

## Study of Correlation Between Chronic Renal Failure and Thyroid Hormones



### Medical Science

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\* Dr. Dipti Mohapatra

Associate Professor, Dept. of Physiology, IMS & SUM Hospital, Bhubaneswar-3, \* corresponding author

Priyambada Panda

Tutor and PhD student, Dept. of Physiology, IMS & SUM Hospital, Bhubaneswar-3

Dr. Manasi Behera

Asst. Professor, Dept. of Physiology, IMS & SUM Hospital, Bhubaneswar-3

Dr. Nibedita Priyadarsini

Associate Professor, Dept. of Physiology, IMS & SUM Hospital, Bhubaneswar-3

### ABSTRACT

Patients with chronic renal failure often have signs & symptoms suggestive of thyroid dysfunction. In view of the variability of thyroid function tests in patients with CRF in previous studies, it was decided to undertake a prospective clinical & biochemical study of thyroid functions & to establish a correlation, if any between thyroid dysfunction & chronic renal failure (CRF). In this study, it was found that the serum levels of T3 and T4 were less than normal whereas level of TSH was raised suggestive of hypothyroidism. Subclinical primary hypothyroidism has been recognized in several studies to be associated with markers of cardiovascular risk and cardiac impairment. Even minor deviations from serum TSH normal range might accelerate the development of atherosclerosis and have adverse effects on cardiovascular performance in the general population so further studies concentrating on improving clinical and biochemical criteria to diagnose thyroid dysfunction in CRF patients are needed.

### INTRODUCTION

The interactions between kidney and thyroid functions are known for years. Thyroid hormones (TH) are necessary for growth and development of the kidney and for the maintenance of water and electrolyte homeostasis.[1] Kidney on the other hand, is involved in the metabolism and elimination of TH. The prevalence of hypothyroidism is increased in patients with chronic renal failure while primary hyperthyroidism is extremely rare.[2, 3, 4] Hyperthyroidism, hypothyroidism & euthyroid state have all been reported in various studies. [5-9]

The kidney plays an important role in the metabolism, degradation, and excretion of thyroid hormones.[10] 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. Epidemiologic data suggests that reduced kidney function is associated with prevalent subclinical and clinical hypothyroidism. [11] Though the thyroid function has been extensively studied in patients with chronic renal failure; the results are variable.

### MATERIALS & METHODS:

The study was conducted in the Department of Medicine and dialysis unit in IMS & SUM Hospital in eastern India. 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 estrogen, corticosteroids, sulphonylurea, phenobarbitones were excluded from the study. After obtaining ethical clearance and consent from the subjects the medical examination was done as per a fixed proforma. 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.

### RESULT:

Table 1: Physical characteristics of case and control

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

Table-2 Study variables in cases and control

Study variable	Case	Control	P value
Blood urea (mg/dl)	96.12 $\pm$ 12.44	28.48 $\pm$ 8.42	< 0.001
Serum creatinine (mg/dl)	5.88 $\pm$ 0.68	1.08 $\pm$ 0.19	< 0.001
T <sub>3</sub> (µg/dl)	81.68 $\pm$ 15.08	112.94 $\pm$ 10.16	< 0.001
T <sub>4</sub> (µg/dl)	5.82 $\pm$ 0.52	8.38 $\pm$ 0.48	< 0.001
TSH (µIU/ml)	4.82 $\pm$ 0.39	3.04 $\pm$ 78	< 0.001

Table 1 shows the anthropological variations in case and control groups. Table 2 shows the blood urea level in the cases as 96.12  $\pm$  12.44mg/dl which is significantly higher than the control group which was 28.48  $\pm$  8.42mg/dl. Similarly the serum creatinine level was significantly higher (5.88  $\pm$  0.68mg/dl) in cases than the control group (1.08  $\pm$  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  $\pm$ 15.08 µg/dl and 5.82  $\pm$  0.52 µg/dl respectively which was significantly lower than the control group. Similarly the level of TSH was significantly higher in the cases (4.82  $\pm$  0.39µIU/ml) compared to the control group (3.04  $\pm$  78µIU/ml).

**DISCUSSION:**

In CRF, several hormonal systems are affected, but to what extent these changes are responsible for manifestations of uremic syndrome are still unclear. Patients with CRF often have signs & symptoms of thyroid dysfunction & so the diagnosis of thyroid disease in these patients has obvious prognostic implications.

There is significant reduction in T3 and T4 levels in patients with CRF regardless the mode of therapy in comparison with those of control group, these findings was similar to most of the results of investigators who have studied thyroid hormones level in clinically euthyroid patients with varying grades of chronic renal failure. [12-13] The reduction in thyroid hormone levels may be due to the effect of chronic renal failure on the thyroid hormones which include altered peripheral metabolism like impairment of peripheral deiodination of T4 which is the main source of T3 resulting in low TT3, possible lowering of thyroxin-binding globulin and possible decrease in the excretion of thyroxin binding to thyroid binding proteins both lead to low TT4.

Although numerous hypothesis for contributing factors, like altered iodine metabolism, decreased peripheral sensitivity to hormones, and autoimmune thyroiditis, the exact underlying mechanisms linking advanced CKD and primary thyroid dysfunction remain unclear.[14] Hypothyroidism associated with kidney dysfunction seems to be more related to decrease in thyroid hormone rather than auto immunity.[15] It is seen that subclinical primary hypothyroidism has been associated with markers of cardiovascular risk and cardiac impairment. Even minor deviations from normal range of serum TSH might accelerate the development of atherosclerosis and have adverse effects on cardiovascular performance in the general population.[16-19] Moreover; subclinical primary hypothyroidism is a strong predictor of all-cause mortality in chronic dialysis patients and as a risk factor for nephropathy and cardiovascular events in type 2 diabetic patients. [20]

**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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