Section: Miscellaneous

Original Research Article

STUDY OF THYROID DYSFUNCTION IN CHRONIC KIDNEY DISEASE PATIENTS OF TELANGANA

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ABSTRACT

Background: Thyroid hormones are metabolically active and typically lowered in End stage renal disease (ESRD). Impaired renal excretion in CKD results in increased plasma iodide levels inhibit the thyroid hormone synthesis. **Materials and Methods:** 80 (Eighty) CKD patients undergone thyroid hormone assay and compared with 80 (Eighty) controlled (healthy volunteers) group. **Results:** 50 (62.5%) normal, 29 (36.2%) low, 1 (1.2%) high in TT4 (µq/dL), 80 (100%) low in TT3 (µq/dL), 18 (22.5%) normal 1 (1.2%) low, 61(76.2%) high range of TSH (µq/dL) in CKD patients. Blood urea, serum creatinine, TT3, TT4, TSH and analysis of thyroid hormone in the cases of treatment modalities have significant P-value ($p<0.001$). **Conclusion:** It is confirmed that, the patients with CKD are at risk of thyroid hypofunction irrespective of their mode of treatments. Present study will be helpful to clinician to treat such patients efficiently to prevent ESRD and management of CKD patients.

INTRODUCTION

Proper kidney function is essential for maintaining body homeostasis through filtration of blood, regulation of body fluid and excretion of metabolic waste products.

The hall mark of CKD is a steady decline in GFR (Glomerular Filtration Rate) to less than 60 ml/min for three months or more, frequently accompanied by nephron structural destruction. End stage renal disease (ESRD) is usually the result of the diseases progression. Various co-morbidities like hypertension, renal bone disease, neuropathy, nutritional impairment are influenced by CKD which impairs the quality of life.[1]

About 16% of adult population suffering with CKD globally in India more than One lakh is diagnosed with CKD every year. Majority of them require long term dialysis or kidney transplantation. Cardiovascular diseases continues to be a primary cause of death for ESRD (or CKD) patients.[2]

Thyroid hormone metabolism, breakdown and excretion are significantly influenced by renal functions. Variations in thyroid hormone levels and changes in hypothalamic pituitary thyroid axis might results from disruptions in the renal function. Among thyroid hormones T3 (triodothyronine) is the most metabolically active during ESRD patients due to decreased peripheral conversion of thyroxime (T4) to (T3).[3] Moreover renal excretion of iodide in CKD results in increased plasma iodide levels which can inhibit thyroid hormone synthesis through the Wolff-Chaikoff effect. Therefore thyroid function is impacted by chronic renal failure.[4] Hence an attempt is made to correlate the dysfunction of thyroid profile in CKD patients.

MATERIALS AND METHODS

80 (Eighty) adult patients aged between 40 to 70 years old attending hemodialysis and OPD at TRR Institute of Medical Sciences, Inole, Patancheru (Mandal) Sangareddy (District)-502319, Telangana were studied.

Inclusive criteria

Above 40 years of age clinically diagnosed CKD patients. The Patients who gave their consent writing for study were selected. 80 (Eighty) controlled (Normal) Volunteers are included.

Exclusion criteria

Family history of goiter or thyroid dysfunction. Thyroid patients already on medication of thyroid hormone drugs or any drugs known to affect thyroid hormone indices like Glucocorticoids Salicylates, Heparin, Lithium, Amiodarone, Sulphonylurea or Phenobarbitone, Pregnancy, Acute illness, Burns were excluded.

Method

Every patient (including controlled group) underwent the methodology. Taking all aseptic precautions 2ml of venous blood collected from median cubital vein overnight fasting in a clot activator vial for TT3, TT4, TSH, blood urea and serum creatinine estimation. The sample was left for 30 to 45 minutes and allowed

to clot completely. The vial was then centrifuged at 3000 rpm for five minutes in a centrifuge machine. Precautions were taken to prevent hemolysis of the sample. The supernatants serum was used for the investigations or transferred to a clean dry vial for storage if the estimations were not done in the same sitting. All chemicals used in the study were for analytic grade and deionised water (Millipore) was used for various purposes.

Duration of study was January 2026 to September 2026.

Statistical analysis

The estimated test related to CKD and thyroid dysfunction compared with controlled group T-test. The variable range of thyroid profile was classified with percentage in CKD patients. The statistical analysis was carried out in SPSS software. The ratio of male and females was 2:1.

RESULTS

[Table 1]: comparison of blood urea and serum creatinine levels in Thyroid dysfunction patients with control group:

- Blood Urea: 154.82(± 40.45) in cases, 22.90 (± 6.30) in controlled, t-test 28.8 and p< 0.001.
- Serum creatinine: 8.82 (± 3.38) in cases, 0.76 (± 0.30) in normal (controlled), t-test 21.2 and p<0.001.

[Table 2]: Study of TT3, TT4 and TSH levels among chronic kidney disease (CKD) patients.

- 80 (100%) low TT3 (mg/d)
- 50 (62.5%) normal, 29 (36.2%) low, 1(1.2%) of TT4 levels
- 18 (62.5%) normal, 1 (1.2%) low, 61 (76.2%) high level of TSH levels

[Table 3]: Comparative study of TT3, TT4 and TSH in CKD patients with controlled group.

- TT3 (µq/dL): 38.92 (± 9.20) in cases, 109.29 (±23.12) in controlled, t-test 25.2 and p<0.001.
- TT4 (µq/dL): 6.62 (± 2.04) in cases, 8.98 (±2.88) in controlled group, t-test 5.98 and p<0.001.
- TSH (µq/dL): 17.88 (± 5.82) in cases, 2.28 (±1.02) in controlled, t-test 23.6 and p<0.001.

[Table 4]: Analysis of thyroid hormones in cases on the basis of treatment modalities

- TT3 (µq/dL): 47.72 (± 10.78) in conservative, 34.46 (± 9.82) in hemodialysis cases, t-test 8.13 and p<0.001.
- TT4 (µq/dL): 8.12 (± 2.40) in conservative, 5.22 (± 3.02) in hemodialysis cases, t-test 6.72 and p<0.001.
- TSH (µq/dL): 6.20 (± 3.06) in conservative, 26.82 (± 11.8) in hemodialysis cases, t-test 15.1 and p<0.001.

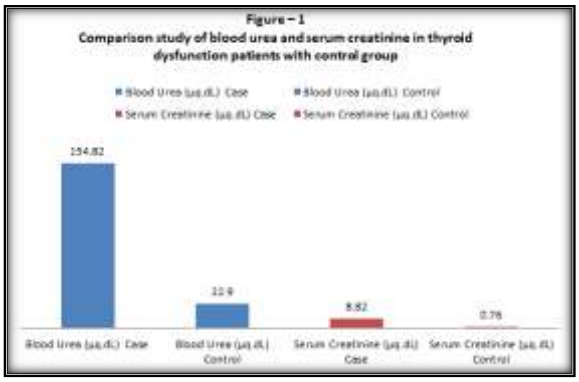

Figure 1: Comparison study of blood urea and serum creatinine in thyroid dysfunction patients with control group

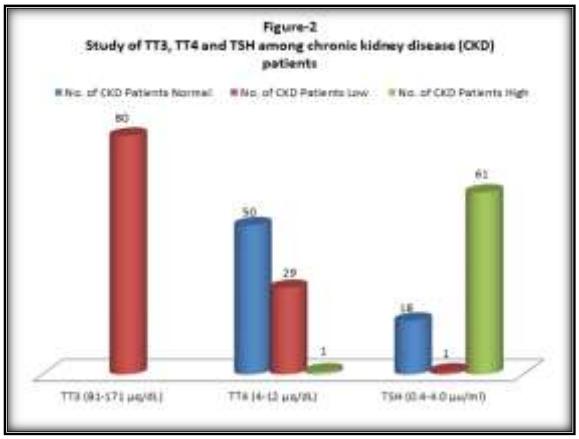

Figure 2: Study of TT3, TT4 and TSH among chronic kidney disease (CKD) patients

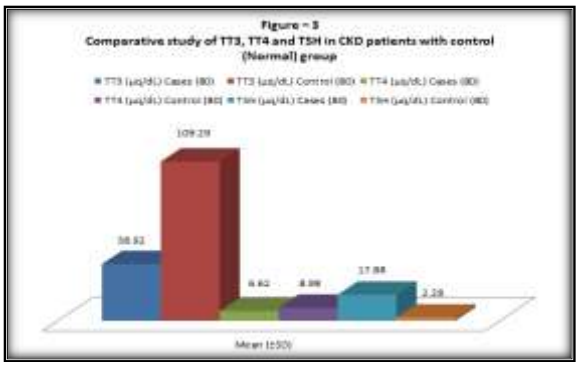

Figure 3: Comparative study of TT3, TT4 and TSH in CKD patients with control (Normal) group

Table 1: Comparison study of blood urea and serum creatinine in thyroid dysfunction patients with control group

Variants	Blood Urea (µq/dL)		Serum Creatinine (µq/dL)	
	Case	Control	Case	Control
Mean and SD ±	154.82 (± 40.45)	22.90 (± 6.30)	8.82 (± 3.38)	0.76 (± 0.30)
t-test	28.8		21.2	
p-value	<0.001		<0.001	

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Table 2: Study of TT3, TT4 and TSH among chronic kidney disease (CKD) patients

Variable (Normal range)	No. of CKD Patients		
	Normal	Low	High
TT3 (81-171 µq/dL)	--	80 (100%)	--
TT4 (4-12 µq/dL)	50 (62.5%)	29 (36.2%)	1 (1.2%)
TSH (0.4-4.0 µq/dL)	18 (22.5%)	1 (1.2%)	61 (76.2%)

Table 3: Comparative study of TT3, TT4 and TSH in CKD patients with control (Normal) group

Variable	TT3 (µq/dL)		TT4 (µq/dL)		TSH (µq/dL)	
	Cases (80)	Control (80)	Cases (80)	Control (80)	Cases (80)	Control (80)
Mean (±SD)	38.92 (± 9.20	109.29 (± 23.12)	6.62 (± 2.64)	8.98 (± 2.88)	17.88 (± 5.82)	2.28 (±1.02)
t-test	25.2		5.98		23.6	
p-value	<0.001		<0.001		<0.001	

p<0.001 = P values is highly significant

Table 4: Analysis of thyroid hormones in the cases on the basis of treatment modalities

Variable	TT3 (µq/dL)		TT4 (µq/dL)		TSH (µq/dL)	
	Conservative	Hemodialysis	Conservative	Hemodialysis	Conservative	Hemodialysis
Mean (±SD)	47.72 (± 10.78)	34.46 (± 9.82)	8.12 (± 2.40)	5.22 (± 3.02)	6.20 (± 3.06)	26.82 (± 11.80)
t-test	8.13		6.72		15.1	
p-value	<0.001		<0.001		<0.001	

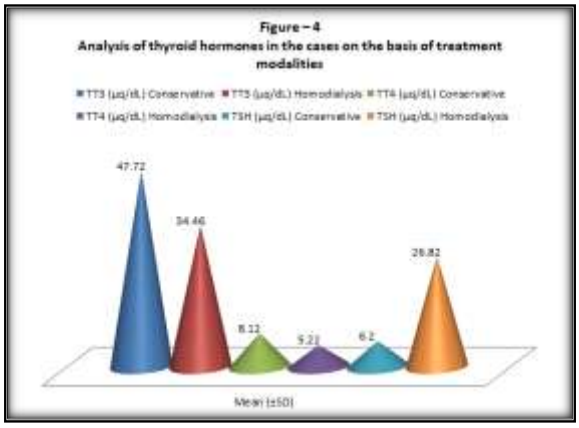

Figure 4: Analysis of thyroid hormones in the cases on the basis of treatment modalities

DISCUSSION

Present study of thyroid dysfunction in chronic kidney disease (CKD) patients of Telangana in the comparative study of blood urea, serum creatinine in CKD with controlled group had significant p-value (P<0.001). [Table 1] In the thyroid profile 80 (100%) low in TT3 (µq/dL), 50(62.5%) normal, 29 (36.2%) low and 1 (1.2%) high TT4 was observed. 18 (22.5%) normal 1(1.2%) low, 61 (76.2%) high level TSH level was observed. [Table 2] Comparative study of TT3 (µq/dL), TT4(µq/dL), TSH (µq/dL) with controlled group had significant P-value (p<0.001) Table 3). Analysis of thyroid hormones in the cases on the basis of treatment modalities like conservative and hemodialysis and significant p-value (p<0.001) [Table 3]. These findings are more or less in agreement with previous studies.[5,6,7]

Present study verified that, hypothyroidism is significantly associated with the prevalence of CKD and reduced eGFR, moreover hypothyroidism was significantly associated with increased serum urea and serum creatinine.[8]

Thyroid profile is affected by various factors including age, BMI pregnancy etc. Additionally co-morbidities such as CKD, cardiovascular disease and osteoporosis have to be considered during the treatment of hypothyroidism.[9]

The pathophysiology of kidney dysfunction in hypothyroidism is attributed to three factors. First, hypothyroidism levels can inhibit the functions of glomeruli and renal tubules and TSH receptors. Second, hypothyroidism can alter tubular ion channel activity and increased glumerulor capillary permeability to proteins.[10] Third, hypothyroidism can affect the hemodynamic status which affect the eGFR and lead to CKD (Especially ESRD).

Association of eGFR, hypothyroidism was significantly associated with elevated serum urea and serum creatinine. Hence biochemical parameters of thyroid hormones gets altered in patients with CKD.[11]

CONCLUSION

The study of thyroid dysfunction in CKD patients. Among abnormalities identified, low TT3 syndrome

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and sub-clinical hypothyroidism were most commonly observed in CKD patients. These findings indicate that thyroid function tends to deteriorate as the severity of CKD increases. Hence the patients of CKD should undergo routine evaluation of thyroid function, as they are at higher risk of developing thyroid dysfunction. The present study demands further genetic, nutritional, hormonal studies because, exact pathophysiology of thyroid dysfunction associated with CKD is still unclear.

Limitation of study: Owing to remote location of research centre, small number of patients and lack of latest techniques we have limited findings and results.

- This research paper is approved by the ethical committee of TRR Institute of Medical Sciences, Inole, Patancheru (Mandal), Sangareddy (Dstict)-502319 Telangana State.

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