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Original Research Article

Study of Thyroid Profile in Chronic Kidney Disorders Middle Aged Individuals

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Abstract

The prevalence of decreased renal function among those with chronic kidney disease (CKD) is rising quickly. Many co morbidities, such as thyroid dysfunction, dyslipidemia, and cardiovascular illnesses, are linked to the progression of CKD. An investigation into thyroid function in CKD patients was done.

Methodology: 90 individuals with chronic renal disease were separated into two groups based on their ages for a cross-sectional study. Serum urea, creatinine, glucose, free triiodothyronine (T3), free thyroxine (T4), thyroid stimulating hormone (TSH), and total cholesterol were all measured in blood samples (5 mL). Each patient's demographic information (age and gender), medical history, hypertension, and cardiovascular diseases were also recorded.

Results: The major significant changes were found in urea (P <0.001), creatinine (P <0.001), eGFR(P <0.001) by the correlation of 2 groups. The prevalence of thyroid dysfunction among the sexes and different age group was tabulated. The probability of low T3 syndrome was 54% (27 cases), while the prevalence of low T4 syndrome was 22% (11 cases). TSH levels in the hypothyroid category were 4% (2 cases). Low T3 syndrome was found in 48.6% of male cases. And it was 62.2% among females. P>0.05, the change was not statistically significant.

Conclusion: The severity of renal failure was correlated with total T3 and free T4. To distinguish between hypothyroidism and non-thyroidal illnesses brought on by CKD, TSH readings will be helpful. Just 6% of the participants in the research experienced goitre. T3 and T4 readings change as a result of the body's energy-saving adaption process.

Keywords: Chronic Kidney Disease, Thyroid Stimulating Hormone, Demographic Information, Hypertension.

Introduction

Thyroid hormones are required for renal growth and development, as well as the maintenance of water and electrolyte balance. (TH). In contrast, the kidney is

engaged in the metabolism and elimination of TH. Both hypothyroidism and hyperthyroidism are linked with significant changes in water and electrolyte metabolism, as well as cardiovascular function, which should be observed from an aspect of clinical management. Changes in water and electrolyte renal management result from all these consequences [1,2]. Moreover, modifications in the production, secretion, metabolism, and clearance of TH coincide with the loss in renal function. Thyroid dysfunction takes on unique features in patients with advanced kidney disease [3]. The various treatments used in the management of patients with kidney and thyroid diseases, on the other hand, may be associated with changes or complications that affect thyroid and kidney function, respectively.

Common etiological causes may coexist with thyroid and renal disorders. Also, the methods used to treat one disease may have an impact on how the other organ is treated. This article focuses on the critical relationships between thyroid function and renal function that are clinically significant and necessary for the clinician to manage the patient effectively.

Methodology

The recruited middle aged volunteers were divided in to 2 groups based on their age. The first age group is between 40-49 years and 50-59 respectively. A total of 90 newly diagnosed and known CKD cases were included in the study. CKD was defined on the basis of National Kidney Foundation guidelines of having an estimated glomerular filtration rate (eGFR) < 60 ml/min/1.732 m2 for more than 3 months. The Modification of Diet in Renal Disease study (MDRD) equation was used to calculate eGFR [13]. Patients with known thyroid disorders, on medications affecting thyroid function and on lipid lowering agents were excluded from the study. The study protocol was approved.

Each patient's demographic characteristics (age and gender) as well as their medical history of diabetes mellitus, hypertension, and CVD were recorded. and blood samples (5 ml) were collected. CVD was defined as a history of coronary heart disease, congestive heart failure, peripheral arterial disease or stroke. Blood was analyzed for serum urea, creatinine, glucose, triiodothyronine (T3), thyroxine (T4) and thyroid stimulating hormone (TSH). Serum urea level and blood glucose were estimated using enzymatic methods and creatinine by Jaffe method. Serum free T3, free T4 and TSH were measured by using fluorescent immunoassay. Thyroid dysfunction was considered if patients thyroid hormones fall outside the reference range; free T3 (4.0– 8.3 pmol/L), free T4 (9.0–20.0 pmol/L) and TSH (0.25–5 mIU/L)

Results

The study population comprised 90 CKD patients with 52.8 % males and 48.2 % females. The mean age of study population was 50.1 ±9 years. Various clinical and biochemical parameters of study population according to CKD stages are shown in Table 1. Diabetes and CVD prevalence in CKD showed significantly increasing trend from stage 3 to 5. Blood urea, creatinine and TSH level increased significantly in urea, creatinine, eGFR and TSH parameters.

Table 1: Characteristics of study patients based on their age division

Variables	All patients N = 90	Group 1 N=40	Group 2 N=50	P value
Age (Years)	50.1 ± 10.1	41.9 ± 5.1	47.5 ± 7.6	0.002
Male	52.8 % (32)	18.8 % (68)	25.2 % (91)	0.117
Female	48.1 % (58)	21.1 % (76)	18.0 % (65)	
Urea (mg/dL)	102.3 ± 60.1	75.3 ± 39.5	108.7 ± 37.7	<0.001
Creatinine (mg/dL)	4.0 ± 3.4	1.7 ± 0.3	3.8 ± 0.5	<0.001
eGFR (ml/min per 1.73 m^2)	28.2 ± 15.3	43.0 ± 8.9	21.0 ± 4.0	<0.001
Free T3 (pmol/L)	4.9 ± 1.1	5.0 ± 1.1	4.5 ± 1.1	0.131
Free T4 (pmol/L)	11.6 ± 3.2	9.9 ± 3.2	11.5 ± 3.3	0.175
TSH (mIU/L)	3.2 (1.8, 6.8)	2.9 (1.6, 4.3)	3.8 (1.7, 7.3)	<0.001
Glucose (mg/dL)	117.4 ± 44.6	119.9 ± 45.6	116.7 ± 46.7	0.596

Table 2 : Sex wise prevalence of thyroid dysfunction in CKD patients

Thyroid hormones	Level of hormone	No	Males, n=37		Females=13		't'	Significance
			frequency	%	frequency	%		
T3	Low	27	18	48.6	9	69.2	1.354	P>0.05
	Normal	23	19	51.4	4	30.8		
T4	Low	11	7	18.9	4	30.8	0.830	P>0.05
	Normal	39	30	81.1	9	69.2		
TSH	High	2	1	2.7	1	7.7	0.636	P>0.05
	Normal	48	36	97.3	12	92.3		

Table 2 above demonstrated the frequency of thyroid disorders in both sexes. Low T3 syndrome was prevalent in 54% of instances (27), while low T4 syndrome was prevalent in 22% of cases (11 cases). 4% of TSH cases were in the hypothyroidism range (2 cases). 48.6% of the patients who were male and had low T3 syndrome. And 62.2% of them were women. There was no statistically significant change (P>0.05). Males were more likely than females to have low T4 levels (18.9% versus 30.8%). There was no statistically significant difference between the sexes (P>0.05). Males had a 2.7% prevalence of TSH in the clinical hypothyroidism range. 7.7% of those were ladies. There was no statistically significant difference in prevalence between the sexes (P>0.05).

Discussion

Table 2 above demonstrated the frequency of thyroid disorders in both sexes. Low T3 syndrome was prevalent in 54% of instances (27), while low T4 syndrome was prevalent in 22% of cases (11 cases). TSH levels were common in CRF affects a wide range of hormonal systems, but it's still not known how much of these changes are to blame for uremic syndrome symptoms. Individuals with CRF frequently exhibit signs and symptoms that point to thyroid dysfunction, making the predictive value of a thyroid illness diagnosis clear. The information presented mostly pertains to the biochemical parameters. Individuals with group 2 CKD have significantly higher in urea levels. Comparable studies include those by Ramiraz *et al*. and Lim VS *et al* [4,5]. Of 50 individuals in our study, 27 patients (or 54%) had low T3 syndrome. Low T3 is more common in stages 1 through 3 (20%), stages 4 and 5 (38%), and stages 5 (70%) of the

disease. This finding is in line with Sang Heon Song *et al*hypothesis .'s that the prevalence of low T3 will rise as CKD stages rise(6). In our study, the TSH readings in the two groups have a positive connection that is statistically significant (P).

In our analysis, group 2 CKD had a greater frequency of lower free T4 levels (22%), which is consistent with studies by Kaptein *et al*.[5] and Avasthi *et al*.[7,8], although it was not statistically significant. Free T4 and creatinine clearance in our study have a positive connection that is statistically significant at P10 IU/ml. 51 > 75 IU/ml indicates a high level of serum TSH. Both of these individuals exhibited extremely low serum T3 concentrations, which can be accounted for by the pituitary thyroid axis' typical feedback regulation. One patient has a goitre and a pleural effusion simultaneously. This finding is in line with that of Joseph *et al*. [9] who evaluated 175 CRF patients with low T3, T4, fT4, but high TSH levels, suggesting that the pituitary thyroid axis should be maintained.

48 patients, or 96%, showed normal serum TSH levels of 5 IU/ml or below. Among the 48 patients, 25 had low T3, and 9 had low total and free T3 and T4. Hence, despite having low serum T3 levels, these 25 patients had normal serum TSH levels. While the TSH response to TRH was attenuated, they showed abnormalities in the hypophyseal mechanism of TSH release in uremic patients.

These results are consistent with study of Spector *et al*.[10] and Ramirez *et al*. reported normal level of serum TSH in patients of CRF in spite of low serum T3 levels.

Conclusion

In 54% of CKD patients, thyroid dysfunction is present. The proportion of individuals who have low T3 and T4 syndrome gradually rises as renal failure becomes more severe. Total T3 and free T4 levels in the serum are directly correlated with levels of creatinine clearance. The severity of renal failure was correlated with total T3, free T4, and TSH readings, which will help distinguish hypothyroidism from non-thyroidal disease brought on by CKD.

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