

## Thyroid Function Abnormalities in Patients with Chronic Kidney Disease

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### Abstract

The function of the thyroid gland is one of the most important in the human body as it regulates the majority of the body's physiological actions. The thyroid produces hormones (T3 and T4) that have many actions including metabolism, development, protein synthesis, and the regulation of many other important hormones. There is a lot of interaction between the kidney and thyroid gland during the disease States thyroid hormones have a major role in regulating the glomerular filtration rate through its hormonal actions in normal physiology. But these things are altered in the disease States such as chronic kidney disease. It is a well-known fact that hypothyroidism causes decreased Glomerular filtration rate whereas hyperthyroidism causes increased Glomerular filtration rate leading to renin-angiotensin-aldosterone system activation. In

our study we aim to see the prevalence of low T3 syndrome in different stages of CKD which is a state of physiological benefit in preserving the proteins lost through the Kidneys in CKD patients and since CKD is progressed in hyperthyroidism state it is a protective mechanism in restoring the CKD status. Other subclinical hypothyroidism hyperthyroidism. Autoimmune hypothyroidism. Glomerulonephritis are all part of a dynamic endocrine and nephrology sequence. Thorough knowledge of these is required for optimum treatment of thyroid in CKD patients.

## Introduction

Chronic kidney disease is increasing in prevalence worldwide with irreversible loss of nephrons and metabolic, endocrine, secretory and excretory functions [1]. In The developing country like Bangladesh is emerging as a major health hazard. It affects every system in the body including the thyroid hormone [2]. The reduced elimination of iodine in CKD, increases iodide levels thereby blocking thyroid hormone production (wolff chaikoff effect) [3]. Chronic Kidney Disease is associated with low levels of serum total and free T3, T4 and reverse T3 [4]. Thyroid Stimulating Hormone is usually normal and found to be in euthyroid state [5]. Many studies have reported hypothyroid, hyperthyroid and euthyroid states in Chronic Kidney Disease. The relationship between severity of renal failure and thyroid dysfunction is unclear [6, 7]. The estimated prevalence of hypothyroidism in CKD is between 0-9%. The low T3 syndrome in CKD is protective and promotes conservation of protein. The low T3 syndrome increases with severity of renal failure [8]. Our aim of the study was to study thyroid function abnormalities in patients with Chronic Kidney Disease and correlate them with severity of renal failure.

## Materials and Methods

These was a cross sectional observation study conducted in Department of Nephrology in Bangabandhu Sheikh Mujib Medical University(BSMMU) Dhaka, Bangladesh Included 50 CKD patients not on dialysis, who are only on conservative management.

## Inclusion Criteria

1. Age more than 18 years.
2. Patients with Chronic Kidney Disease on conservative management admitted in BSMMU.
3. Patients with Chronic Kidney Disease who are willing to participate in the study and give informed written consent.

## Exclusion Criteria

1. Patients on Dialysis.
2. Acute illness, diabetes mellitus, liver disease, recent surgery, trauma.
3. Nephrotic range proteinuria or hypoalbuminemia.
4. Patients who have received drugs altering thyroid profile like Amiodarone, Phenytoin, Beta blocker, Steroids, Estrogen, iodine compounds.

## Statistical Analysis

1. Simple random sampling.
2. T test was used for continuous variables and chi square test for categorical variables.
3. ANOVA test was used to compare three groups.
4. A p value of <0.05 was considered statistically significant.

## Results

In our study the age matched graph shows the maximum number of patients in the category of 40-49 years with 6 males and 4 females, 50- 59 years had 6 males and 4 females, whereas between 60 to 69 years there were 4 males and 4 females. The extreme age groups had few patients with chronic kidney disease above 70 there were 2 females and 2 males between 18-29 years there were 2males and 2 females and 30-39 years had 1 male and 2 females. There is a cluster of cases in middle age and with equal sex distribution.

In our study the number of chronic kidney patients having low T3 were 37 which constituted 74%,the patients with normal T3 were 10 constituting 20% and those with high T3 were 3, suggesting primary

hyperthyroidism, so excluding them 75% of our patients had low T3 syndrome.

In our study 37 patients had low T3, 24 had low T4 with 46 patients being normal TSH, only 4 had high TSH. Excluding patients with primary hypothyroidism.

Patients with low T3 low T4 were clustered more towards end stage renal disease with 60%. Patients also were in moderate numbers with low T3 and low T4 in stage 4 chronic kidney disease. 20% In stage 3 chronic kidney disease T4 and TSH were almost normal with only 10% patients having low T3 syndrome. In stage 2 chronic kidney disease 10% had low T3, low T4 with rest being normal TSH.

In our study patients with low T3 were 35 accounts for nearly 70% and T3 were 13 (26%). Only 2 patients had primary hypothyroidism-4%

In our study low T3 syndrome had ranged from 0.67-1.89 of the mean with a standard deviation of 0.52-0.86

## Discussion

The present study was aimed to assess the prevalence of thyroid dysfunction in chronic kidney disease patients and to determine the correlation between thyroid dysfunction and severity of renal disease [9]. Various studies were conducted about thyroid dysfunction and severity of chronic kidney disease and have shown different results. Since thyroid profile undergoes changes due to dialysis [10]. In our study, chronic kidney disease patients only on conservative management were studied. Dialysis also changes the previous serum thyroid hormone status in patients with renal failure; several studies have observed a link between CKD and hypothyroidism [12]. But there are not many studies correlating low T3 with severity or stage of CKD. In our study none of the patients had clinical or biochemical features Hyperthyroidism. In our study 50 patients of CKD who were on conservative management fulfilling the criteria for Chronic kidney disease, the maximum number of patients were in the category of 40-49 years with 6 males and 4 females,

50- 59 years had 6 males and 4 females, whereas between 60 to 69 years there were 4 males and 4 females. The extreme age groups had few patients with chronic kidney disease above 70 there were 2 females and 2 males between 18-29 years there were 2 males and 2 females and 30-39 years had 1 male and 2 females. There was a cluster of cases in middle age and with equal sex distribution. Among the 50 patients studied, 60% of patients were males and 30% were females. In our study the duration of symptoms of CKD varied from 4 months to 8 months, mean duration being 6.07 months and the creatinine clearance varied from 4 ml/minute-60 ml/minute of the 50 patients, 38 patients had GFR of less than 15 ml/minute accounting to 76%, 6 patients had GFR ranging from 15-30 ml/minute accounting for 12% and 4 patients had GFR ranging from 30- 60ml/minute accounting for 8%.and 4% above 60ml/min. Among these patients most were in the range of creatinine clearance < 1g/day in all the patients in our study. Ultrasound abdomen was done in all patients, that showed features of contracted kidney in 40 patients accounting for 80% and the remaining 10 patients had loss of corticomedullary differentiation, accounting for 20%. Out of 50 patients in our study, 48 patients had anaemia, 44 patients had normocytic normochromic anaemia in peripheral blood picture and the remaining 4 patients had microcytic hypochromic anaemia. The only Indian study directly correlating severity of CKD and Low T3 syndrome is by Swaminathan K et al., who compared the estimated Glomerular filtration rate values with T3, T4, TSH found a significant correlation with 66% patients having thyroid dysfunction with >50% having low T3, more severe the stage of chronic kidney disease [13-15].

## Conclusion

In our study of 50 CKD patients, 60% had low T3 values. Excluding hypothyroidism the T3 level was low in 50% patients and T4 level was low in 20% patients. The change in serum T3 and T4 can be taken as protective to conserve protein. As the stage of CKD increases the patients with low T3 T4 level increases. The incidence of

low T3 increases with age. There is a direct linear relationship with GFR and low T3 in our patients.

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