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Thyroid Dysfunction in Patients with Chronic Kidney Disease: A Cross Sectional Study

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Abstract:
Introduction*:The kidney plays an important role in the metabolism, degradation, and excretion of several thyroid hormones. In this study we aimed to study the thyroid profile of patients with chronic kidney disease (CKD) and to assess the associations between different thyroid function variables and presence of kidney dysfunction.*
Methodology: *This descriptive study was conducted on patients with CKD attending outpatient and inpatient clinics of five randomly selected private hospitals in Jalandhar city, Punjab from July 2016 till December 2016. We collected clinical information of the patient and results of various biochemical investigations like hemoglobin level, serum urea and creatinine, free triiodothyronine (free T3), free thyroxine (free T4), thyroid stimulating hormone (TSH) and total protein. We compared the biochemical variables among hypothyroid and euthyroid patients.*
Results:*During the study period we included 58 patients with chronic kidney disease. Serum urea ranged from 39.4 mg/dL to 270.5 mg/dL and estimated glomerular filtration rate ranged between 3.8 and 62.4 mL/min/1.73 m^2, with a mean of 19.8 ± 4.46. Mean free triiodothyronine and thyroxine levels were found to be 1.7 ± 0.8 pg/dL and 1.4 ± 0.6 ng/dL respectively. In our patient population, 23 patients were hypothyroid and 35 were euthyroid. We found that the serum creatinine and eGFR was significantly different between hypothyroid and euthyroid patients. Serum urea and serum albumin was not statistical different between the patient groups.*
Conclusion: *High serum creatinine and low eGFR was significantly associated with hypothyroid status in patients with chronic kidney disease.*
Keywords:*hypothyroidism, chronic kidney disease, uremia,*

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I. Introduction

The kidney plays an important role in the metabolism, degradation, and excretion of several thyroid hormones. The kidney normally contributes to the clearance of iodide, primarily by glomerular filtration. Thus, iodide excretion is diminished in advanced renal failure, leading sequentially to an elevated plasma inorganic iodide concentration and an initial increment in thyroidal iodide uptake. Therefore, it is not surprising that impaired kidney function results in disturbed thyroid function. In kidney dysfunction all levels of the hypothalamic-pituitary-thyroid axis may be involved and may include alterations in hormone production, distribution, and excretion [1].Ideally, abnormalities in thyroid function tests should be thoroughlyinvestigated in patients with severeuremia. Moreover, the epidemiologic data suggest that pre-dialysis patients with chronic kidney disease have an increased risk of hypothyroidism and many cases are subclinical in nature [2].However, it has been seen that the overlap in symptomatology between the chronic kidney disease and hypothyroidism require a careful interpretation. Nonetheless, it is possible to assess thyroid function in an individual uremic patient physical diagnosis and thyroid function biochemical testing.

In this study we aimed to study the thyroid profile of patients with chronic kidney disease (CKD) and to assess the associations between different thyroid function

II. Methodology

2.1 Study Design and Setting

This descriptive study was conducted on patients with CKD attending outpatient and inpatient clinics of five randomly selected private hospitals in Jalandhar city, Punjab from July 2016 till December 2016.After obtaining approval of the institutional ethics committee, we included all patients, aged 18 years or above, from

the selected centres who were diagnosed with CKD by their treating physicians according to the prevalent clinical practice. We excluded patients who were on dialysis or had a known status of thyroid abnormality. We also excluded hose who were taking medication which would affect the thyroid status in a patient like lithium or amiodarone.

III. Data Collection And Data Analysis

After explaining the purpose of the study and obtaining informed written consent, we collected socio-demographic information of the patient. We also collected past medical history like diabetes and hypertension, previous episodes of kidney injury and clinical signs and symptoms. Furthermore we collected clinical information of the patient from the clinical medical records like systolic and diastolic blood pressure, hemoglobin level, serum urea and creatinine, free triiodothyronine (free T3), free thyroxine (free T4), thyroid stimulating hormone (TSH) and total protein. Using serum creatinine we calculated the estimated glomerular filtration rate (eGFR) using the MDRD formula [3]. For our study we defined hypothyroidism as TSH level more than 4mU/L. All patients underwent additional investigations as deemed necessary by the treating physician. The data was entered and cleaned in Microsoft excel and analysed in Epi Info software. We described the quantitative variables as means and standard deviations. Comparison of biochemical variables among hypothyroid and euthyroid patients was done using unpaired t test (for parametric data) or Wilcoxon signed rank test (for non-parametric data). We defined p value less than 0.05 as statistically significant.

IV. Results

During the study period we included 58 patients with chronic kidney disease. Mean age of the patients was 52.1 ± 11.2 years and systolic and diastolic blood pressures were 158.2 and 93.4 mm Hg (Table 1). Mean haemoglobin was 8.7 ± 1.7 mg/dL. We found that the patient population had serum urea ranging from 39.4 mg/dL to 270.5 mg/dL. Estimated glomerular filtration rate ranged between 3.8 and 62.4 mL/min/1.73 m^2, with a mean of 19.8 ± 4.46. Mean free triiodothyronine and thyroxine levels were found to be 1.7 ± 0.8 pg/dL and 1.4 ± 0.6 ng/dL respectively. In our patient population, 23 patients were hypothyroid and 35 were euthyroid. We found that the serum creatinine and eGFR was significantly different between hypothyroid and euthyroid patients (less than 0.05, Table 2). Serum urea and serum albumin was not statistical different between the patient groups.

V. Discussion

It has been studied previously that in uremic patients there is a marked increase in the intrathyroidal iodide pool, which results in diminished uptake of radiolabeled iodide by the thyroid [4].Because of the Wolff-Chaikoff effect, increases in total body inorganic iodide can potentially block thyroid hormone production. This mechanism may partiallyexplain the slightly higher incidence of goiter and hypothyroidism in patients with chronic kidney disease [5]. It has been shown previously that most patients with end-stage renal disease have decreased plasma levels of free T3, which depicts diminished conversion of T4 to T3 in the periphery [6].However, this abnormality is not associated with increased conversion of T4 to the metabolically inactive reverse T3 (rT3), because plasma rT3 levels are typically normal in patients with CKD. In chronic illnesses, on the other hand, the conversion of T4 to T3 is also reduced, but the generation of rT3 from T4 is enhanced. This interesting finding helps us to differentiate a uremic patient from patients with chronic illness [7]. Low levels of total T3 may also reflect metabolic acidosis [8] and reduced protein binding. Circulating thyroid hormones are usually bound to thyroid hormone-binding globulin (TBG) and, to a lesser extent, to prealbumin and albumin. Although circulating TBG and albumin levels are typically normal in uremia (exceptnephrotic syndrome), retained substances like urea, creatinine, indoles, and phenols in renal failure may inhibit hormone binding to these proteins [9].It has also been seen that the plasma concentration of thyroid-stimulating hormone (TSH) is usually normal in chronic kidney disease [10]. However, the TSH response to exogenous thyrotropin-releasing hormone (TRH) therapy is often delayed, and it requires a prolonged time to return to baseline levels [11]. It has been proposed that reduced renal clearance may contribute to delayed recovery since TSH and TRH are normally cleared by the kidney.

Although earlier thought to be an adaptive response to chronic illness, low T3 concentrations have been associated with all-cause mortality in uremic patients [12].In a study of 210 hemodialysis patients low T3 concentrations, particularly of more than 38-months duration, were associated with a higher risk of all-cause and cardiovascular mortality, with hazard ratios of 2.7 and 4.0 respectively [13]. A low thyroxine level was also associated with all-cause mortality.Additionally, there is a substantial clinical overlap between chronic kidney disease and hypothyroidism. In addition to low total and plasma free T3 levels, there are a number of symptoms that are common to both conditions, including cold intolerance, puffy appearance, dry skin, lethargy, fatigability, and constipation. Furthermore, the frequency of goiter is markedly increased in end-stage renal disease [14].

VI. Conclusion

This study described the clinic-epidemiological profile of thyroid dysfunction in patients with chronic kidney disease. We also found high serum creatinine and low eGFR to be significantly associated with hypothyroid status in patients with chronic kidney disease. Future studies in varied geographic locations are needed to support our findings.

Table 1. Baseline characteristics of patients with chronic kidney disease included in the study

Variables	Mean ± Standard deviation	Range
Age (years)	52.1 ± 11.2	24-88
Systolic blood pressure (mm of Hg)	158.2 ± 24.5	130-190
Diastolic blood pressure (mm of Hg)	93.4 ± 8.6	76-132
Hemoglobin (mg%)	8.7 ± 1.7	5.2-10.9
Serum urea (mg/dL)	148.4 ± 28.7	39.4-270.5
Serum creatinine (mg/dL)	5.7 ± 4.2	1.3-11.8
eGFR (mL/min/1.73m^2)	19.8 ± 4.46	3.8-62.4
Free T3 (pg/dL)	1.7 ± 0.8	0.8-4.2
Free T4 (ng/dL)	1.4 ± 0.6	0.5-3.3
TSH (μIU/mL)	4.9 ± 2.6	0.7-24.9
Total protein (gm/dL)	6.2 ± 0.9	4.3-8.1

eGFR: estimated glomerular filtration rate; T3: triiodothyronine; T4: thyroxine; TSH: thyroid stimulating hormone

Table 2. Comparison of kidney function between hypothyroid and euthyroid patients

Variables	Hypothyroid (n=23)	Euthyroid (n=35)	p value
Serum urea (mg/dL)	132.4 ± 44.8	144.5 ± 27.3	> 0.05
Serum creatinine (mg/dL)	7.2 ± 2.5	4.2 ± 2.1	<0.05
eGFR (mL/min/1.73m^2)	12.8 ± 10.5	29.4 ± 12.9	<0.05
Serum albumin (gm/dL)	3.1 ± 0.9	3.3 ± 0.7	> 0.05

GFR: estimated glomerular filtration rate

References

[1]. Ramirez G. Abnormalities in the hypothalamic-hypophyseal axes in patients with chronic renal failure. Semin Dial 1994; 7:138.
[2]. Lo JC, Chertow GM, Go AS, Hsu CY. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. Kidney Int 2005; 67:1047.
[3]. Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. Annals of internal medicine. 1999 Mar 16;130(6):461-70.
[4]. Ramírez G, Jubiz W, Gutch CF, et al. Thyroid abnormalities in renal failure. A study of 53 patients on chronic hemodialysis. Ann Intern Med 1973; 79:500.
[5]. Kaptein EM. Thyroid hormone metabolism and thyroid diseases in chronic renal failure. Endocr Rev 1996; 17:45.
[6]. Wartofsky L, Burman KD. Alterations in thyroid function in patients with systemic illness: the "euthyroid sick syndrome". Endocr Rev 1982; 3:164.
[7]. Medri G, Carella C, Padmanabhan V, et al. Pituitary glycoprotein hormones in chronic renal failure: evidence for an uncontrolled alpha-subunit release. J Endocrinol Invest 1993; 16:169.
[8]. Wiederkehr MR, Kalogiros J, Krapf R. Correction of metabolic acidosis improves thyroid and growth hormone axes in haemodialysis patients. Nephrol Dial Transplant 2004; 19:1190.
[9]. Spaulding SW, Gregerman RI. Free thyroxine in serum by equilibrium dialysis: effects of dilution, specific ions and inhibitors of binding. J ClinEndocrinolMetab 1972; 34:974.
[10]. Lim VS, Flanigan MJ, Zavala DC, Freeman RM. Protective adaptation of low serum triiodothyronine in patients with chronic renal failure. Kidney Int 1985; 28:541.
[11]. Duntas L, Wolf CF, Keck FS, Rosenthal J. Thyrotropin-releasing hormone: pharmacokinetic and pharmacodynamic properties in chronic renal failure. ClinNephrol 1992; 38:214.
[12]. Enia G, Panuccio V, Cutrupi S, et al. Subclinical hypothyroidism is linked to micro-inflammation and predicts death in continuous ambulatory peritoneal dialysis. Nephrol Dial Transplant 2007; 22:538.
[13]. Meuwese CL, Dekker FW, Lindholm B, et al. Baseline levels and trimestral variation of triiodothyronine and thyroxine and their association with mortality in maintenance hemodialysis patients. Clin J Am SocNephrol 2012; 7:131.
[14]. Castellano M, Turconi A, Chaler E, et al. Thyroid function and serum thyroid binding proteins in prepubertal and pubertal children with chronic renal insufficiency receiving conservative treatment, undergoing hemodialysis, or receiving care after renal transplantation. J Pediatr 1996; 128:784.

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