



ASSOCIATION OF THYROID HORMONE LEVELS AND CHRONIC KIDNEY DISEASE

General Medicine

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ABSTRACT

Introduction- Normal thyroid hormone metabolism, breakdown, and excretion depend heavily on the kidney. We sought to assess the serum thyroid hormone levels in CKD patients in the current investigation because there is little data on the association between thyroid hormone levels and CKD. **Methods-** This cross-sectional and time bound study was conducted in department of General Medicine and Nephrology in NIMS&R Hospital, Jaipur for 18 months. **Results-** Number of patients with low serum T3 levels increased proportionately with decreasing eGFR levels. Serum T4 and TSH levels were not significantly related to worsening renal function. **Conclusion-** Low T3 syndrome was the commonest and subclinical hypothyroidism was the second most common thyroid abnormality detected. Hypothyroidism and severity of CKD did not correlate with each other.

KEYWORDS

CKD, Thyroid hormone, TSH, Serum T3

INTRODUCTION:

Chronic kidney disease (CKD) is frequently characterised by endocrine abnormalities^{1,2}. Normal thyroid hormone metabolism, breakdown, and excretion depend heavily on the kidney.

Many indications and symptoms of thyroid dysfunction are present in CKD patients, including asthenia, hyporeflexia, edema, dry skin, cold intolerance, and reduced BMR. It is therefore challenging to rule out thyroid dysfunction in CKD cases based solely on clinical history.

Thyroid hormones have a critical role in growth, metabolic control, protein synthesis, and other hormone function. Triiodothyronine (T3) and thyroxine (T4), the two primary hormones produced by the thyroid gland, are crucial for the renal system's proper operation³. Therefore, it is crucial to assess the relationship between thyroid diseases and the etiopathogenesis of chronic renal disease.

AIM:

To study the association between thyroid hormone levels and chronic kidney disease.

OBJECTIVES:

1. To determine the prevalence of thyroid hormones dysfunction in patients with chronic kidney disease.
2. To establish the association between thyroid hormone dysfunction and severity of renal diseases.

MATERIALS AND METHODS:

It was a cross-sectional and time bound study, conducted in Department of General Medicine and Nephrology in National Institute of Medical Sciences & Research Hospital, Jaipur from 1st January, 2021 to 30th June, 2022.

Inclusion Criteria:

Either of the following present for >3 months

1. Markers of kidney damage (one or more)
 - A. Albuminuria (AER $\geq$ 30 mg/24 hours; ACR $\geq$ 30mg/g [$\geq$ 3 mg/mmol])
 - B. Urinesediment abnormalities
 - C. Electrolyte and other abnormalities due to tubular disorders
 - D. Abnormalities detected by histology
 - E. Structural abnormalities detected by imaging
 - F. History of kidney transplantation
2. Decreased GFR
 - A. GFR <60ml/min/1.73m² (GFR categories G3a-G5)

Exclusion Criteria:

1. Patients who underwent peritoneal dialysis or hemodialysis
2. Nephrotic range of proteinuria
3. Low serum protein especially albumin

4. Other conditions like

- A. Acute illness
- B. Recent surgery, trauma or burns
- C. Diabetes mellitus
- D. Liver diseases
- E. Drugs altering thyroid profile like Amiodarone, Steroids, Dopamine, Phenytoin, Oestrogen pills, Iodine containing drugs.

OBSERVATION AND RESULTS:

70 CKD patients on conservative management who fulfilled the criteria were studied and the results analyzed.

Of 70 patients, 59 (84.3%) were males and 11 (15.8%) were females. Out of 70 patients, the highest amount of patients were from 41-50 years age group. 10 patients belonged to less than 30 years age group, 9 patients were from 31-40 years age group. 17 patients belonged to 51-60 years age group, while 61-70 years age group had 13 patients. More than 70 years age group had least amount of patients with 2 patients. Mean age of the population was 49 years.

In this study, 6 (9%) patients were stage 3 CKD, 21 (30%) patients were stage 4 CKD and 43 patients (61%) were stage 5 CKD. eGFR varied from 6 to 36 mL/min/1.73m².

Table 1: Analysis of thyroid dysfunction

THYROID DYSFUNCTION	NO OF PATIENTS	PERCENTAGE
NORMAL	14	20%
LOW T3	34	49%
SUBCLINICAL HYPOTHYROIDISM	13	19%
HYPOTHYROIDISM	9	13%

In this study, 56 (80%) out of 70 patients had thyroid dysfunction. 34 (49%) patients had Low T3 syndrome making it the commonest thyroid dysfunction. 13 (19%) patients had Subclinical hypothyroidism and hypothyroidism were seen in 9 (13%) patients.

Table 2: Serum T3 correlation with eGFR

eGFR	SERUM T3		TOTAL
	LOW	NORMAL	
STAGE 3	1 (16.6%) [2.5%]	5 (83.3%) [16.7%]	6 (100%) [8.5%]
STAGE 4	10 (47.6%) [25%]	11 (52.3%) [36.6%]	21 (100%) [30%]
STAGE 5	29 (67.4%) [72.5%]	14 (32.6%) [46.7%]	43 (100%) [61.5%]
TOTAL	40 (57.1%) [100%]	30 (42.8%) [100%]	70 (100%) [100%]
p=0.03589 (significant)			

Number of patients with low serum T3 levels increased proportionately with decreasing eGFR levels with $p=0.03589(S)$.

Table 3: Thyroid dysfunction correlation with eGFR

eGFR	TYPE				TOTAL
	NORMAL	LOW T3	SUBCLINICAL HYPO	HYPO	
STAGE 3	3 (50%) [21.4%]	1 (16.7%) [2.9%]	1 (16.7%) [7.7%]	1 (16.7%) [11.1%]	6 (100%) [8.6%]
STAGE 4	8 (38.1%) [57.1%]	9 (42.9%) [26.5%]	2 (9.5%) [15.3%]	2 (9.5%) [22.2%]	21 (100%) [30%]
STAGE 5	3 (7%) [21.4%]	24 (55.8%) [70.6%]	10 (23.2%) [76.9%]	6 (14%) [66.7%]	43 (100%) 61.4%]
TOTAL	14 (20%) [100%]	34 (48.6%) [100%]	13 (18.6%) [100%]	9 (12.9%) [100%]	70 (100%) [100%]

Low T3 syndrome & eGFR: $p=0.00416$ (Significant) Subclinical hypothyroidism & eGFR: $p=0.01542$ (Significant)
Hypothyroidism & eGFR: $p=0.09362$ (Not significant)

DISCUSSION:

We found that 80% of CKD patients had thyroid dysfunction and 20% had normal thyroid status. Low T3 syndrome was the commonest dysfunction that occurred in CKD patients on conservative management which is consistent with Singh et al⁵, Ramirez et al⁶, P Iglesias et al⁴, Hegedus et al⁷ studies.

In our study 19% of CKD patients had subclinical hypothyroidism. A study by Choncholet al⁸ estimated 18% of CKD patients on conservative management had subclinical hypothyroidism.

In the present study the proportion of CKD patients with Subclinical hypothyroidism increased from 16.7% in stage 3 to 23.2% in stage 5 with p value of 0.01542 which is significant. Lo et al⁹ also showed similar results. In their study the Subclinical hypothyroidism prevalence was 5.4% in patients with $eGFR > 90 \text{ ml/min/1.73m}^2$ and it increased to 23% in patients with $eGFR < 30 \text{ ml/min/1.73m}^2$.

The patients with Low T3 syndrome increased from 16.7% in CKD stage 3 to 55.8 % in stage 5 CKD with p value of 0.00416 which is significant.

Hypothyroidism did not have any correlation with CKD stages.

CONCLUSION:

1. Thyroid dysfunction occurred in 80% of Chronic Kidney Disease patients.
2. Low T3 syndrome was the commonest thyroid abnormality detected.
3. Subclinical hypothyroidism was the second most common thyroid abnormality detected. It occurred in 19% patients indicating significant alteration of thyroid hormone physiology in Chronic Kidney Disease patients.
4. Frank hypothyroidism was the least commonly detected thyroid abnormality.
5. Hypothyroidism and severity of CKD did not correlate with each other.
6. Number of patient with Low T3 syndrome and subclinical hypothyroidism progressively increased with increasing severity of Chronic Kidney Disease and had linear correlation with severity of CKD.
7. Serum TSH and T4 levels did not correlate with CKD severity.

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