Section: Medicine

Original Research Article

THYROID FUNCTION ABNORMALITIES IN PATIENTS WITH CHRONIC KIDNEY DISEASE - A CROSS SECTIONAL STUDY

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Received : *23/11/2023*
Received in revised form : *10/01/2024*
Accepted : *29/01/2024*

Keywords:
Hypothyroidism, chronic kidney disease, dialysis

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DOI: 10.47009/jamp.2024.6.1.262

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 1321-1324

Abstract

Background: To determine the thyroid hormone levels in patients with chronic kidney disease in our hospital. To find the prevalence of hypothyroidism in chronic kidney disease patients. **Materials and Methods:** It was a Hospital based Cross sectional study done in Department of Internal Medicine OPD and General Medicine IP wards in Government TD Medical college, Alappuzha from Sept 2022 to Nov 2022. This study is planned on all chronic kidney disease patients who are attending Department of Internal Medicine OPD and admitted in general medicine wards in medical college, Alappuzha. **Result:** 54.6% belonged to males and 45.4% belonged to females which clearly show the study was male preponderance. the most common age group was 51-60 years comprising 50%, followed by 41-50 years (25%). among 132 patients, 13.6% went to dialysis due to kidney complications and it was not significant (p>0.05). on the basis of gender the prevalence of hypothyroidism was nearly same which was 8% in males and 7% in females and it was statistically significant (p>0.05). **Conclusion:** Our Study Concludes that most of The Patients Were Euthyroid and 24% Patients Had Deranged Thyroid Hormone Profile.

INTRODUCTION

Thyroid hormones play an important role in regulating metabolism, development, protein synthesis, and influencing other hormone functions.[1] These hormones can also have significant impact on kidney disease, so it is important to consider the physiological association of thyroid dysfunction in relation to chronic kidney disease. Chronic kidney disease has been known to affect the pituitary-thyroid axis and the peripheral metabolism of thyroid hormones.[2] Various thyroid functional test abnormalities are commonly observed in chronic kidney disease (CKD) due to alterations in thyroid hormone synthesis, metabolism, and regulation. The incidence and prevalence of chronic kidney disease (CKD) are rising worldwide.[3] It is becoming more common in the developing world with the increasing impact of non-communicable diseases in these countries. Also, autoimmune disorders, including thyroid dysfunction are more common and may worsen the clinical status of patients with CKD.[4,5] In this study we aim to study the thyroid dysfunction seen in chronic kidney disease. On the background of available studies, it is more than evident that chronic kidney disease is a major public health problem and its prevalence has reached alarming levels. It is an important cause for morbidity and mortality. Impaired kidney function can affect thyroid hormone metabolism. Subclinical and overt Hypothyroidism, as well as non-thyroidal illness causing TSH alterations have been reported in CKD patients.[6] Thyroid dysfunction may worsen the morbidity in CKD patients and it also increases the cardiovascular mortality in CKD patients.[7] There is a paucity of studies about thyroid function tests in CKD patients in our state, and also there is variability in thyroid function tests in CKD patients in previous studies. So it was decided to undertake this study.

MATERIALS AND METHODS

It was a Hospital based Cross sectional study done in Department of Internal Medicine OPD and General Medicine IP wards in Government TD Medical College, Alappuzha From Sept 2022 to Nov 2022. This study is planned on all chronic kidney disease patients who are attending Department of Internal Medicine OPD and admitted in general medicine wards in medical college, Alappuzha.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Inclusion Criteria

1. All patients above 20yrs of age with Chronic Kidney Disease who are willing to participate in the study.

CKD Criteria

1. Elevated serum urea, creatinine & decreased creatinine clearance.
2. USG evidence of CKD

a. Bilateral contracted kidneys - < 8cms
b. Poor cortico medullary differentiation
c. Renal parenchymal alteration.

Exclusion Criteria

1. Patients with Pre-existing thyroid dysfunction who are on treatment.
2. Patients on treatment with oestrogen, corticosteroids, barbiturates.

Consecutive sampling technique was used.

Sample size:

$N = 4\ pq / d^2$

N = sample size

p = prevalence which is 43% in India[8]

q = 100-p = 57

d = 20% of prevalence = 8.3

Thus, substituting values N = 132

Minimum of 132 consecutive patients will be taken. Maximum sample size that can be attained in 3 months' duration will be taken.

Methodology:

The data was collected using a pre formed proforma. After taking due permission and Approval from Institutional Review Board & IEC, 132 consecutive patients with Chronic Kidney Disease, satisfying the inclusion/exclusion criteria and who have consented to participate in the study were included in the study. Detailed history regarding symptoms was taken. Clinical examination including general examination and system examination was done.

Blood samples was collected for serum Urea, Creatinine, Uric Acid, RBS, CBC & Thyroid Profile during OP visit for OP patients and in the wards for IP patients. TSH, TOTAL T4, FREE T4, TOTAL T3, FREE T3 was estimated using CLIA method on these patients. All information was recorded in proforma.

Hypothyroidism was considered in patients with high TSH and low T3, T4, FT3, FT4 values.

Patients with all parameters normal were considered Euthyroid.

Patients with raised TSH with normal T3 T4 values was considered subclinical hypothyroid.

Patients with low T3 with normal TSH values was considered low T3 syndrome.

Data Analysis: Data was coded and entered in Microsoft Excel and analysed using IBM SPSS software (Version 22.0). The frequency was updated in proportion and percentages. P<0.05 was considered the threshold for statistical significance.

Ethical Concerns

The above-mentioned study was conducted in this institution after obtaining due ethical clearance from the Ethical Committee of Government Medical College, Alappuzha and Department of General Medicine, Government Medical College, Alappuzha. Informed consent was obtained from patients in the study.

RESULTS

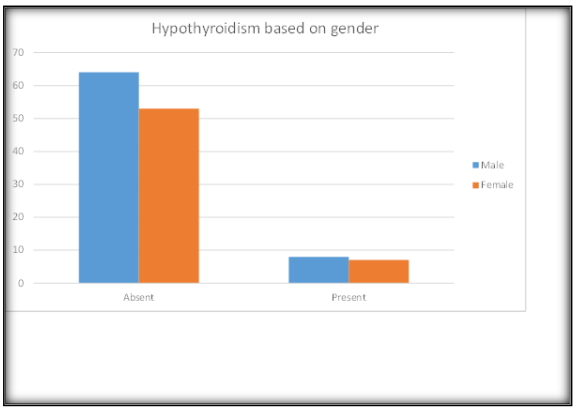

Figure 1: Prevalence of Hypothyroidism based on Gender

As per [Table 1] out of 132 study participants, 54.6% belonged to males and 45.4% belonged to females which clearly shows the study was male preponderance.

As per [Table 2] the most common age group was 51-60 years comprising 50%, followed by 41-50 years (25%).

As per [Table 3] the most common co-morbidity was participants having both hypertension and diabetes (35%), followed by 27.3% only have hypertension and 25% have only type 2 DM

As per [Table 4] mean values of thyroid hormone levels were in the normal range as compared to reference range values.

As per [Table 5] among 132 patients, 13.6% went to dialysis due to kidney complications and it was not significant (p>0.05).

As per [Table 6] the prevalence of hypothyroidism among CKD patients was found to be 11.4%.

As per [Table 7] and [Figure 1] on the basis of gender the prevalence of hypothyroidism was nearly same which was 8% in males and 7% in females and it was statistically significant (p>0.05).

Table 1: Distribution of sample according to sex

Total	**132**	**Percentage**
Male	72	54.6
Female	60	45.4

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 2: Distribution of sample size according to age

Total	132	Percentage
21-30 YRS	2	1.5
31-40 YRS	7	5.3
41-50 YRS	33	25
51-60 YRS	66	50
61-70 YRS	24	18.2

Table 3: Distribution of sample according to co morbidities

Total	132	Percentage
HTN + DM	46	34.9
TYPE2 DM ONLY	33	25
SYST HTN ONLY	36	27.3
TYPE2 DM + SYST HTN + IHD	11	8.3
SYST HTN + OTHERS	6	4.6

Table 4: Thyroid hormone reference range – mean, sd, range of all patients

Test	Ref. Range	Mean	SD	Medium	Minimum	Maximum
TSH	0.27-4.2iu/ml	2.8	2.0	2.1	0.5	9.0
FT3	1.7-4.2 pg/ml	2.6	1.1	2.4	0.5	4.5
T3	80-20mcg/dl	94.2	17.8	97.5	43.0	121.0
FT4	0.7-1.8 ng/ml	1.3	0.4	1.5	0.3	1.9
T4	5.1-14.1 mcg/dl	9.2	3.5	10.1	1.2	150.

Table 5: Patient percentage undergoing dialysis

hemodialysis	Number	Percentage
Yes	18	13.6
No	114	86.4

Table 6: Patient percentage undergoing dialysis

hypothyroidism	Number	Percentage
Present	15	11.4
Absent	117	88.6

Table 7: Patient percentage undergoing dialysis

hemodialysis	Male	Female	Total
Absent	64	53	117
Present	8	7	15
Total	72	60	

DISCUSSION

Thyroid dysfunction in chronic renal failure was extensively studied by many. Various studies conducted in this line have showed different results. Many studies conducted in chronic renal failure patients showed low T3 values. Low T3 had been reported in study conducted by Ramirez et al,[9] Out of 132 patients studied, majority were males. Major participants in this study were between 51-60 yrs with a mean age of 52.8 _+ 15.6 years, which is almost similar to the study of Klaura Paudel,[10] which had a mean age of 47.2 +_ 15.6 years and Joan C.Lo et al,[11] which had a mean age of 48.7+_18.9 years. Major comorbidity leading to CKD was a combination of diabetes mellitus and hypertension which shows increased prevalence of type 2 dm and hypertension in our population.[12] In our study all the patients did not have deranged TFT. There was significant reduction of serum T3 level, T4 level and elevaton of level in ckd patients studied by us, which is similar to study on Evaluation of thyroid hormone levels in chronic kidney disease patients by Rajeev G et al,[13] and study on thyroid function in patients with chronic kidney disease by Kumar R et al,[14] and a study on thyroid dysfunction in chronic renal failure: pituitary thyroid axis and peripheral turnover kinetics of thyroxine and triiodothyronine by Lim VS et al.[15] TSH was raised in 18.2% patients, FT3 was low in 24.2% patients, T3 and T4 was low in 18.2% of patients. This reduction in T3 concentrations has been linked to a decrease in the peripheral synthesis of T3 from T4. Chronic metabolic acidosis associated with the CKD may contribute to this effect.[16]

Similar to T4, reduced total T3 levels could be explained by impaired binding to serum carrier protein due to accumulation of uremic toxins.[19] Low serum free T3 levels in uraemia have been interpreted as an appropriate response aimed at reducing energy expenditure and minimising protein catabolism,[17] in addition chronic metabolic acidosis in CKD, may also contribute to low Ft3 levels.

Carrero et al,[17] found low T3 levels to be independent predictors of cardiovascular mortality in CKD patients and low T3 as a more sensitive predictor of mortality in CKD patients and low T3 as a more sensitive predictor of mortality in CKD than FT3.[17] From the various studies, it has been

ISSN (O): 2687-5365; ISSN (P): 2753-6556

suggested that this thyroid hormone profile derangement are a part of body adaptation mechanism. Our study reports 11.4% of patients to be hypothyroid. Majority of patients were Euthyroid (66%). Subclinical hypothyroidism weas seen in 1.5 % patients. A study conducted by Carrero et al,[17] also found that the prevalence of hypothyroidism was common at 18% of all patients with CKD. Out of 53 females, 7 had hypothyroidism; high titre of anti-thyroid antibodies is associated with a higher prevalence of hypothyroidism in women. Major comorbidity leading to CKD was SYST HTN and TYPE 2 DM. Limitation to this study is that some patients were on furosemide, steroids, heparin which may alter thyroid levels. Early diagnosis and treatment of thyroid disease could significantly reduce morbidity and mortality.

CONCLUSION

Our Study Concludes that most of The Patients Were Euthyroid and 24% Patients Had Deranged Thyroid Hormone Profile. Prevalence of Hypothyroridism. In our Study Is 18.2%, Apart from Hypothyroidism, Ft3 Was Low in 24.2% Patients, major comorbidities leading to Ckd Are Type 2 Dm and Hypertension. Alteration in The Values of T3 and T4 Occurs as a Part of Body's Adaptation Mechanism to Conserve Energy.

REFERENCES

1. Andrew S.Levey et al, Chronic Kidney disease, MD ANN INTERN MED 2003;139:137-147.
2. Joanne V.Bargman et al, Chronic Kidney disease, Harrisons Principles of internal medicine vol2 , 21st, 2022
3. Feinstein EI, kaptein EM et al. Thyroid function in patients with nephrotic syndrome and normal renal function. American Journal OF newphrology, 1982 2 70d76
4. Kaptein EM et al Thyroid function in renal failure, Contributions to nephrology 1986 5064D72
5. P Iglesias et al. Thyroid dysfunction & Kidney disease. European Journal of Endocrinology (2009) 160 : 503-515
6. Robert Schrier. Abnormalities in the thyroid gland and hypothalamo pituitary thyroid axis in patients with CKD – Diseases of the kidney and Urinary Tract, eighth edition 2007
7. Joan C Lo et al, Increased prevalence of clinical and subclinical hypothyroidism in persons with chronic kidney disease, Kidney international 2005.
8. Dr. J. Punekar , Dr. A. A. Singh , Dr. Manoj Kumar Malav. Study of Thyroid Function in Patients with Chronic Kidney Disease.ijhsr;15 (8)-2249-9571
9. Ramirez Al, Intisar et al. Thyroid dysfunction and kidney dysfunction. Oman medical journal [2022];vol 37;12-15.
10. Klara Paudel. Prevalence and clinical characteristics of hypothyroidism in a population undergoing maintenance hemodialysis. J Clin Diagn Res 2014 Apr;8(4):MC01-4. Epub 2014 Apr 15.
11. Joan C Lo, Glenn M Chertow, Alan S Go, Chi-Yuan Hsu. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease; Kidney Int 2005 Mar; 67(3):1047-52.
12. Sinjari YH et al Thyroid function disorders in patients with chronic kidney disease. Med J Babylon 2022:19:76-80.
13. Gandham Rajeev, Wilma Delphine Silvia Chickballapur Rayappa. Evaluation of thyroid hormone levels in chronic kidney disease patient. Saudi J Kidney Dis Transpl 2015 Jan;26(1):90-3.
14. Iglesias Pedro, Bajo A et al. Thyroid dysfunction and kidney disease – An update. Ann intern med 1976 jun; 84(6):672-6.
15. V S Lim, V S Fang, A I Katz. Thyroid dysfunction in chronic renal failure. A study of the pituitary-thyroid axis and peripheral turnover kinetics of thyroxine and triiodothyronine Clinical Trial J Clin Invest 1977 Sep;60(3):522-34.
16. Josef Coresh, Elizabeth Selvin, Les Prevalence of chronic kidney disease in the United States.JAMA 2007 Nov 7;298(17):2038-47.
17. J J Carrero, A R Qureshi, J Axelsson, M I Yilmaz, S Rehnmark. Clinical and biochemical implications of low thyroid hormone levels (total and free forms) in euthyroid patients with chronic kidney disease. Comparative Study J Intern Med 2007 Dec;262(6):690-701.

ISSN (O): 2687-5365; ISSN (P): 2753-6556