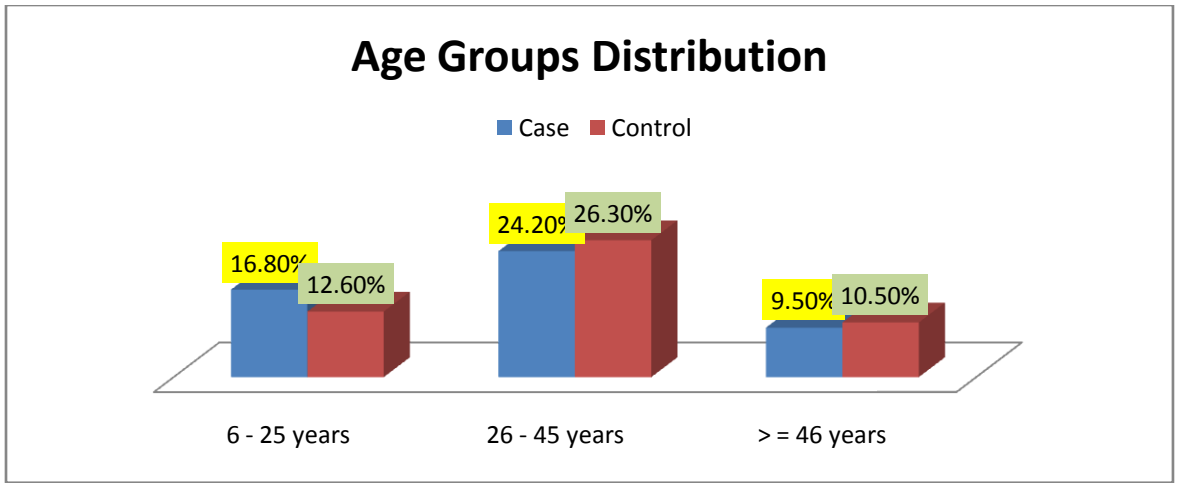

Figure (1) showed the distribution of study samples according to Age group, in the age group that range between(26 – 45) years there were 23(24.2%) patients which represent the highest percentage .

Table (2) Distribution of study groups according to their Gender

Study Groups	Genders		Total
	Male	Female	
Case	15 15.8%	33 34.7%	48 50.5%
Control	7 7.4%	40 42.1%	47 49.5%
Total	22 23.2%	73 76.8%	95 100.0%

0.05

*** P value = 0.05 (s)**

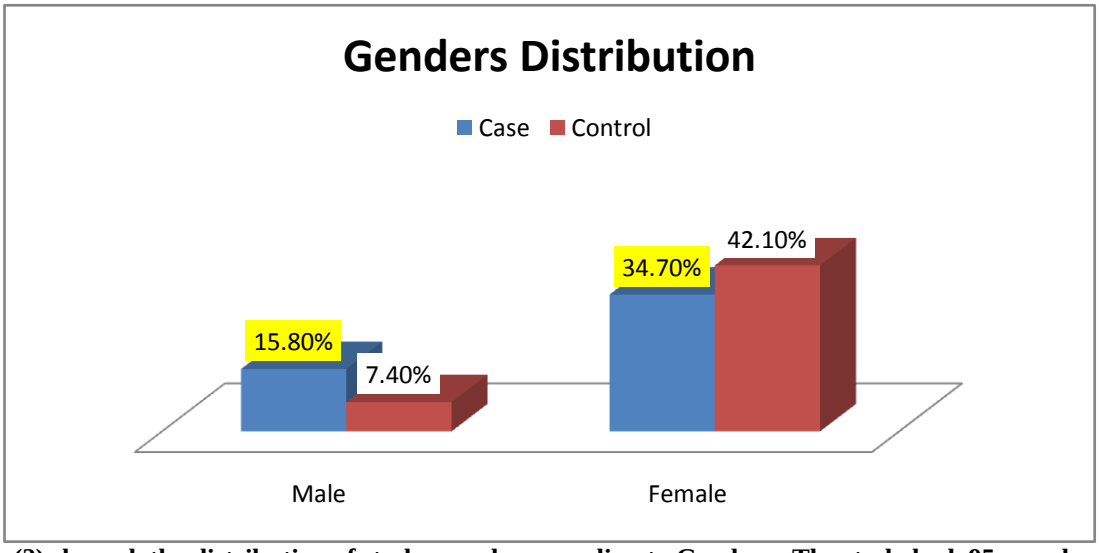

Figure (2) showed the distribution of study samples according to Genders. The study had 95 samples which included 48 as case group and 47 sample as a control , in case group (15) samples were males which represents (15.8%) and the other (33) samples were females which represents (34.7%).

Table (3) Represent the T 3 level among Study Groups

Study Groups	T3 Levels	Total

	Normal (0.9 - 2.33)	Abnormal < (0.9 - 2.33)	
Case	17 17.9%	31 32.6%	48 50.5%
Control	45 47.4%	2 2.1%	47 49.5%
Total	62 65.3%	33 34.7%	95 100.0%

0.001

0.000

* P value = 0.000< (HS)

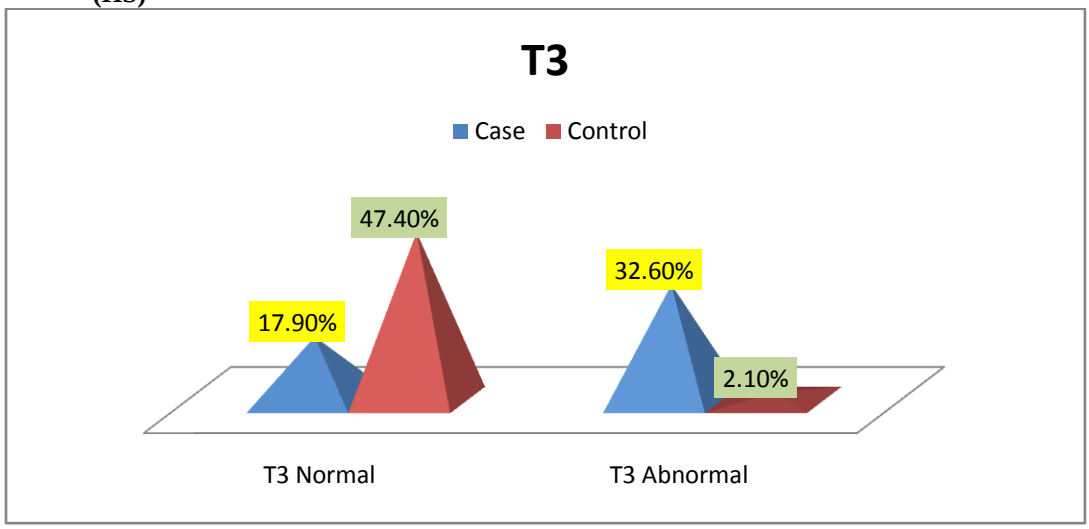

Figure (3) shows that total number of samples examined were (95) which included 48 sample cases and 47 sample control , in cases group (31) samples were abnormal values while (17) samples were normal values of T3 . There was a highly significant difference between normal and abnormal values of T3 P<0.001

Table (4) Represent the T4 level among Study Groups

Study Groups	T4 Level		Total
	Normal (60 - 120)	Abnormal < (60 - 120)	
Case	24 25.3%	24 25.3%	48 50.5%
Control	45 47.4%	2 2.1%	47 49.5%
Total	69 72.6%	26 27.4%	95 100.0%

0.000

* P value = 0.000< 0.001 (HS)

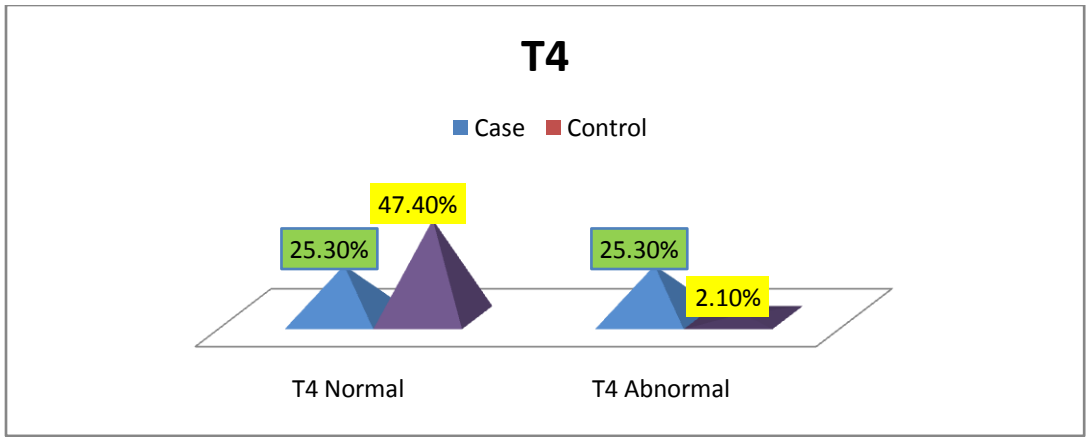

Figure (4) showed that total number of samples examined were (95) which included 48 samples as case and 47 samples as a control . In cases group (24) samples were had abnormal values of (48) while (24) samples with normal values of T4. There was a highly significant difference between normal and abnormal value of T4. P<0.001

of TSH level among Study Groups

Study Groups	TSH Level		Total
	Normal (0.25 - 5)	Abnormal > (0.25 - 5)	
Case	18 18.9%	30 31.6%	48 50.5%
Control	45 47.4%	2 2.1%	47 49.5%
Total	63 66.3%	32 33.7%	95 100.0%

0.000

*** P value = 0.000< 0.001 (HS)**

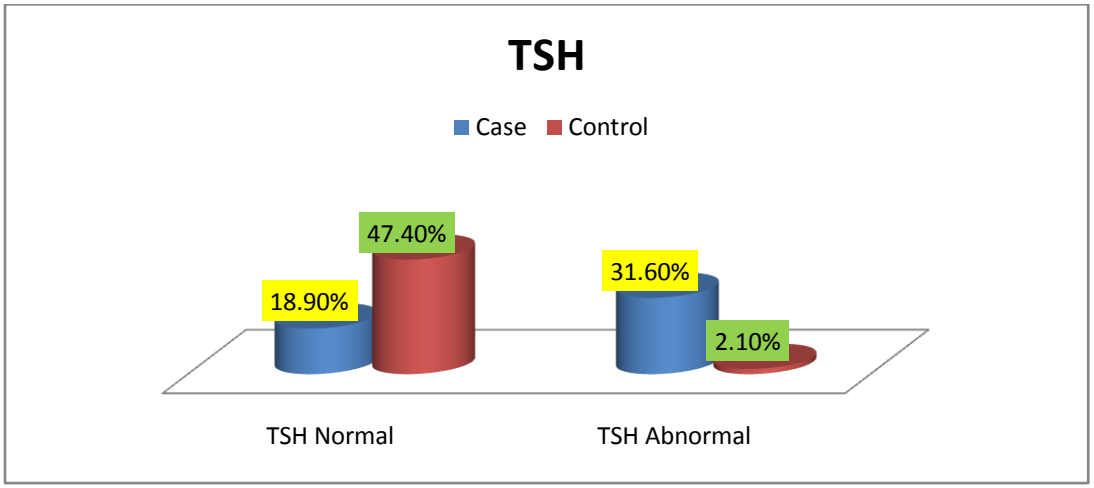

Figure (5) represents the normal & abnormal values of TSH . The total number of samples examined was (95) which included 48 samples were cases and 47 samples were control . In case group (30) Sample have abnormal values and (18) sample have normal values of TSH. There was a highly significant difference between normal and abnormal values of TSH . P<0.001

Table (6) Comparison between normal and abnormal values of serum Creatinine

Study Groups	Creatinine Level	Total

	Normal (62 - 124)	Abnormal > (62 - 124)	
Case	13 13.7%	35 36.8%	48 50.5%
Control	29 30.5%	18 18.9%	47 49.5%
Total	42 44.2%	53 55.8%	95 100.0%

0.001

*** P value = 0.001< 0.005 (S)**

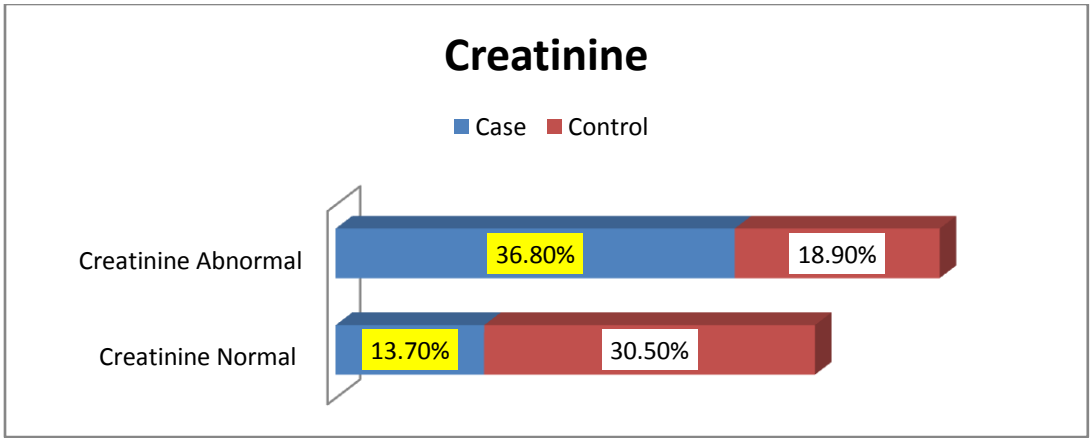

Figure (6) showed that total number of samples examined were (95) which included 48 samples as case and 47 samples as a control . In Case group there was (35) samples have abnormal values of creatinine and (13) samples have normal values of serum creatinine . There was a significant difference P<0.005 between normal and abnormal values of Creatinine.

Table (7) Comparison between normal and abnormal values of Blood Urea

Study Groups	Urea Level		Total
	Normal (3.3 - 7.5)	Abnormal > (3.3 - 7.5)	
Case	44 46.3%	4 4.2%	48 50.5%
Control	43 45.3%	4 4.2%	47 49.5%
Total	87 91.6%	8 8.4%	95 100.0%

0.975

*** P value = 0.975 > 0.05 (NS)**

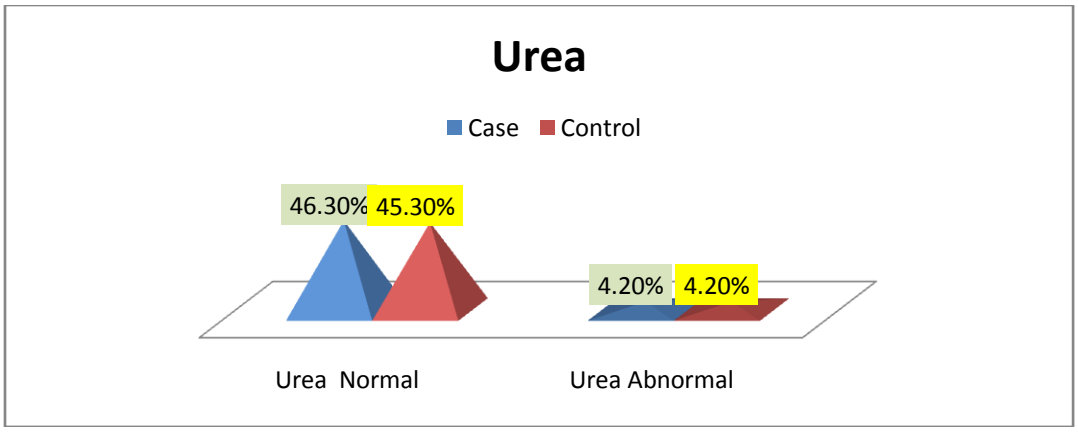

Figure (7) showed that total number of samples examined were (95) which included 48 samples Cases and 47 samples Control. in Case group (4) samples have abnormal values of blood urea and (44) samples have normal values. There was no significant difference (P> 0.05) between normal and abnormal values of blood urea .

Discussion

Thyroid hormones influence the function of all body organs and cells . The data presented here clearly indicates how biochemical markers of major organ system of the body (kidney) may be affected by alteration in the levels of thyroid hormones . Distribution of study groups according to their age was shown in Table (1) & Figure (1) , the highest percentage rate 23(24.2%) was observed in the patients whom age from (26-45) years , followed by 16(16.8%) in patients whom age (5-25) years , and there was no significant difference between age groups (P> **0.05)** . The results of this study was agreed with HS. Chandhury *et al* .,(2013). And was disagreed with JOAN *et al.,* (2005) who mentioned that the age group (≥ 90) years which represent the highest percentage 517(44.5 %) followed by 450(38.7 %) in patients aging (60-89) years and this may be due to large number of samples that were collected or long duration of sampling . Distribution of study groups according to their gender in table (2) & Figure (2) shows the percentage rate of females was more than the percentage rate of males , and this due to the biggest number of samples which was from females . The results of this study were similar to Chandhury *et al* .,(2013) who recorded hypothyroidism was more frequent in females ; hypothyroid , hyperurecemia due to a reduction in renal plasma flow and glomerular filtration secondary to thyroid hormone deficiency T3 ,T4 levels were shown under Table (3) , (4) & Figure(3) , (4) respectively . In the present study there was a highly significant difference between normal and abnormal values of T3 , T4 P<0.005 . This finding was in accordance with Singh *et al*., (2006) , who found that the (T3 ,T4) level significantly decrease when compared to control . The TSH level was shown under Table & Figure (5) . The result of this study showed that TSH level was normal in (18) samples which represent (18.9 %) and increased in (30) samples which represent (31.6%) . In the present study there was a highly significant difference between normal and abnormal values of TSH P<0.001, this finding was similar to Singh *et al* ., (2006) . Who found that TSH level was unchanged or elevated .Table & Figure (6) which represent the normal and abnormal values of serum creatinine . In this study there was a significant increase in serum creatinine when compared to control , the result of this study was agreed with previous study which as done by other investigator Kreisman and Hennessey., (1999) who mentioned that the serum creatinine level in hypothyroid cases was significantly greater in comparison to euthyroid value .

the result of this study was agreed too with Aminul *et al*.,(2013). Who found serum creatinine level significantly higher in hypothyroid patients compared to controls . Comparison between normal and abnormal values of blood urea in Table & Figure (7) , the result of this study shows that was no significant difference between normal and abnormal values of blood urea in hypothyroid patients compared to controls (P> 0.05) this finding consistent with previous study was done by Montenegro *et al* ., (1996) and Balaji Rajagopalan *et al*., (2013) . Who recorded that there was a negative correlation of between thyroid hormone and blood urea . This finding indicates that blood urea levels were negatively regulated by thyroid hormones, especially T3 and therefore tend to increase in overt hypothyroid cases when T3 levels were low. Histological changes in nephrons, especially basement membrane thickening have been demonstrated in both hypothyroid rats and humans Lippi *et al*.,(2008. These changes may result in physiological effects including alterations in renal hemodynamics, decrements in renal blood flow and glomerular filtration rate (GFR) and hence reduced clearance of creatinine and uric acid. Another recent study also

indicated a mutual relationship between kidneys and thyroid status where TSH glomerular filtration rate (e-GFR) (1>2.5mIU/L were associated with decreased estimated Sarika *et al* ., (2009).
All the findings of the present study were helpful in understanding the complex interactions between the thyroid gland and major organ system like kidney therefore , patients presenting with these biochemical abnormalities were recommended to be investigated for hypothyroidism and vice versa .

Conclusion : There was a significant difference between normal and abnormal values of Creatinine. and there was a highly significant difference between normal and abnormal values of TSH,T3,T4 .
Recommendation : According to the result of study the following were suggested for further search larger sample size could give a better and more acceptable result , It would have been better if more controls could be added and it was advisable to measure other biochemical factors in the blood like uric acid , serum albumin , and total protein .

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