Original Research Paper

Volume - 13 | Issue - 01 | January - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

General Medicine

# EVALUATION OF T3 LEVELS IN PATIENTS WITH CHRONIC KIDNEY DISEASE ON CONSERVATIVE MANAGEMENT

**Dr. Swaroopa Rani** Post Graduate Student, department of General medicine KVG medical college and hospital, Sullia, Dakshina Kannada, Karnataka.

**Dr. C.R Bhatt*** HOD and professor department of General medicine KVG medical college and hospital, Sullia, Dakshina Kannada, Karnataka*Corresponding Author

**ABSTRACT** **BACKGROUND:** Chronic kidney disease is one of the most common non-communicable disease with significant mortality and morbidity. Thyroid function abnormalities in chronic kidney disease are well known but there are few studies conducted to establish a physiological link between the two conditions. Chronic kidney disease leads to permanent loss of nephrons causing disturbance in the normal homeostasis of the body affecting very system of the body.

**OBJECTIVES:**

1. To study the prevalence of serum low T3 in patients with chronic kidney disease on conservative management.
2. To establish a clinical significance between low T3 and severity of the disease.

**METHODS:** In this study, 65 patients of chronic kidney disease who were not on haemodialysis were randomly selected. After thorough history and detailed examination, relevant investigations done,which includes blood investigations like renal function tests and an early morning sample was taken to assess the thyroid function. The correlation between T3 levels and chronic kidney disease were studied. **RESULTS:** Alteration of thyroid function is very common in CKD patients. Low T3 was widely prevalent among these patients amounting to 60% of the sample. It was also evident that the serum T3 fell more severely with the progress of the disease. **CONCLUSION:** It is very important to screen all CKD patients for thyroid function abnormalities. Low T3 values can be a useful.

**KEYWORDS :** Chronic kidney disease, Hypothyroidism , hyperthyroidism, , thyroid disorder, low T3 syndrome,triiodothyronine

## Introduction

Chronic kidney disease (CKD) is recognized as a global health problem due to its high cost, reduced patient quality of life [1], high comorbidities and poorer prognosis of other diseases such as metabolic diseases [2]. The thyroid gland influences metabolic processes in the body and clinical/translational research supports a connection between thyroid and kidney function. Patients with CKD and end-stage kidney disease (ESKD) are prone to hypothyroidism [3–9] and low free triiodothyronine (FT3) syndrome [combined low FT3 levels with normal thyroid-stimulating hormone (TSH) levels] [6, 10]. Thyroid function can also affect kidney function, CKD progression, and increase cardiovascular disease (CVD) disease risk. CKD patients have a high risk for CVD and impaired thyroid function may increase their CVD risk as well as mortality, as has been shown for ESKD patients . Zoccali et al. reported T3 to be a strong marker of survival in ureamic patients. Fan et al. reported a high prevalence of low-T3 syndrome in a very small cohort of CKD patients with severely reduced kidney function and patients with ESKD, suggesting low-T3 syndrome to be a risk factor of CKD progression.

In addition, impaired renal handling of iodine increases serum iodine levels, causing a prolonged Wolff - Chaikoff effect. The clinical importance of this low T3 syndrome is controversial. The low T3 levels (especially total T3 and not free T3) in CKD patients have been correlated with higher levels of markers of inflammation, malnutrition (lower prealbumin, IGF-1),increased endothelial dysfunction, poorer cardiac function, poor survival, and higher cardiovascular mortality in some studies.

Overt and subclinical hypothyroidism may be associated with low glomerular filtration rate (GFR), possibly caused by reduced renal blood flow, which is a vascular characteristic of hypothyroid patients Low thyroid function within the clinically normal range has also been associated with reduced renal blood flow but it is not known if GFR may vary within the normal range of thyroid function.

In view of variability of thyroid profile in chronic kidney disease patients in previous studies, a prospective biochemical and clinical study on T3 levels has been undertaken in the department of medicine, KVG medical college and hospital, Sullia.

## Materials and Methodology

This is a cross section study with n = 50 patients, fulflling the criteria for CKD, who are on conservative management, attending to Department of General Medicine, KVG Medical College and Hospital, Sullia. Systemic random sampling was usedafter satisfying the inclusion and exclusion criteria.

Clinical history and physical examination and relevant investigations for the study were done, with preference to renal and thyroid diseases. Quantitative determination of total T3, T4 and TSH were done by Enzyme Linked Fluorescence immunoassay at Central laboratory of KVG medical College and hospital.

### Inclusion Criteria:

1. Patients with Chronic kidney disease, who are on conservative management.
2. Presence of Uremic symptoms for 3 or more months.
3. Raised blood urea, serum creatinine and reduced creatinine clearance.
4. Ultrasonogram evidence of chronic kidney disease.

### Exclusion Criteria:

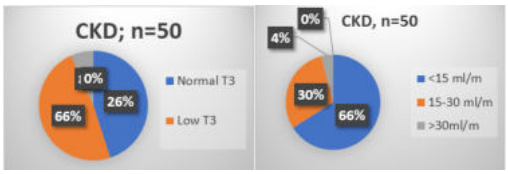
1. Patients on peritoneal dialysis or Haemodialysis
2. Nephrotic range proteinuria
3. Hypoalbuminemia
4. Other conditions like acute illness , resent surgery , trauma ,burns, liver disease.
5. Hypothyroidism patients on medications for the same.
6. Drugs altering thyroid profile like amiodarone, phenytoin, beta blockers, dopamine, steroids, estrogen pills and iodine containing drugs.

**-1:GFRvariation withT3 and hypothyroidism**

| CKD; n=50 | GFR >30ml/m N=2 | GFR 30-15ml/m N=15 | GFR <15 ml/m N=33 |
|---|---|---|---|
| Normal T3 | 1 | 6 | 10 |
| Low T3 | 1 | 8 | 20 |
| LowT3, T4, High TSH (Primary Hypothyroid) | 0 | 1 | 3 |

Among 50 patients included in our study, 33( 66%) had low T3 level. Among them, 4 (8%) patients,low T3 is due to primary hypothyroidism (they also had low T4 and high TSH) Hence,29 (58%) patients had low T3 due to the influence of CKD ($p<0.05$)

**OBSERVATION-2 : GFR variation with low T3**




33(66%) patients had GFR of less than 15ml/ min,
15(30%) patients had GFR ranging from 15-30ml/ min and
2 (4%) patients had GFR ranging from more than 30 ml/ min.
33(66 %) of study subjects had low T3 level & 4( 8% )had Primary hypothyroidism, while 13(26% )had normal thyroid functions.

## RESULTS:

In our study 29 patients ( 66%) had low T3.8% had primary hypothyroidism In patients with low GFR ,the serumT3 level was found to be decreased. Lower the GFR in CKD patients, the serum T3 levels were proportionately low. This shows a direct linear relationship between GFR and T3 level. In patients with low T3, the mean value of TSH in various stages of renal disease did not show any correlation with GFR.

## DISCUSSION

The present study was aimed at to assess the prevalence of low T3 levels in CKD patients and to determine the correlation between low T3 and severity of CKD. Various studies was conducted about low T3 and severity of CKD and showndifferent results.

Among the 50 patients study, 68% of patients were males and 32% patients were females. Of the 50 patients, 33 patients had GFR of less than 15 ml/minute accounting to 66%, 15 patients had GFR ranging from 15 – 30 ml/minute accounting for 30% and 2 patients had GFR ranging from more than – 30 ml/minute accounting for 4%.

The blood urea value varied from 45 – 184 mg/dl, the mean value being 102.12. Among the patients studied most of them have blood urea in the range of 81-120 mg/dl.

The creatinine values varied from 3 – 14 mg/dl, the mean value being 7.34. Among the patients study most of them have serum creatinine in the range of 4 – 8 mg/dl.

In our study out of 50 patients, 33 patients had low serum T3 levels (66%). 4 patients among low serum T3 value, they also had low T4 and high TSH suggesting primary hypothyroidism (8%). So excluding 4 patients of hypothyroidism 29 patients had low T3 syndrome in our study. 16 patients had low T4 levels in our study, out of which 4 patients had low T3 and high TSH suggesting primary hypothyroidism. Excluding hypothyroidism 12 (24%) patients had low T4 in our study.The TSH values in our study ranged from 0.6-38 micro IU/ml, the mean value being 6.494. Among 50 patients, 46 patients were in the normal range and 4 patients had high value of more than 20 micro IU/ ml. In patients who were in the high range 3 were males and 1 was female.

Excluding hypothyroidism, mean TSH level in our study is within normal limits. The mean TSH levels are also within normal limits for the various ranges of GFR. But TSH level doesn't show any linear correlation with the severity of renal failure.

In our study of CKD patients with low T3 syndrome, the mean TSH values in several stages of renal failure are found to be in normal range. TSH values did not show any linear correlation with glomerular filtration rate in our study.

One similar study showed similar results which was conducted by Spector and Ramirez et al Dudani et al, Karunanidhi et al. These studies depicted abnormality in hypophyseal mechanism of TSH release in uraemic patients as the TSH response to the TRH was blunted.

Several studies reported in CKD patients showed low T3 values. Low T3 had been reported in Ramirez et al, Hegedus et a1, Beckett et al PonAjil Singh et al, P Iglesias and JJ Diez and many others. Ramirez and Spector et a1 study showed linear correlation between mean serum T3 and T4 and severity of renal failure.

previous studies by Quionverde et a1,reported high preponderance of hypothyroidism in CKD So, diagnosis of hypothyroidism in CKD mainly rest on TSH level which should be very high (>20 µIU/dl) with low serum T4. In this study none of the patients had clinical or biochemical features of hyperthyroidism.

Among the patients study 58% had low T3 syndrome, 24% had low T4 syndrome and 8% had primary hypothyroidism.

As with other studies, mean T3 level in our study was reduced in GFR less than 15 ml/min. In patients with low GFR, T3 level was found to be reduced and it shows there was direct linear relationship between T3 level and GFR, which is consistent with Avinashi et al study.

## DIALYSIS:

As stated previously, HD and continuous ambulatory peritoneal dialysis have shown to affect the thyroid profile independently of CKD. Also drugs like heparin, furosemide used during dialysis will affect the thyroid profile.

Kayimaet a1 and Giordano et al have showed, studies regarding effect of dialysis on CKD patients with thyroid dysfunction.

These studies showed no significant improvement in thyroid profile after repeated hemodialysis. But in the patients who have undergone renal transplant surgery, most of the thyroid function parameters returned to normal with TSH below normal.

## LIMITATIONS OF THIS STUDY

Thyroid dysfunction was studied in patients with CKD irrespective of the etiology of CKD therefore individual correlation of the etiology of CKD with thyroid dysfunction could not be studied.

Thyroid dysfunction was not studied in patients on dialysis, as dialysis itself affects the thyroid profile independently of CKD.

**CONCLUSION;** Alteration of thyroid function is very common in CKD patients.66 % of the CKD patients on medical management had low T3.Low T3 may be reflection of chronic illness / malnutrition.The number of patents with low T3 progressively increased with stages of CKD.In patients with low GFR the serum T3 level was found to be decreased. This shows a direct linear relationship between GFR and T3 level.It is very important to screen all CKD patients for thyroid function abnormalities.

## REFERENCES

1 Levin A,, Tonelli M,, Bonventre J et al. . Global kidney health 2017 and beyond: a roadmap for closing gaps in care, research, and policy. Lancet 2017; 390: 1888–1917
2 EckardtKU,, Coresh J,, Devuyst O et al. . Evolving importance of kidney disease: from subspecialty to global health burden. Lancet 2013; 382: 158–169.
3 CholmL,, Lippi G,, Salvagno G et al. . Prevalence of subclinical hypothyroidism in patients with chronic kidney disease. Clin J Am Soc Nephrol 2008; 3: 1296–1300
4 Kaptein EM. Thyroid hormone metabolism and thyroid diseases in chronic renal failure. EndocrRev 1996; 17: 45–63.
5 KapteinEM,,Quion-Verde H,, Chooljian CJ et al. . The thyroid in end-stage renal disease. Medicine (Baltimore) 1988; 67: 187–197.
6 Lo JC,,Chertow GM,, Go AS et al. . Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. Kidney Int 2005; 67: 1047–1052.
7 Ng YY,, Wu SC,, Lin HD et al. . Prevalence of clinical and subclinical thyroid disease in a peritoneal dialysis population. Perit Dial Int 2012; 32: 86–93.
8 Hollowell JG,,Staehling NW,, Flanders WD et al. . Serum TSH, T(4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). J Clin Endocrinol Metab 2002; 87: 489–499.
9 SchultheissUT,,Daya N,, Grams ME et al. . Thyroid function, reduced kidney function and incident chronic kidney disease in a community-based population: the Atherosclerosis Risk in Communities study. Nephrol Dial Transplant 2016; 32: 1874–1881.
10 Xu G,, Yan W,, Li J. An update for the controversies and hypotheses of regulating nonthyroidal illness syndrome in chronic kidney diseases. Clin Exp Nephrol 2014; 18: 837–843.