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Study the correlation between thyroid disorder and chronic kidney failure

Lina.M.Z.Yosuf
Department of Medical Laboratory Techniques - Technical Institute /Amara- South Technical University
lina.m.zeki@stu.edu.iq

***Abstract*: Thyroid disorder and kidney function were once thought by specialists to be clinically negligible and spontaneous, but there have been many reports of elevated serum creatinine. hyperthyroidism patients. The present study was conducted through a number of hospitals in different regions of Iraq including Baghdad, Babylon, Najaf, Samawa and Maysan. The present study was conducted in the period from August Dec 2018. Samples were collected as 90 thyroid patients and 70 from CKD patients; A set of laboratory analyzes was conducted for the collected samples such as TSH hormon,Cr,urea,T3, andT4 hormone. Data of age, sex and chronic diseases was considered. The results showed there is a strong inverse relationship between TSH hormone and Cr at r=-0.5,p<0.01 for males categories 20-29Y, and40-49y. Moreover, it was found that there is a strong inverse relationship between TSH hormone and Cr at p<0.01 in hyperthyroidism male patients, and no significant correlation in hypothyroidism patients additionally, there is a strong inverse relationship between T4 hormone and Cr at r=-0.3 ,r=- 0.5 ,p<0.001 for males and females respectively in hypothyroidism patients in CKD patients. Forthermore, the results showed that there is a strong inverse relationship between TSH hormone and Cr at p<0.01 for males for (20-29,30-39,50-59)Y. This study recommends the need to perform kidney function tests for thyroid patients and treatment in the event of detect.**

***Keywords*: hypothyroidism, hyperthyroidism, TSH hormon, CKD, Creatinine**

I. INTRODUCTION

The kidney is considered one of the most important organ of the human body. It is the member who responsible of purifying the blood from toxins resulting from metabolism. Diagnosis of CKD is generally by blood tests to measure the glomerular filtration, rate and urine tests to measure albumin further tests, such as an ultra sound or underlying cause (Pirkle, Barry, 2014). It controls the majority of the body's physiological behavior, making it one of the most essential in the human body. Thyroid hormones (T3 and T4) play multiple roles in the body, including metabolism, growth, protein synthesis, and the regulation of many other hormones (Małgorzata Gietka-Czernel,2017). Thyroid disorder and kidney function were once thought to be clinically insignificant and spontaneous, but there have been many reports of elevated serum creatinine in hypothyroid patients, and it has even been reported that overt and subclinical hypothyroidism could be linked to an increased risk of chronic kidney disease (Zhang, 2014).

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II. PATIENTS AND METHODS

This study was conducted at many Hospitals of Iraq including Baghdad, Babylon, Najaf, Samawa and Maysan. All samples were randomly selected from the thyroid patients and from the patients with chronic kidney diseases that attending Dialysis Unit at these hospitals during the period from Aug, 2018 till Dec, 2018. The subjects were collected as 90 thyroid patients and 70from CKD patients as shown in Table 1. A set of laboratory analyzes was conducted for the collected samples such as TSH hormon,Cr,urea,T3, andT4 hormone a with taking data age, sex and chronic disease.

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Table (1) Details of subject including in this study

Sex	Thyroid disorder patients	Chronic kidney disease patients(CKD)	Total
Female	50	36	86
Male	40	34	74
Total	90	70	160

III.RESULT

3.1 Analysis values of thyroid patients

3.1.1 According age

3.1.1.1 Males

The results obtained from this study showed that values of average and SD± of creatinine, urea, TSH,T3,T4 in an age between (20-29)years were 1.0 ± 0.2 mg/dl, 30.8 ± 13.2 mg/dl, 50.2 ± 70.5 Iu/ml,7.2 ± 5.2 ng/ml, 208.9± 50.3 ng/ml respectively while the average and SD of creatinine urea, SH,T3,T4 in an age of (30-39)year were 2.4± 3.0 mg/dl, 56.5± 53.6 mg/dl, 20.0± 22.4 Iu/ml, 11.5± 23.8 ng/ml, 87.6±67.6 ng/ml respectively as shown in Table 2 while in the age of (40-49)years ther were creatinine, urea, TSH,T3,T4 1.0± 0.2 mg/dl, 29.9±10.1 ng/dl,14.9±15.8 Iu/ml, 1.6±0.4 ng/ml, 59.4± 3.6.3 ng/ml, respectively as shown in Table 2.

The age of (50-59)years. There were creatinine, urea, TSH, T3, T4, 1.0±0.3 mg/dl, 25.7±7.4 mg/dl, 3.2±7.3 Iu/ml, 4.0±3.1 ng /ml, 110.5±84.3 ng/ml respectively as show in Table 2.

The results of this group showed significant increasing in creatinine and urea at P< 0.05 for the age group of (30-39) years of males while all the age group have owned high level in TSH at P<0.001 as show in Table 2. 1±2

This results show that is a strong inverse relationship between TSH and creatinine in age

1. (20-29)year r= - 0.5 at P< 0.01
2. (40-49)year r= - 0.26 at P< 0.05 as shown Table 7.

while at the other ages showed non-there is a strong inverse relationship between TSH and creatinine

the urea showed significant inverse correlation with TSH at age (40- 49)year

at r= - 0.5 P<0.01 as show in Table 7.

while the other groups of age showed non-significant invers correlation.

3.1.1.2 Females

The obtained results from this study show that values average and SD± of creatinine, urea, TSH,T3,T4 in the age of (20-29) years of females were 1.7± 2.7 mg/dl , 46.5± 27.8 mg/dl , 21.5± 25.0 Iu/ml ,2.4± 2.3 ng/ml , 62.0± 65.9 ng/ml respectively as show in Table 3.

In the age of (30-39)year values of creatinine, urea, TSH,T3,T4 were 1.7± 2.8 mg/dl , 36.3 ± 2.8.6 mg/dl ,14.9± 20.8 Iu/ml , 3.5± 2.6 ng/ml , 76.6± 63.9 ng/ml respectively

In the age of (40-49) years values of creatinine, urea, TSH,T3,T4 were 1.1± 0.9 mg/dl ,32.3±8.9 ng/dl ,4.7±7.1 Iu/ml , 2.6±1.5 ng/ml, 68.7± 59.9 ng/ml respectively

In the age (50-59)years values of creatinine, urea, TSH,T3,T4 were 2.4 ± 2.5 mg/dl, 60.0 ± 29.4 mg/dl, 8.1 ± 17.3 Iu/ml, 3.0 ± 2.1 ng/ml, 139.8 ± 62.5 ng/ml respectively as shown in Table 3.

The results of this group are showed significant increasing in creatinine at P< 0.001 in the age group (50-59) years while and showed the other group (20-29) (30-39) significant increasing in creatinine level at P<0.05

The results showed non-there is a strong inverse relationship between TSH and creatinine in all age groups as shown in Table 7.

While correlation between TSH and urea showed significant inverse correlation at

1. Age (20-29) year r= - 0.27at P< 0.05
2. (50-59) year r= - 0.4 at P< 0.01

While the other age group didn't show significant correlation as show in Table 7.

3.1.2 According hypo, hyper thyroid

3.1.2.1 Males

The results which obtained from this study have divided the thyroids patients to two groups one 28% with hyperthyroidism and 50% with hypothyroidism as show in figure (2) according the value of TSH and T4,T3 where the group hyperthyroidsm was named as depending on the high ratio of thyroxin hormone T3,T4 in the serum decrease TSH hormone less than 0.04 Iu/ml while hypothyroidism group was called as in state low levels in thyroxin T3 and T4 and high level of TSH from the normal range its more than 5 Iu/ml.

3.1.2.1. A Hyperthyroidism male patients

The results showed that the age average of males in this group was 44 ± 12.9 and with (22) patients and value average of creatinine and urea were (2.0 ± 2.9, 44.7± 52.8) mg/dl respectively at significant P = < 0.05 to creatinine while the average and SD of TSH,T3,T4, were (0.1 ± 0.1 Iu/ml) (4.0 ± 2.2, 142.6 ± 58.9) ng/ml respectively at significant P= <0.05 as shown Table 4.

This results also showed significant inverse relationship between creatinine and TSH where r= - 0.28 at p< 0.05

And the presense significant inverse relationship between urea and TSH r= - 0.31 at P <0.01

While relationship between creatinine and T4 didn't show significant **c**orrelation at P>0.05 in male hyperthyroid ism group as shown in Table 6.

3.1.2.1 B hypothyroidism male patients

The results of this study showed that average of age to this group were (40) with (18) patients and the value average of creatinine and urea were (1.4 ± 1.5 , 37.2 ± 25.4)mg/dl respectively at P>0.05 no significant ratio while the average and SD± of TSH ,T3,T4 were (26.5 ± 26.3)Iu/ml and (9.4 ± 21.5 , 77.1 ± 64.7)ng/ml respectively at p< 0.05 then significantly increasing in TSH and decreasing of T4 in hypothyroidsim patient as illustrated in Table 4.

This results also showed non-significant relationship between TSH with creatinine and TSH with urea at P> 0.05 and there were inverse relationship between T4 and creatinine in which r= - 0.5 at P< 0.001 that mean increase of creatinine in hypo thyroid ism patients with decrease of T4 in this patients as shown in Table 6.

3.1.2.2 Female according thyroidism

In this study the female group of thyroid in patients were 50 patients more than males and the incidence of female disease is more than the rate of infection in males ,sites (18)female with hyper thyroid ism and (30)female patient with hypothyroidism and this results showed distribution of hypothyroid is more than hyperthyroidism in female patient of thyroid sites 60% of menal with hypothyroidism and 36 % with hyperthyroidism as show in Figure 2.

And according the value of TSH T3 and T4 in case increasing of TSH more than normal maximum range 5Iu/ml and decreasing of thyroxin hormone T4,T3 less than 0.04Iu/ml this are called hypothyroidism**.**

3.1.2.2.A hyperthyroidism female

This results showed that the age of (30) female was (43.14)years and the value of creatinine and urea value were this values of creatinine showed P < 0.05 (1.7±2.7,42.3± 38.9)mg/dl respectively and the average with SD of TSH was (0.1± 0.1)Iu/ml and the average of T3 ,T4 with SD ± were (3.9 ± 2.6,98.1 ± 78.3)ng/ml respectively as show in Table 5.

This results also showed that there is a strong inverse relationship between urea and TSH r= - 0.28, at P< 0.05 and non-there is a strong inverse relationship between TSH and creatinine r= - 0.1 at P >0.05 this mean increasing the ratio of creatinine with decreasing of TSH in hyper thyroid ism patients as show in Table 6.

While the results showed inverse significant correlation between T4 and creatinine at r= - 0.6 P< 0.001.

3.1.2.2.B hypothyroidism

This results showed that the average age of this group was (34.1) year and the average and SD of creatinine urea

were (1.5±2.6,40.3± 25.7)mg/dl respectively and TSH was 18.7± 19.8 Iu/ml at P= 0.05.

On the other hand,the average of T3 ,T4 were (2.3± 2.0,65.3± 57.4)ng/ml at p< 0.05 as shown in Table 5.

The results didn't show a significant relationship between creatinine with TSH or urea with TSH at P >0.05. However the results illustrated an inverse significant relation hip between T4 and creatinine r= - 0.3 at P< 0.05 as show Table 6.

Table2: values of average and SD of creatinine,urea,TSH,T3,T4 according to the age in males Thyroid patients

age/year	creatinine(mg/dl)	urea(mg/dl)	TSH(Iu/ml)	T3(ng/ml)	T4(ng/ml)
20-30	1.0±0.2	30.8±13.2	50.2±70.5	7.2±5.2	208.9±50.3
30-40	2.4±3.0	56.5±53.6	20.0±22.4	11.5±23.8	87.6±67.6
40-50	1.0±0.2	29.9±10.1	14.9±15.8	1.6±0.4	59.4±36.3
50-60	1.0±0.3	25.7±7.4	3.2±7.3	4.0±3.1	110.5±84.3

Table3: The average and SD of creatinine,urea.TSH,T3,T4,according the age in females Thyroid patients

Age/year	creatinine(mg/dl)	urea(mg/dl)	TSH(Iu/ml)	T3(ng/ml)	T4(ng/ml)
20-30	1.7±2.7	46.5±27.8	21.5±25.0	2.4±2.3	62.0±65.9
30-40	1.7±2.8	36.3±28.6	14.9±20.8	3.5±2.6	76.6±63.9
40-50	1.1±0.9	32.3±8.9	4.7±7.1	2.6±1.5	68.7±59.9
50-60	2.4±2.5	60.0±29.4	8.1±17.3	3.0±2.1	139.8±62.5

Table 4: The average and SD of creatinine, urea, TSH, T3, T4 in hypo and hyperthyroidism of males

Thyroid disease	creatinine(mg/dl)	urea(mg/dl)	TSH(Iu/ml)	T3(ng/ml)	T4(ng/ml)
hyper-thyroidism	2.0± 2.9	44.75 ± 52.87	0.1 ± 0.1	4.0 ± 2.2	142.6 ± 58.2
hypo-thyroidism	1.4±1.5	37.2 ± 25.4	26.5 ± 26.3	9.4 ± 21.5	77.1 ± 64.7

Table 5: The average and SD of creatinine, urea, TSH, T3,T4 in hypo and hyperthyroidism of females

Thyroid disease	creatinine(mg/dl)	urea(mg/dl)	TSH(Iu/ml)	T3(ng/ml)	T4(ng/ml)
hyperthyroidism patients	1.7±2.7	42.3±38.9	0.1±0.1	3.9±2.6	98.1±78.3
hypothyroidism patients	1.5±2.6	40.3±25.7	18.7±19.8	2.3±2.0	65.3±57.4

Table 6: The correlation coefficient r= between TSH and creatinine,TSH and urea,creatinine and T4 in hypo and hyper thyroidism patients

r= between T4 and creatinine		**r=between TSH and urea**		**r=between TSH and creatinine**		**thyroid patients**
Females	**Males**	**Females**	**Males**	**females**	**males**	
r=-0.6 p<0.01	**r=-0.4 p<0.01**	**r=-0.28 p<0.05**	**r=-0.31 p<0.01**	**r=-0.1 p>0.05**	**r=-0.28 p<0.05**	**hyper thyroidism**
r=-0.3 p<0.05	**r=-0.5 p<0.01**	**r=-0.2 p>0.05**	**p>0.05**	**r=-0.2 p>0.05**	**r=0.01 p>0.05**	**hypo thyroidism**

IV. DISCUSSION

The results of the current study showed a high percentage in thyroid disorder of the female more than males and these results comes in line with previous studies *Uygur MM, 2018* ; Q. M. Zhang, C. J. Li *et al.*2017; Prz mnopauzalny 2017. It is showed that thyroid diseases predominantly affect women; their incidence is 5-20 times higher in women than in men.

Additionally most females in the study have a high level of TSH hormone and this corresponds to previous studies Uygur MM, 2018 ;Trummer C, Schwetz V, 2015 TSH hormone is associated with the insulin resistance independently of body mass index and age(Chen MJ and Ho HN,2016).

the present study showed that the distribution of hypothyroidism (serum TSH elevated; freeT4 decreased) more than hyperthyroidism in female from (30-50)y and males patients of thyroid and these results comes in line with previous studies Ladenson PW, 2013;Vanderpump MP, Tunbridge WM, et al.2015; Bremner AP, Feddema P,v et al.2012. when the thyroid produces less thyroid hormone than it should which causes the metabolism to run too slow. This is called hypothyroidism, myxoedema or an underactive thyroid. It may also be called Hashimoto's disease. Hypothyroidism is mostly seen in women between the ages of 40 - 50 and is seen in women ten times more often than men. It often occurs during the menopausal years and symptoms are often ignored during the early stages by both patients and doctors if the patient is at this age (Division of Endocrinology Boston, 2017;Thyroid UK 2017 Conference). Moreover, hypothyroidism causing hypertension, cardiac insufficiency, adverse lipid profile, insulin resistance, and endothelial dysfunction poses an increased risk for atherosclerosis, cardiovascular disease, diabetes mellitus type.2, mental deficiency, depression, and kidney dysfunction. (Somwaru LL, Rariy CM, *et al.*, 2012; Pearce S, Brabant G, *et al.* 2013).

Also the results of CKF patients showed disturbance electrolytes of serum Na, K, Cl, Ca and Hb levels in which reducing the level of hemoglobin and calcium, while sodium, chloride and potassium appeared to rise, These results come in line with previous studies which confirmed this disturbance electrolytes of CKF patients Chang AR, et al.2016; Ingelfinger JR,2015; Holland-Bill L, *et al.*, 2015; Liamis G, *et al.*, 2013

Also these results of CKF patients showed increasing in creatinine and urea levels in both males and females these results comes in line with previous studie of Hida M, Saito, 1985; Hayrullah , Mehmet *et al.*, 2011; Lascano M,2010.

Also the results of CKF patients showed that there is a strong inverse relationship between TSH hormone and creatinine in males of CKF patients. These results comes in line with previous studies of Connie. Rhee, 2017; Zhang , Chang *et al*.2014; Singh , Verma , 2016.

Whereas the results of CKF females patients showed that there is no strong inverse relationship between TSH hormone and creatinine, with normal level of TSH hormone these results comes in line with the previous study of Aryee, 2018.

V. CONCLUSION

The result of the present study showed that there is a strong inverse relationship between TSH and creatinine in age (20-29)year and (40- 49) year of males also the level of urea showed a significant inverse correlation with TSH at age (40- 49)year of males.The correlation between TSH and urea showed a significant inverse correlation at age of (20-29) year and(50-59)year of females.In CKD patients the results showed that there is a strong inverse relationship between TSH hormone and Cr at $p<0.01$ for males for (20-29,30-39,50-59)Y and blood pressure and DM were the main reasons for the CKD.

VI. REFERENCES

1. Aryee na, Tagoe Aa, Anomah v2, Arko-boham B2, Adjei dn2. Thyroid hormone

status in Ghanaian patients with chronic kidneydisease,.1;29:137.2018.29.137.12992. **2018**.

3. C. M. Rhee, K. Kalantar-Zadeh, E. Streja et al.,The relation-ship between thyroid function and estimated glomerular filtration rate in patients with chronic kidney disease,Nephrology,Dialysis, Transplantation, vol. 30, no. 2, pp. 282–287, **2015**.

4. Chang AR, et al: Antihypertensive medications and the prevalence of hyperkalemia in a large health system. Hypertension ;67:1181-1188.**2016**.

5. Chen MJ and Ho HN. Hepatic manifestations of women with polycystic ovary syndrome. Best Pract Res Clin Obstet Gynaecol; 37: 119-128. **2016**

6. Cheung AK, Rahman M, Reboussin DM, Craven TE, Greene T, et al , Papademetriou V, Ricardo AC, Servilla K, Wall B, Wolfgram D, Yee J; SPRINT Research Group: Effects of intensive BP control in CKD. J Am Soc Nephrol 28: 2812–2823, **2017**.

7. Gopinath B, Harris DC, Wall JR, Kifley A, Mitchell P.Maturitas. Relationship between thyroid dysfunction and chronic kidney disease in community-dwelling older adults. **2013** Jun; 75(2):159-64,. Epub Mar 29,**2013**.

8. Meuwese Cl Gussekloo J, Je Craen Aj, Dekker Fw, Den Elzen Wp. Thyroid status and renal function in older persons in the general population.j clin endocrinol metab.;99(8):2689-96. **2014**

9. Holland-Bill L, et al Hyponatremia and mortality risk: a Danish cohort study of 279508 acutely hospitalized patients Eur J Endocrinol;173:71-81. **2015**.

10. Ingelfinger JR: N Engl J A new era for the treatment of hyperkalemia? Med;372:275-277. **2015**

11. Jmam SK. Ahmad SI .thyroid disorders basic science and clinical parcke first edition springer international publisling **2016**

12. Ladenson PW. . Philadelphia: Lippincott Williams and Wilkins Diagnosis of Hypothyroidism. In: Braverman LE, Cooper DS, editors. Werner and Ingbar's The Thyroid. 10th;. pp. 6064–611**,2013**

13. Liamis G, et al: Electrolyte disorders in community subjects: prevalence and risk factors. Am J Med;126:256-263. **2013**

14. Małgorzata Gietka-Czernel. The thyroid gland in postmenopausal women: physiology and diseases.; 16(2): 33–37. **2017**

15. Pirkle, Barry I. Freedman. Hypertension and chronic kidney disease: controversies in pathogenesis and treatment, Minerva Urol Nefrol; 65(1): 37–50. **2014**

16. Q. M. Zhang, C. J. Li et al. Association of thyroid-stimulating hormone levels with microvascular complicationsin type 2 diabetes patients, Medical Science Monitor, vol. 23,pp. 2715–2720, **2017**.

17. Shahbazian H, Rezaii I.Diabetic kidney disease;review of the current knowledge.J Renal Inj Prev. ;2:73–80. **2013**

18. Singh S, Verma A, Aryal G, Thapa S, Khakurel S, Shrestha K.J Nepal Health Res Counc.Thyroid hormone profile in patients with chronic kidney disease: a single centre study.; 14(34):197-201. **2016**

19. Somwaru LL, Rariy CM, Arnold AM, et al.The natural history of subclinical hypothyroidism in the elderly: the cardiovascular health study. J Clin Endocrinol Metab.;97:1962–1969. **2012**.

20. Trummer C, Schwetz V, Giuliani A, ObermayerPietsch B and erchbaum E. Impact of elevated thyroid-stimulating hormone levels in polycysticovary syndrome. Gynecol Endocrinol; 31: 819-823. **2015**

21. Uygur MM, Yoldemir T, Yavuz DG. Climacteric. **2018** Dec; 21(6):542-548. Epub **2018** .

22. Zhang Y, Chang Y, Ryu S, Cho J, Lee WY, Rhee EJ, Kwon MJ, Pastor-Barriuso R, Rampal S, Han WK, et al., Thyroid hormone levels and incident chronic kidney disease in euthyroid individuals the Kangbuk Samsung Health Study. Int J Epidemiol. 43(5):1624-32. **2014**.