International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 08-14 www.ijdmsrjournal.com ISSN: 2582-6018

A Hospital Based Study: Thyroid Status In Chronic Kidney Disease Patients In Muzaffarnagar Medical College, Muzaffarnagar

Dr. Jivesh Garg
Guide : Dr.Subodh Prakash
Co – Guide : Dr. K.K.Pahwa

Submitted: 25-06-2021 Revised: 06-07-2021 Accepted: 09-07-2021

I. INTRODUCTION

Thyroid hormone function and kidney functions are closely related[1]. The thyroid hormones are essential for growth and development of the kidney and for maintaining electrolyte and water homeostasis. On the other hand, kidney has its vital role in metabolism and elimination of thyroid hormones.

Chronic kidney disease (CKD) is a clinical condition leading to irreversibly decreased renal function leading to metabolic, excretory, and synthetic failure leading to accumulation of non-protein nitrogenous substances with patient presenting with a range of clinical features.

ESRD (End stage renal disease) is the last stage of chronic kidney disease which may result in death without renal replacement therapy. Inspite of many etiologies, CKD is the final result of irreversible destruction of nephrons ultimately resulting in pathological change of homeostasis of the human body. Thyroid hormonal system is one of those systems. Renal system is closely related to thyroid as it competes for iodide clearance.

Change in serum thyroid hormone occurs in many systemic illnesses which predominantly affect the fT_3 level when no primary disease of thyroid gland is detected. It is also known as "Low **T_3 syndrome", "Sick euthyroid syndrome", "Non thyroid illness syndrome"** and **"Thyroid hormone adaptation syndrome".** One of the systemic illnesses affecting thyroid function is chronic kidney disease.

Patients with CKD have same signs and symptoms suggestive of thyroid dysfunction like cold intolerance, sallow complexion, oedema, hyporeflexia, low BMR, and dry skin. In the patients of CKD, it is difficult to exclude thyroid dysfunction only on clinical background.

Many studies have been conducted on thyroid function in CKD patients. For past many years, the results were different in various studies. Hypothyroidism, hyperthyroidism, and euthyroidism all have been reported in previous studies. The relation between severity of CKD and thyroid dysfunction is not clear.

Having seen that there is variability of thyroid function test in patients of CKD in previous studies, a prospective clinical and biochemical study of thyroid function in CKD patients was undertaken in the Department of medicine, Muzaffarnagar Medical College, Muzaffarnagar

AIMS AND OBJECTIVES

- **AIM:** Correct interpretation of thyroid function in chronic kidney disease patients and correlation with severity of renal compromise.
- **OBJECTIVES:**

1. To study the prevalence of thyroid dysfunction in patients with chronic kidney disease.
2. To study the correlation between thyroid dysfunction and severity of renal diseases.

II. MATERIALS AND METHODS

SOURCE OF DATA:

Patients with chronic kidney disease coming to medicine OPD and admitted in IPD in Muzaffarnagar Medical College, Muzaffarnagar.

METHODS OF COLLECTION OF DATA:

After selecting the patients, fulfilling the inclusion criteria, qualifying patients underwent detailed history, clinical examination and laboratory investigations. About 5 ml of blood sample from each patient was collected in non-heparinized serum bottle and was sent for thyroid profile.

STUDY SUBJECTS:

The present study was conducted on hospitalized patients at MMCH who were diagnosed to have chronic kidney disease. Informed consent was obtained from all the patients.

STUDY TYPE: Cross-sectional Study

International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 08-14 www.ijdmsrjournal.com ISSN: 2582-6018

STUDY SITE: Department of Medicine,
Muzaffarnagar Medical College,
Muzaffarnagar
STUDY DURATION: 18 Months
NUMBER OF CASES: 100

INCLUSION CRITERIA

Patients with chronic kidney disease. Patients who fulfill the criteria for CKD and who are on conservative management and not undergoing renal replacement therapy.

Criteria for Chronic Kidney Disease[1]

CKD is defined as abnormalities of kidney structure or function, present for >3 months, with implications for health.(either of the following present for >3 months)

i) Markers of kidney damage (one or more)
- ❖ Albuminuria (AER ≥ 30mg/24 hours; ACR ≥ 30 mg/g)
- ❖ Using sedimentabnormalities
- ❖ Electrolyte and other abnormalities due to tubulardisorders
- ❖ Abnormalities detected byhistology
- ❖ Structural abnormalities detected byimaging
- ❖ History of kidneytransplantation

ii) DecreasedGFR-GFR<60ml/min/1.73m2

EXCLUSION CRITERIA

1. Patients on peritoneal dialysis or hemodialysis
2. Recent surgery or Trauma
3. Liver diseases
4. Drugs altering thyroid profile like amiodarone, steroids, dopamine, phenytoin, beta-blocker, estrogen pills, iodine-containing drugs.
5. Pregnancy
6. Nephrotic range of proteinuria
7. Low serum protein especially albumin (Serum Albumin < 3 g/dl).

III. METHODOLOGY

Detailed clinical history and clinical examination will be undertaken with preference to thyroid and renal diseases. The following investigations will be performed.

1. Urine routine and microscopic examination for presence of albumin and pus cells
2. Hemoglobin to check for anemia and Peripheral blood smear to check for burr cells.
3. Renal parameters like blood urea, serum Creatinine and creatinine clearance (usingCockcroft — Gault formula)
4. Serum electrolytes including calcium.
5. 24-hour urine protein and serum protein.
6. USG Abdomen for kidney size, echo texture.

After selecting the patients, fulfilling the above criteria, about 5 ml of blood sample from each patient will be collected in non-heparinized serum bottle and will be sent for thyroid profile.

Components of thyroid profile in this study:

a) Serum free triiodothyronine (fT_3)
b) Serum free thyroxine (fT_4)
c) Serum thyroid stimulating hormone (TSH)

Quantitative determination of fT_3, fT_4, TSH will be done by Chemiluminescent Immunosorbent Assay (CLIA).Chemiluminescent immunoassay (CLIA) is an immunoassay technique where the label, i.e. the true "indicator" of the analytic reaction, is a luminescent molecule.

IV. OBSERVATIONS AND RESULTS

In this study, 100 chronic kidney disease patients who were on conservative management and fulfilled the inclusion criteria (mentioned earlier) were studied.

Out of 100 patients, 56 (56%) were males and 44 (44%) were females.

Range of age of the cases enrolled in this study was 21 years (minimum) to 75 years (maximum). Mean age was 47.5 ±12.6. Maximum cases were from the age group 30 years to 50 years (59%).

Creatinine clearance varied from 7.1 to 55.7 and mean creatinine clearance was 21.3 ± 11.5

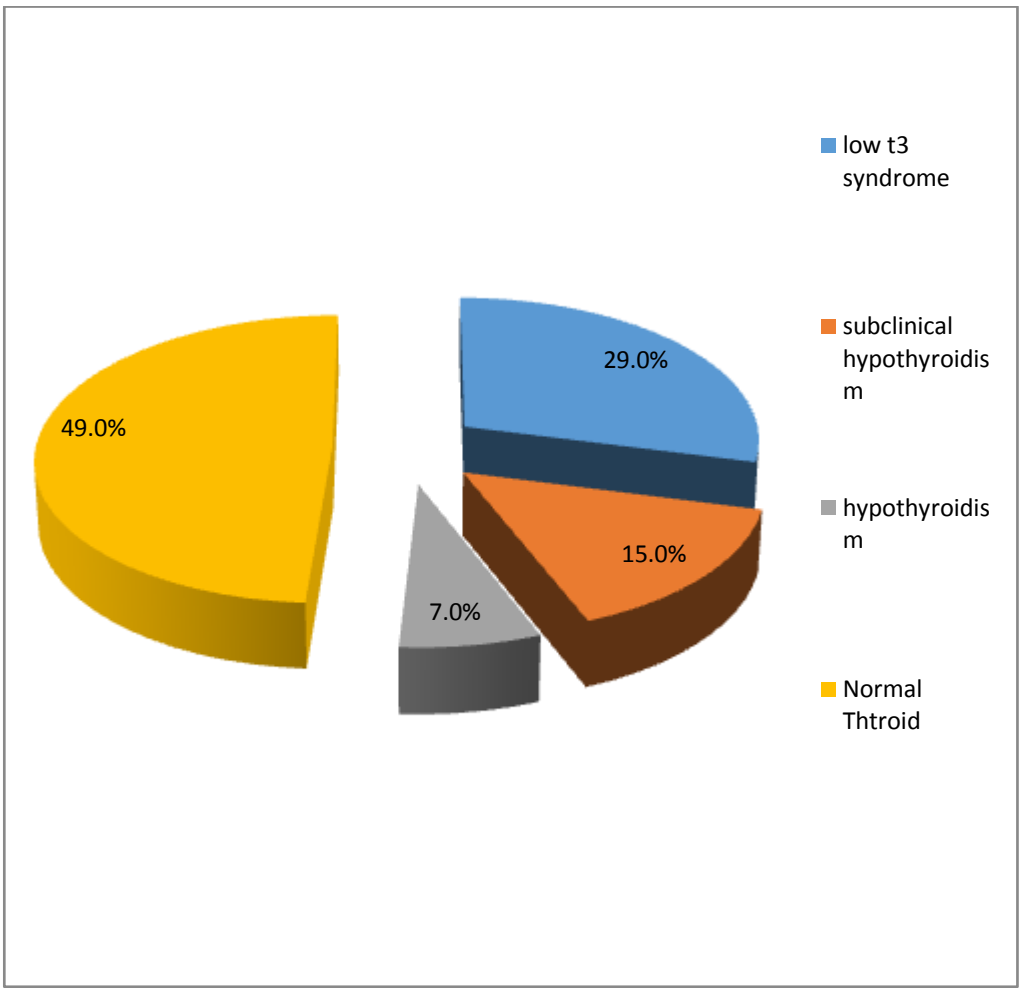
57% cases were hypertensive and 46% had diabetes mellitus.

Low T3 syndrome was the commonest thyroid dysfunction observed in 36 patients (36%). 3 patients (16.7%) of stage 3 CKD,12 patients (30.7%) of stage 4 CKD and 21 patients (51.2%) of stage 5 CKD had low T3syndrome.

Subclinical hypothyroidism was the second common thyroid dysfunction. It was detected in 15 patients (15%). 1 patient(5%) of stage 3, 2 patients (5.1%) of stage 4 and 12 patients (29.3%) of stage 5 had subclinicalhypothyroidism.

7 patients had frank hypothyroidism in our study.5 patients (12.2%) were stage 5 CKD and 2 patient (5.1%) in stage 4 CKD. In present study overall 51 patients (51%) had thyroid dysfunction, 49 patients (49%) had normal thyroid function tests.

ANALYSIS OF TYPES OFTHYROID DYSFUNCTION


low t3 syndrome
subclinical hypothyroidism
hypothyroidism
Normal Thtroid
29.0%
15.0%
7.0%
49.0%

International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 08-14 www.ijdmsrjournal.com ISSN: 2582-6018

The proportion of CKD patients with SCH was 5% in stage 3,5.1% in stage 4 and 29.3% in stage 5 CKD.

Low T3 syndrome was found in 15% in CKD stage 3, 25.6% in stage 4 CKD and 39%in stage 5 CKD patients.

Hypothyroidism was found in 5.1% of stage 4 and 12.2% of stage 5 CKD patients.

CORRELATION OF TYPE OF THYROID DYSFUNCTION WITH STAGE OF CKD

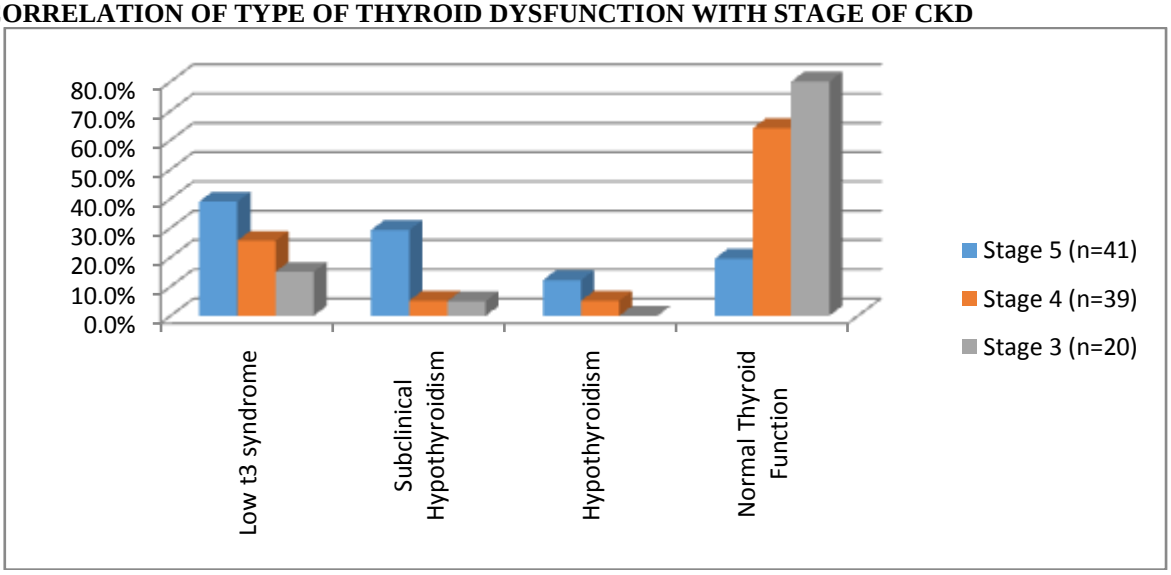
	STAGE OF CKD						TOTAL
	STAGE 5 (N=41)		STAGE 4 (N=39)		STAGE 3 (N=20)		
LOW T3 SYNDROME	16	39.0%	10	25.6%	3	15.0%	29
SUBCLINICAL HYPOTHYROIDISM	12	29.3%	2	5.1%	1	5.0%	15
HYPOTHYROIDISM	5	12.2%	2	5.1%		0.0%	7
NORMAL THTROID	8	19.5%	25	64.1%	16	80.0%	49

Low T3 syndrome & stage of CKD: x2 = 14.933, p = 0.001 (HS)

Subclinical hypothyroidism & stage of CKD: x2 = 12.875, p = 0.002 (HS)

Hypothyroidism & Creatinine stage of CKD: x2 = 1.60, p = 0.449 (NS)

CORRELATION OF TYPE OF THYROID DYSFUNCTION WITH STAGE OF CKD



International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 08-14 www.ijdmsrjournal.com ISSN: 2582-6018

PEARSON CORRELATION OF TYPE OF THYROID DYSFUNCTION WITH CREATININE CLEARANCE

	CORRELATIONS	FT3(2.60-4.80 PG/ML)	FT4(0.61-1.12 NG/DL)	TSH(0.34-5.60 µIU/ML)
CREATININE CLEARANCE	PEARSON CORRELATION	0.322	0.324	-0.302
	P-VALUE	0.001	0.001	0.002

V. DISCUSSION

The kidney normally plays an important role in the metabolism,degradation, and excretion of thyroid hormones. It is not surprisingthereforethat impairmentin kidneyfunctionleadsto disturbedthyroid physiology.All levelsof the hypothalamic-pituitary-thyroidaxismay be involved,includingalterations in hormone production,distribution,and excretion.

A large number of hormonal systems are affected by CRF, yet it remains unclear to what extent these changes are responsible for manifestations of uremic syndrome. Patients with CRF often have signs &symptoms suggestive of thyroid dysfunction &hence the diagnosis of thyroid disease inthese patients hasobvious prognostic implications.

The present study was aimed at to assess the prevalence of thyroid dysfunction in CKD patients and to determine the correlation between thyroid dysfunction and severity of renal disease. Various studies were conducted about thyroid dysfunction and severity of CKD and shown different results.

In our study, CKD patients only on conservative management were studied. This is because thyroid profile undergoes changes due to dialysis independent of that due to chronic kidney disease. Dialysis also changes the previous serum thyroid hormone status in patients with renal failure. We have consciously excluded patients with CKD undergoing dialysis because dialysis in CKD patients independently alters thyroid hormones as demonstrated by Rhee et al[2], Ramirez et al[3]. Kayima et al[4]

In our study 100 patients of CKD who were on conservative management fulfilling the criteria for CKD were studied, among these 100 patients, 56 were males and 44 were females, their age varied from 21 to 75 years. Among these 100 patients, patients who were 30 years old and below were 6, between 31 - 60 years were 77 and 60 years of age and above were 17 in number.

In our study the duration of symptoms of CKD varied from 4 months to30 months, mean duration being 11.57 months and the creatinine clearance varied from 7.1 ml/minute- 55.7 ml/minute.

In our study, ultrasound abdomen was done in all patients, that showed features of contracted kidney in 57 patients accounting for 57% and the remaining 43 patients had loss of cortico-medullary differentiation which accounts for 43%.

The present study showed 7% of patients had frank hypothyroidism. A study by Quvionverdeet al[5] estimated about 5% ESRD patients had hypothyroidism.

Elaborated study by Kaptein et al[6] estimated the prevalence of primary hypothyroidism was about 2.5 times much frequent in chronic kidney disease and dialysis. The hypothyroidism in CKD was estimated to range between 0 and9.5%.

Features of hypothyroidism such as delayed ankle jerk was present in 2 patients, out of which one were hypothyroid and goitre was found in one patient.

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.

Several studies reported in CKD patients showed low T3 values. Low T3 had been reported in Ramirez et al[3], Hegedus et a1[7], Beckett et al[8] PonAjil Singh et al[9] and many others. Ramirez et al[3] study showed linear correlation between mean serum T3 and T4 and severity of renalfailure.

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 ofhyperthyroidism.

THYROID DYSFUNCTION CORRELATION WITH eGFR :

In the present study the proportion of CKD patients with Subclinical hypothyroidism increased from 5% in stage 3 to 29.3% in stage 5 with p value of 0.004 which is highly significant.

The patients with Low T3 syndrome increased from 15% in CKD stage 3 to 39 % in stage 5 CKD. Hypothyroidism did not have any correlation with creatinine clearance.

Hypothyroidism and subclinical hypothyroidism are the most common observed alterations. Rhee et al.[10] in a group of 461,607 patients with stage 3 to 5 CKD observed that a 10 mL/min lower estimated GFR increased the risk of hypothyroidism by 18% and was associated with an increase in 0.11 mU/l in TSH levels

Hypothyroidism and subclinical hypothyroidism are linked to an increased risk of cardiovascular disease and reduced cardiac function in CKD patients.

Patients with CKD are at greatly increased risk of thyroid dysfunction. Thyroid hormone abnormalities couldrepresentariskfactorforcardiovasculardisea seand might also be implicatedin kidney disease progression.

VI. CONCLUSION

In my study population, 100 CKD patients who were on conservative management were studied. Among them 51% of the patients had low T3 values.

Subclinical hypothyroidism was the second most common thyroid abnormality detected. It occurred in 15% patients indicating significant alteration of thyroid hormone physiology in Chronic Kidney Disease patients.

The change in the serum levels of free T3 in patients with CKD can be considered as being protective, promoting conservation ofprotein.

There is progressive increase in the number of patients with Low T3 with the severity of renalfailure.

There is increase in incidence of hypothyroidism in patients with chronic kidneydisease.

In patients with low GFR the serum free T3 level was found to be decreased. This shows a direct linear relationship between GFR and free T3 level.

REFERENCES

[1]. Eknoyan G, Lameire N, Eckardt K, Kasiske B, Wheeler D, Levin A, Stevens PE, Bilous RW, Lamb EJ, Coresh J, Levey AS. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int. 2013 Jan 1;3(1):5-14.

[2]. Rhee CM, Brent GA, Kovesdy CP, Soldin OP, Nguyen D, Budoff MJ, Brunelli SM, Kalantar-Zadeh K. Thyroid functional disease: an under-recognized cardiovascular risk factor in kidney disease patients. Nephrology Dialysis Transplantation. 2015 May 1;30(5):724-37.

[3]. Ramirez G, Jubiz, W., Gutch, C, F., Bloomer, H. A., Siegler, R.,&Kolff,W. J. Thyroid abnormalities in renal failure: a study of 53 patients on chronic hemodialysis. Annals of Internal Medicine, 1973 ; 79 : 500 -4.

[4]. Kayima JK, Otieno LS, Gitau W, Mwai S. Thyroid hormone profiles in patients with chronic renal failure on conservative management and regular haemodialysis. East African medical journal. 1992 Jun 1;69(6):333-6.

[5]. Quionverde H, Kaptein EM, Rodriguez H, Massry S. Prevalence of thyroid-disease in chronic-renal-failure (CRF) and dialysis patients. Inkidney International 1984 Jan 1 (Vol. 25, No. 1, pp. 190-190). 350 MAIN ST, Malden, MA 02148: Blackwell Science INC.

[6]. Kaptein EM, Quion-Verde HE, Chooljian CJ, Tang WW, Friedman PE, Rodriquez HJ, Massry SG. The thyroid in end-stage renal disease. Medicine. 1988 may;67(3):187-97.

[7]. Hegedüs L, Andersen JR, Poulsen LR, Perrild H, Holm B, Gundtoft E, Hansen JM. Thyroid gland volume and serum concentrations of thyroid hormones in chronic renal failure. Nephron. 1985;40(2):171-4.

[8]. Beckett GJ, Henderson CJ, Elwes R, Seth J, Lambie AT. Thyroid status in patients with chronic renal failure. Clinical nephrology. 1983 Apr;19(4):172.
[9]. Singh PA, Bobby Z, Selvaraj N, Vinayagamoorthi R. An evaluation of thyroid hormone status and oxidative stress in undialyzed chronic renal failure patients. Indian Journal of Physiology and Pharmacology. 2006;50(3):279.
[10]. Rhee CM, Kalantar-Zadeh K, Streja E, Carrero JJ, Ma JZ, Lu JL, et al. The relationship between thyroid function and estimated glomerular filtration rate in patients with chronic kidney disease. Nephrol Dial Transplant. 2015;2:282–7.