Original Research Article

Study of Correlation between Chronic Renal Failure and Thyroid Hormones

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ABSTRACT

Thyroid hormones play a very important role regulating metabolism, development, protein synthesis, and influencing other hormone functions. The two main hormones produced by the thyroid are triiodothyronine (T3) and thyroxine (T4). These hormones can also have significant impact on kidney disease, so it is important to consider the physiological association of thyroid dysfunction in relation to chronic kidney disease (CKD). CKD has been known to affect the pituitary-thyroid axis and the peripheral metabolism of thyroid hormones. Low T3 levels are the most common laboratory finding followed by subclinical hypothyroidism in CKD patients. Hyperthyroidism is usually not associated with CKD but has been known to accelerate it. One of the most important links between thyroid disorders and CKD is uremia. Patients who are appropriately treated for thyroid disease have a less chance of developing renal dysfunction. Clinicians need to be very careful in treating patients with low T3 levels who also have an elevation in TSH, as this can lead to a negative nitrogen balance. Thus, clinicians should be well educated on the role of thyroid hormones in relation to CKD so that proper treatment can be delivered to the patient.

Keywords: chronic renal failure, chronic kidney disease, thyroid hormones.

INTRODUCTION

The interactions between kidney and thyroid functions are known for years. Thyroid hormones are necessary for growth and development of the kidney and for the maintenance of water and electrolyte homeostasis. Kidney on the other hand, is involved in the metabolism and elimination of thyroid hormone.[1]

The prevalence of hypothyroidism is increased in patients with chronic renal failure while primary hyperthyroidism is extremely rare. Hyperthyroidism, hypothyroidism & euthyroid state have all been reported in various studies.[2,3]

The kidney plays an important role in the metabolism, degradation, and excretion of thyroid hormones. So, any impairment in kidney function leads to disturbed thyroid physiology including hypothalamic-pituitary-thyroid axis, leading to alterations in hormone production, distribution, and excretion.[4,5]

Epidemiologic data suggests that reduced kidney function is associated with prevalent subclinical and clinical hypothyroidism. Though the thyroid function has been extensively studied in patients with chronic renal failure; the results are variable.[6,7,8]

MATERIAL AND METHODS

The study was conducted in the department of general medicine in GUJARAT ADANI INSTITUTE OF MEDICAL SCIENCES, a tertiary care center in BHUJ Information was collected from patients through pre-tested preform meeting the objectives of the study. Purpose of the study has been carefully explained to patients and consent was taken.

Inclusion and Exclusion Criteria: Data collection was done by clinical history, examination and investigation. The study subjects were divided into 2 groups as cases & controls.

Cases included 30 patients of both sexes, aged between 40-70 years diagnosed with chronic kidney disease with serum creatinine > 5.5 mg/dl and urea > 55mg/dl and dipstick test positive for protein and with clinical symptoms of chronic renal failure.

Control groups included 30 healthy subjects of same age and sex matched to the cases from their relatives who volunteered for the study. All subjects in the study group were assessed for possible thyroid dysfunction depending on clinical and physical examination. Patients with diagnosed thyroid dysfunction on treatment, diabetic nephropathy, patients on treatment with oestrogen, corticosteroids, sulphonyl urea, and phenobarbitones were excluded from the study Morning sample blood was drawn after 12 hrs overnight fasting.

Serum urea estimated by Diacetyl Monoxide Method (DAM, Method), serum creatinine is estimated by Jaffe's method and estimation of serum T3, T4 & TSH by chemiluminescence immunoassay (CLIA) method.

Results of clinical and hormonal assessment of thyroid function of the cases with chronic renal failure were compared with those of the control group by statistical analysis using Chi-square test and t-test with p value < 0.005 considered significant.

Table-1: Physical characteristics of case and control

	Males		**Females**		**Total**	
Parameters	Control	Case	Control	Case	Control	Case
Numbers	22	22	8	8	30	30
Age in years (mean ±SD)	48.88 ± 15.48	51.33 ± 14.12	48.78 ± 15.26	48.68 ± 12.13	49.82 ± 15.20	52.12 ± 12.54
Weight in kg (mean ±SD)	68.12 ± 6.42	64.88 ± 9.12	52.00 ± 4.54	57.14 ± 2.26	62.13 ± 8.75	62.88 ± 8.48
Height in cm(mean ±SD)	170.00 ± 6.22	166.82 ± 6.44	156.22 ±3.78	153.54 ±1.16	164.89 ±10.33	163.16 ±8.82

RESULTS

This study shows the blood urea level in the cases as 96.12 ± 12.44mg/dl which is significantly higher than the control group which was 28.48 ± 8.42mg/dl.

Similarly, the serum creatinine level was significantly higher (5.88 ± 0.68mg/dl) in cases than the control group (1.08 ± 0.19 mg/dl).

The values of serum T3 and T4 were significantly lower in the cases compared to the control group. The values of T3 and T4 in cases was found to be 81.68 ±15.08 µg/dl and 5.82 ± 0.52 µg/dl respectively.

Similarly, the level of TSH was significantly higher in the cases (4.82 ± 0.39µIU/ml) compared to the control group (3.04 ± 0.78µIU/ml).

Table-2: Study variables in cases and control

Study variable	Case	Control	P-value
Blood urea (mg/ dl)	96.12 ± 12.44	28.48 ± 8.42	< 0.001
Serum creatinine (mg/dl)	5.88 ± 0.68	1.08 ± 0.19	< 0.001
T_3(µg/dl)	81.68 ± 15.08	112.94 ± 10.16	< 0.001
T_4 (µg/dl)	81.68 ± 15.08	112.94 ± 10.16	< 0.001
TSH (µIU/ml)	4.82 ± 0.39	3.04 ± 0.78	< 0.001

DISCUSSION

In this study of individual serum creatinine and serum TSH measurements we observed a higher prevalence of hypothyroidism in patients of CRF. on examining granular categories of CRF we found a strong associated with hypothyroidism there has been increasing recognition of an interplay between thyroid status and kidney function. similarly, hypothyroidism has been shown to cause changes in kidney structure and function in both development and adulthood. patients of CKD with hypothyroidism have decrease renal plasma flow and GFR.

Cardiovascular risk is associated with hypothyroidism so patients should be monitored for the thyroid function in CKD.as my study gets concluded on the strong association between thyroid function and CKD with significant p value further studies are required in this area to build a strong note on it.

CONCLUSION

Subclinical primary hypothyroidism is more common in persons with CRF but the mechanisms linking subclinical primary hypothyroidism and CRF is unclear.

As subclinical hypothyroidism has been associated with increased cardiovascular risk in CRF patients, adult patients with CRF should be routinely screened for subclinical primary hypothyroidism and further studies concentrating on improving clinical and biochemical criteria to diagnose thyroid dysfunction in CRF patients are needed.

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