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Original Research Article

EVALUATION OF THYROID STATUS IN PATIENTS WITH CHRONIC KIDNEY DISEASES

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ABSTRACT

Background: Thyroid hormones have a very crucial role in the regulation of metabolism, proteins synthesis and influencing functions of various other hormones in the human body. While both kidneys play an essential role in the metabolism of thyroid hormone by conversion of thyroxine (T4) to triiodothyronine (T3). In patients with chronic kidney diseases, frequent abnormal thyroid functions are observed.

Aim: To study the pattern of thyroid dysfunction in chronic kidney disease population and to evaluate the correlation existing in between severity of kidney failure and thyroid dysfunction

Methods: This cross sectional observational study was conducted in the department of internal medicine in a tertiary care hospital, central India. 100 chronic kidney disease patients were included in the study. Diagnosis of chronic kidney failure was performed as per criteria laid down by Kidney Disease Outcome Quality Initiative. Blood was drawn for estimation of serum creatinine, GFR and thyroid profile.

Results: Among 100 CKD patients, most of them (64%) were male with age ranging from 18 to 80 years with mean age of 57.08±10.35 years. Of the total patients, 6%, 12%, 29%, 26% & 27% patients belonged to CKD Stages 1,2,3,4 & 5 respectively. Low T3 is the most common thyroid dysfunction & the earliest abnormality noticed in CKD patients. The prevalence of low T3 syndrome in this study was 48%. Increasing trend for Low T3 prevalence with increasing severity of CKD was noticed in this study and was statistically significant (P<O.001). Statistically significant correlation was also seen with increasing prevalence of hypothyroidism & fall in GFR as the severity of kidney dysfunction increased.

Conclusion: We have observed that most early and common dysfunction was lowT3 syndrome in CKD patients. Thyroid dysfunction significantly increases kidney failure progression. Fall in GFR as the severity of CKD.

Keywords:CKD**,** Thyroid dysfunction, GFR, low T3 syndrome

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1. INTRODUCTION

The thyroid gland regulates most of the physiological actions of the body. Both the kidneys and thyroid are physiologically and functionally related to each other [1]. Thyroid hormones and renal functions have a multifaceted mutual interdependence. Thyroid hormones exert influence on water and electrolyte milieu in our body. Renal growth involves thyroid hormones making their contribution to renal physiology important.[2] Decrease in iodothyronines is associated with reduced blood flow to kidneys and decreased glomerular filtration rate (GFR) along with alteration in tubular reabsorption resulting in decrease in water excretion.[3] Conversely, thyrotoxicosis is found to cause polyuria following enhanced glomerular filtration and tubular reabsorption [4]. Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiological processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR <60 mL/min per 1.73 m2) for 3 or more months, irrespective of etiology or by signs of kidney damage such as proteinuria including microalbuminuria, hematuria, abnormal imaging or biopsy findings [5-6]. The association amongst kidney and thyroid functions is known for years. Thyroid hormones (TH) are essential for growth and development of the kidney and for the maintenance of fluid and electrolyte homeostasis. On the other hand, kidney is engaged in the metabolism and elimination of TH. The decrease of kidney function is accompanied by changes in the synthesis, secretion, metabolism, and elimination of TH. Thyroid dysfunction gains unique characteristics in those individuals with advanced kidney disease [7-8]. The children with congenital hypothyroidism have a higher prevalence of congenital renal anomalies. This fact supports that thyroid hormones play an important role in development of kidneys during early embryogenesis. It has been well known that hypothyroidism decreases, while the hyperthyroidism increases the kidney-toweight ratio by a not fully understood mechanism [9-10].

Several studies have been conducted to study thyroid function abnormalities in chronic kidney disease patients. All abnormalities like hypothyroidism, hyperthyroidism and euthyroid state have been reported in the studies done earlier. The relation between severity of renal failure and thyroid dysfunction is not clear.

Aims & objectives: To study the prevalence of thyroid dysfunction in patients with chronic kidney disease and also study the correlation between thyroid dysfunction and severity of renal diseases

2. MATERIALS & METHODS

This was a cross sectional observational study conducted in the department of internal medicine in a tertiary care center, central India. A total of 100 patients diagnosed to have chronic kidney disease and being admitted in our hospital during the study period were enrolled.

Cases were diagnosed on basis of history, physical examination, laboratory findings & ultra sonography. All study participants were fully explained about the purpose of the study and consent in written was obtained.

Inclusion criteria:

- All individuals diagnosed with CKD above 18 yrs of age, both male and female on conservative management
- Patients not dependent on hemodialysis
- Those who provide consent for the study

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Exclusion criteria:

- Patients with previously diagnosed thyroid illness, visible goitre& on medications influencing thyroid status
- Other systemic illness like already having cardiac involvement
- Those who declined consent
- CKD individuals who are on maintenance hemodialysis

Detailed histories, through general examination were done and blood was drawn for biochemical examinations. Blood urea, serum creatinine and GFR were estimated for diagnosis of CKD & the diagnosis was further confirmed by doing ultrasonography of abdomen. Blood was also investigated for evaluation of thyroid profile. Components considered for thyroid profile in this study were serum triiodothyronine (T3), serum thyroxine (T4), serum thyroid stimulating hormone (TSH).Quantitative determination of T3, T4, TSH is done by Enzyme Linked Immunosorbent assay.

Criteria for Chronic Kidney Disease were symptoms of uremia for 3 months or more. Elevated blood urea, serum creatinine and decreased creatinine clearance. Ultra sound evidence of chronic kidney disease are Bilateral contracted kidneys - size less than 8 cm in male and size less than 7 cm in female. Poor corticomedullary differentiation, Type II or III renal parenchymal changes, Supportive laboratory evidence of CKD like anemia, low specific gravity, changes in serum electrolytes, etc., radiological evidence of renal osteodystrophy.

3. RESULTS

Table 1: Socio-demographic characteristics of the study participants

Socio-demographic characteristics		**Frequency**	**Percentage**
Age in years	18-30	14	14%
	31-45	21	21%
	46-60	37	37%
	>60	28	28%
Gender	Male	64	64%
	Female	36	36%
Socio-economic class	Lower	39	39%
	Middle	34	34%
	Upper	27	27%
Residential status	Rural	53	53%
	Urban	47	47%

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Figure 1: Analysis of thyroid dysfunction in this study

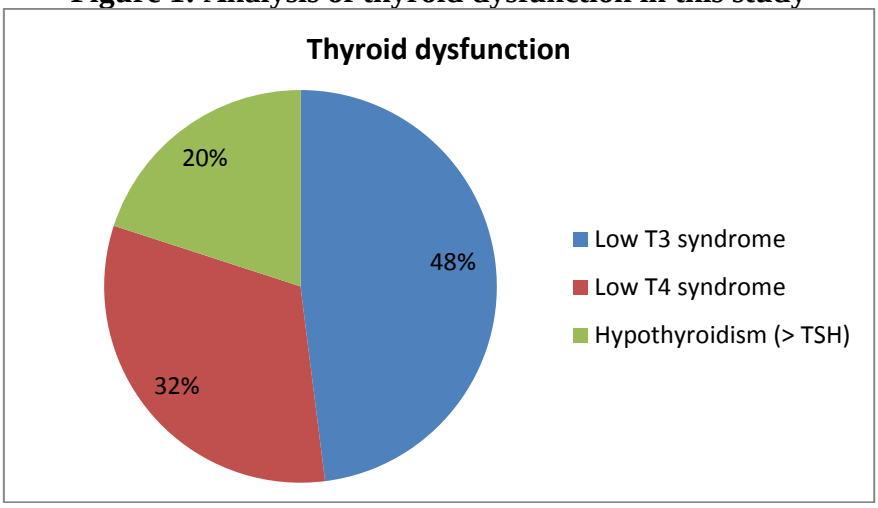

Table 2: Percentage & frequency of patients in various stages of CKD

CKD Stage	GFR ml/min/1.73m2	Frequency	Percentage
Stage 1	≥ 90	6	6%
Stage2	60-89	12	12%
Stage3	30-59	29	29%
Stage 4	15-29	27	27%
Stage 5	<15	26	26%

Table 3: Frequency of patients in various stages of CKD in relation to thyroid status

Thyroid status	Total participant	CKD Stage 1	CKD Stage 2	CKD Stage 3	CKD Stage 4	CKD Stage 5
Euthyroid	34	4 (11.8%)	6 (17.6%)	10(29.4%)	9 (26.5%)	5 (14.7%)
Low T3	43	2(4.7%)	5(11.6%)	11(25.6%)	9(20.9%)	16(37.2%)
Subclinical hypothyroidism	11	0 (0%)	1 (9.1%)	4 (36.4%)	4 (36.4%)	2 (18.1%)
Overt hypothyroidism	4	0(0%)	0(0%)	1 (25%)	2(50%)	1(25%)
Low T4	5	0(0%)	0(0%)	2(40%)	2(40%)	1(20%)
Subclinical hyperthyroidism	3	0(0%)	0(0%)	1 (33.3%)	1(33.3%)	1(33.4%)

Table 4: Values of thyroid hormones in different stages of CKD & correlation with GFR

Thyroid hormone values	CKD1 (GFR ≥90)	CKD 2 (GFR 60-89)	CKD 3 (GFR 30-59)	CKD 4 (GFR 15-29)	CKD 5 (GFR < 15)
T3	0.88 -2.31	0.76-2.0	0.48-2.0	0.40-2.2	0.10-1.70
FT3	3.6-7.8	3.1-8.2	2.8-8.1	2.1-7.5	1.1-6.2
T4	76-112	68-114	38-117	48-119	34-120
FT4	10.9-16.4	10.9-17.4	7.7-17	6.4-16.8	7.4-19.1
TSH	1.60-4.0	0.40-8.0	0.16-15	0.14-50	0.40-38

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4. DISCUSSION:

Many alterations in thyroid functions have been reported in association with CKD patients. Patients with chronic kidney disease often have signs and symptoms suggestive of thyroid dysfunction. Hence the diagnosis of thyroid disease is of utmost importance in these patients [11].

In this study 100 patients were taken, who fulfils the criteria for CKD, Of them 64 are males and 36 are females. Their age varied from 18 to 80 years with mean age of 57.08±10.35 years. It was seen that gender of the patients bears no statistical significance on prevalence of thyroid dysfunctions in CKD patients; concordance finding reported by Manasa et al [12] andSingla et al [13].

Our study is consistent with the results of *Bhavika L et a1* [14] study showing low T3, low T4 and normal or mild elevation of TSH. Yet it is unclear that to what extent these changes are responsible for the manifestations of Uraemic syndrome. From the various studies it has been suggested that this thyroid profile derangements is a part of body adaptation mechanism

Present study found that majority of the patients coming for medical help were in stages 3 to 5 & they make up 82% of the study population. This trend shows patients comes late for medical help only when the disease had advanced, similar results observed by Bhatele P et al [15].

Low T3 is the most common thyroid dysfunction & the earliest abnormality noticed in CKD patients. The prevalence of low T3 syndrome in this study was 35.8%. These findings were in accordance with other studies done in India and abroad. Srivastava S et.al [16] reported a prevalence of 43% and Swaminathan et.al [17] reported at 58%.

An increasing trend of having low free T3 in serum was demonstrated with increasing trend of severity of CKD stages and hence decreasing GFR values; excluding the patients who had overt hypothyroidism.Statistically significant correlation was achieved with increasing prevalence of hypothyroidism & fall in GFR as the severity of kidney dysfunction increased, our finding were comparable with the many other studies [18-20].

5. CONCLUSION:

Chronic kidney diseases are a major threat to population, physically, emotionally and financially. Efforts are there to explore the need of predictor markers for mortality in CKD & hypothyroidism was found to be one of them. Low T3 has been found to be associated with increased mortality as it further predisposes CKD individuals to cardiovascular complications. The prevalence of thyroid conditions consistently increased with severity of CKD individuals as judged by 5 stages of CKD. There was significant correlation with decreasing GFR values and low serum T3, free T3 & increased TSH levels.

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Conflicts of interest: none

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