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Relationship between thyroid dysfunction and severity of chronic kidney disease

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Abstract
Chronic kidney diseases (CKDs) are a global burden and now a day's it's recognized as a foremost public health issue worldwide. Patients with CKD have variation in thyroid hormone metabolism. This study aims to evaluate the status of thyroid hormone profile in different stages of CKD and find out the correlation if any between thyroid dysfunction and severity of renal diseases. A prospective observational study was carried out on 100 patients with Chronic Kidney Disease on conservative management. Quantitative determination of T3, T4, TSH was done by ELISA and its data were analysed. Out of 100 patients, 48 patients had low T3 syndrome which accounts for 48% of the patients. 22 patients had low T4 syndrome (0.5-9.5µg/ml, mean 5.631) which accounts for 22% of the patients and 10 patients had primary hypothyroidism TSH >20µIU/ml. Excluding Primary Hypothyroidism, analysis of serum T3,T4 and TSH in the study subjects shows very high significance $\chi 2 = 20.82$, $p < 0.001$. In patients with low T3 syndrome, the mean values of TSH in various stages of renal disease are within normal range mean 4.85, values of TSH did not show any linear correlation with GFR. Number of patients with low T4 syndrome did not correlate with severity of renal disease. Thyroid Dysfunction occurred in 58% of the patients with chronic kidney disease in our study. The low T3 province of CKD can be seen as being defensive, advancing preservation of protein. The quantity of patients with low T3 disorder dynamically increments with the seriousness of renal failure.

Keywords: Thyroid dysfunction, CKD, TSH, Renal failure

Introduction
Chronic kidney disease (CKD) is a worldwide weight and its pervasiveness is rising exponentially [1, 2]. Interminable kidney malady is related with expanded dismalness and mortality and furthermore with expanded risk of cardiovascular illness, cardiovascular breakdown and increment human services uses [3, 4]. The commonness of CKD in Nepal is 10.6% [5]. National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-K/DOQI) in 2002 characterize and group CKD into 5 phases dependent on GFR [6, 7]. Diabetes mellitus, incessant glomerulonephritis, hypertension, and smoking are the basic hazard factors for CKD [8]. End-stage renal disease (ESRD) is the development type of Stage 5 CKD that can be treated with renal substitution treatment [9, 10]. Endocrine variations from the norm are regular in CKD. The kidney assumes a significant job in the debasement and discharge of thyroid hormones. CKD upsets thyroid capacity from multiple points of view, including low circling thyroid hormone focus, lacking official to transporter proteins and changed iodine stockpiling in the thyroid organ [11, 12]. Low fT3 is the sign of fundamental unsettling influence [13]. The information related thyroid dysfunction in CKD with various stages in India is rare. The target of the present examination was hence to assess the thyroid hormone profile in patients with CKD.

Material and Methods
A prospective study was conducted on 100 patients of whom were diagnosed to have chronic kidney disease and being admitted in IMS and Sum hospital, January 2016 to October 2017. These samples were selected by using simple random sampling method. Statistical parameters mean, standard deviation (SD) and correlations were used and parametric and nonparametric tests were used for the analysis. Informed consent was obtained from all the patients. Patients with chronic kidney disease fulfilling the criteria for CKD and who are on conservative management were included in the study.

Patients with chronic kidney disease fulfilling the criteria for CKD and who are on conservative management were included in the study. 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 2 or 3 renal parenchymal changes. Supportive laboratory evidence of CKD like anemia, low specific gravity, changes in serum electrolytes, etc., radiological evidence of renal osteodystrophy. Exclusion criteria are patients on peritoneal dialysis or hemodialysis. Nephrogenic range of proteinuria. Low serum protein especially albumin. Other conditions like acute illness, recent surgery, trauma or burns, diabetes mellitus, liver diseases, drugs altering thyroid profile like amiodarone, steroids, dopamine, phenytoin, beta blocker, estrogen pills, iodine-containing drugs.

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.100 patients with Chronic Kidney Disease (CKD) fulfilling the criteria for CKD who were on conservative management were studied.

Results

Among these 100 patients 78 were male and 22 were female, their age varied from 12-70 years, of these 100 patients, patients who were 30 years old and below were 16, between 30-60 years were 50 and patients above the age of 60 years were 12 in number. Of the 100 patients, 42 patients had GFR of <10ml/min accounting to 42%, 38 patients had GFR ranging from 11-20 ml/min accounting for another 38% and the remaining 20 patients had GFR > 20ml/min accounting for 20%. Blood urea varied from 64 – 177 mg/dl and creatinine levels varied from 3mg – 17.2mg/dl, 24 hours urine protein excretion was <1g/day in all the patients in our study. Serum calcium and phosphorous were normal in all our patients, 80% of the patients had anaemia with peripheral smear revealing normocytic normochromic anaemia in 72% and hypochromic anaemia in 8% of the patients. Burr cells were present in 40% of the cases, two patients had pleural effusion in our study, 4 patients in the study showed evidence of osteodystrophy and none of the patients had pericardial effusion. Ultrasound abdomen showed evidence of CKD in all patients, contracted kidney was present in 90% of the patients, remaining patients had poor corticomedullary differentiation. Among the 50 patients in our study 48 of them had low serum T3 levels (48%), 10 patients among the low serum T3 level also had high TSH value of >20μIU/ml with low T4 levels and also symptoms suggestive of hypothyroidism.

Table 1: Analysis of hypothyroid symptoms in CKD

Variants	No. of patients with symptoms	Percentage
Low T_3 Syndrome (n=48)	34	70.83%
Hypothyroidism (n=10)	10	100%
CKD without thyroid dysfunction (n=42)	28	66.67%
Total (100)	72	72%

$X^2 = 0.032$, p>0.05 NS

Table 2: Age incidence of Low T_3 syndrome in this study

Age in years	No of patients	Low T_3 syndrome	Percentage
< 30	20	6	30%
31-60	62	34	54.8%
>60	18	8	44.4%
total	100	48	48%

X^2= 1.066 p>0.05 NS

Therefore these 10 patients were grouped under Primary Hypothyroidism as per the criteria (10%). 22 patients had low T4 levels accounting for 22% of the patients. Symptoms of hypothyroidism such as tiredness, somnolence, weight gain, cold intolerance, hoarseness of voice etc were also studied in the sample population. 72%, 72 patients had the symptoms as shown in (Table 1). 34 patients of the 24 who had low T3 syndrome had symptoms accounting for 70.83% and 5 patients among who were hypothyroid had symptoms accounting for 100%. 21 patients with CKD did not show thyroid dysfunction, among these 42 patients 28 of them had symptoms of hypothyroidism which accounts to 66.67%. Dry, flaky skin was present in 30 patients of which only 8 patients were hypothyroid, sinus bradycardia was present in 14 patients of which only 4 patients were hypothyroid, delayed ankle jerk was present in 16 patients of which only 4 patients were hypothyroid.

Table 3: Sex incidence of low T_3 syndrome in this study

Sex	No. of patients	Low T_3Syndrome	Percentage
Male	78(78%)	40	51.3%
Female	22 (22%)	8	38.7%
Total	100(100%)	48	48%

$X^2 = 0.78$, $p < 0.05$, NS

Table 4: Distribution of thyroid dysfunction in this study among various creatinine clearance levels

Creatinine Clearance mi/mm	No. of Patients		Low T_3Syndrome		Hypothyroidism	
	No.	Percent	No.	Percent	No.	Percent
<10	42	42.00	28	66.67	6	14.3
11 — 20	38	38.00	14	36.84	4	10.50
> 20	20	20.00	6	30.00	0	0.00

$X^2 = 8.47$, p>0.05 significant

Table 5: Analysis of hypothyroid symptoms in CKD

Variants	No. of patients with symptoms	Percentage
Low T_3 Syndrome (n=24)	34	70.83%
Hypothyroidism (n=5)	10	100%
CKD without thyroid dysfunction (n=21)	28	66.67%
Total (50)	72	72%

$X^2 = 0.032$, p>0.05 NS

Hypothyroidism did not show any linear correlation with GFR. increased number of hypothyroid patients of about 8 in number were present in GFR 11-20ml/min whereas only 2 patients had hypothyroidism in GFR <10ml/min. None of the patients in our study had diffuse thyroid swelling. Age incidence of low T3 syndrome was done in this study as shown in (Table 2), it showed that 30% of the CKD patients who had low T3 level were 30 years of age or below and 54.8% of the patients were between the ages 31-60 years, as the age increased the number of patients with low T3 also

increased, 44.4% of the patients with low T3 were above the age of 60 years.

Sex incidence of low T3 syndrome in one study showed that 51.3% of males had low T3 and 38.7% of the females have low T4 syndrome (Table 3). The T3 levels varied from 0.2 – 1.9ng/ml (Fig 1), the mean value being 0.665. Excluding the patients with primary hypothyroidism, the mean value was 0.706, this value was in low normal limit. Excluding hypothyroidism T3 levels were studied in relation to GFR, mean value of serum T3 was low (0.534ng/ml) only in patients with GFR <10ml/min (Table 5). The mean value was low normal in patients with GFR >10ml/min. According to our study, number of patients with low T3 increased with increase in the severity of renal failure (Table 6) in spite of low T3. The serum T4 levels varied from 0.5 – 9.5µg/dl. Mean value of serum T4 among 50 patients was 5.631, excluding hypothyroidism patients the mean value was 5.98µg/ml. this value is within low normal level of T4. Excluding 5 hypothyroid patients who have low T4 values, 22 other patients accounting to 22% had T4 level below normal and low T3 syndrome (Table 6).

Table 6: Analysis of thyroid dysfunction in this study

Thyroid dysfunction	No. of Patients	Percentage
Low T_3 syndrome	48	48%
Low T_4 syndrome	22	22%
Hypothyroidism	10	10%

Table 7: Distribution of low T_3 and T_4 syndrome in this study

Creatinine Clearance ml/mm	No. of patients	Low T_3 Syndrome		Low T_4 Syndrome	
		No.	Percent	No.	Percent
<10	42	28	66.67%	14	31.3%
11–20	38	14	36.84%	6	15.82%
>20	20	6	30%	2	10%

Table 8: Distribution of thyroid dysfunction in this study among various creatinine clearance levels

Creatinine Clearance mi/mm	No. of Patients		Low T_3Syndrome		Hypothyroidism	
	No.	Percent	No.	Percent	No.	Percent
<10	42	42.00	28	66.67	6	14.3
11 — 20	38	38.00	14	36.84	4	10.50
> 20	20	20.00	6	30.00	0	0.00

Among the 100 patients, TSH was normal in 38 patients (76%) and values between 7.1-20µIU/ml in 7 patients (14%). It was elevated >20µIU/ml in 5 patients (100%) of which 6 were female and 4 were male. According to our study, in patients with low T3 syndrome, the mean values of TSH in various stages of renal disease are within normal range, values of TSH did not show any linear correlation with GFR (Table 8).

Discussion and Conclusion

In our investigation, patients just on conservative management were studied. This is on the grounds that thyroid profile experiences changes because of dialysis autonomous of that because of incessant kidney ailment. Dialysis likewise changes the past serum status of thyroid hormone in the patients with renal disappointment. Numerous investigations have been directed by looking at CKD patients on traditionalist Management and patients on hemodialysis by Ramirez [14] and Kayima *et al*. [15].

Similarly as with different studies, mean T3 level in our investigation was diminished beneath typical in GFR under 10 ml/min. In higher GFR, it was available in low ordinary and there was no straight relationship between's T3 level and GFR, which is steady with Avasthi *et al.* study [16]. Mean T4 level in our investigation was inside typical breaking points in all degrees of GFR, yet it is in low ordinary level and furthermore it doesn't connect with the seriousness of renal disappointment. In our investigation, not every one of the patients with CKD have low T3 and T4. It is evaluated that solitary 58% (58 patients) of patients have Thyroid Profile anomaly. Staying 42% of patients have typical thyroid profile. Among 58% of these patients barring essential hypothyroidism patients 28% have just low T3 level with typical T4 level. Staying 20% have both low T3 and T4 level. The level of patients having low T3 and T4 step by step increment with decline in GFR. The patients who will grow such changes in thyroid profile isn't known. Barring hypothyroidism, mean TSH level in our examination was inside ordinary cutoff points. The mean TSH levels are likewise inside ordinary cutoff points for the different scopes of GFR. In any case, TSH level doesn't show any straight relationship with the seriousness of renal disappointment. This is reliable with the investigation directed by Spector and Ramirez *et al*, [17, 14]. These investigations showed variation from the norm in hypophyseal instrument of TSH discharge in uraemic patients as the TSH reaction to the TRH was blunted. In our examination, barring those with hypothyroiddism, 14 patients had gentle rise of TSH with low T3 level. Among these patients, T4 is inside typical breaking points in 8 of the patients. In the staying 3 patients T4 is underneath typical. There were no clinical highlights reminiscent of hypothyroidism in these patients. Examinations like FT4, FT3, TRH reaction and against thyroid auto antibodies should be possible to analyze hypothyroidism in these patients.

Our investigation is steady with the consequences of Ramirez *et al*. [14] study demonstrating low T3, low T4 and typical or gentle height of TSH. However it is misty that to what degree these progressions are liable for the appearances of Uraemic disorder. From the different examinations it has been proposed that this thyroid profile confusions is a piece of body adjustment instrument. Past examinations by Quion verde *et al*. [18] revealed high pervasiveness of hypothyroidism in CKD. It was assessed to be about 5% in patients with terminal renal disappointment. In our examination, hypothyroidism is available in 10% of the patients yet doesn't associate with the seriousness of the renal disappointment. The side effects of hypothyroidism were appropriated similarly in both hypothyroid and CKD patients in our investigation. Indications of hypothyroidism were more typical in CKD without hypothyroidism than with hypothyroidism. Along these lines, determination of hypothyroidism in CKD primarily lay on TSH level which ought to be exceptionally high (>20 µIU/dl) with low serum T4. In this examination none of the patients had clinical or biochemical highlights of hyperthyroidism.

In conclusion this study revealed that patients with CKD, thyroid dysfunction occured in 58% of the patients. Incidence of hypothyroidism is increased in patients with chronic kidney disease. Number of patients with low T3 and T4 syndrome progressively increased with the severity of

chronic kidney disease. Serum level of T3 and T4 had no correlation with the severity of chronic kidney disease.

Reference

1. Sharif MU, Elsayed ME, Stack AG. The global nephrology work: emerging threats and potential solutions! Clin Kidney J. 2015; 9(1):11-22.
2. Levey AS, Coresh J, Balk E, Kausz AT, Levin A, Steffes MW *et al*. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification and stratification. Ann Intern Med. 2003; 139(2):137-47.
3. Niemczyk S, Niemczyk L, Romejko-Ciepielewska K. Basic endocrinological disorders in chronic renal failure. Endocrinologia Polska. 2012; 63(3):250-7.
4. Singh S, Upadhyay-Dhungel K, Aryal G. Value of calcium and phosphorous in chronic kidney disease patients undergoing hemodialysis: a retrospective study. Journal of Pathology of Nepal. 2012; 2:293-6.
5. Sharma SK, Dhakal S, Thapa L, Ghimire A, Tamrakar R, Chaudhary S *et al*. Community-based screening for chronic kidney disease, hypertension and diabetes in Dharan. J Nepal Med Assoc. 2013; 52(189):205-12.
6. Nahas M, Astor BC, Matsushita K *et al*. The definition, classification, and prognosis of chronic kidney disease: a KDIGO controversies conference report. Kidney Int. 2011; 80:17-28.
7. Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P *et al*. Prevalence of chronic kidney disease in the United States. JAMA. 2007; 298:2038-47.
8. Haroun MK, Jaar BG, Hoffman SC, Comstock GW, Klag MJ, Coresh J. Risk factors for chronic kidney disease: a prospective study of 23,534 men and women in Washington Country, Maryland. J Am Soc. Nephrol. 2003; 14(11):2934-41.
9. Ekart R, Ferjuc A, Furman B, Gerjevic S, Bevc S, Hojs R. Chronic kidney disease progression to end stage renal disease: a single center experience of the role of the underlying kidney disease. Ther Apher Dial. 2013; 17:363- 7.
10. Singh PA, Bobby Z, Selvaraj N, Vinayagamoorti R. An evaluation of thyroid hormone status and oxidative stress in undialyzed chronic renal failure patients. Indian J Physiol Pharmacol. 2006; 50(3):279-84.
11. Basu G, Mohapatra A. Interactions between thyroid disorders and kidney disease. Indian J Endocrinol Metab. 2012; 16:204-13.
12. Rajeev G, Chickballapur Rayappa W, Vijayalakshmi R, Swathi M, Kumar S. Evaluation of thyroid hormone levels in chronic kidney disease patients. Saudi J Kidney Dis Transpl. 2015; 26(1):90-3.
13. Zoccali C, Mallamaci F, Tripepi G, Cutrupi S, Pizzini P. Low triiodothyronine and survival in end stage renal disease. Kidney Int. 2006; 70(3):523-8.
14. Ramirez G *et al*. Thyroid abnormalities in renal failure. A study of 53 patients on chronic dialysis. Ann Internal Medicine. 1973; 79:500-4.
15. Kayima JK *et al*. Thyroid hormones profile in patients with chronic renal failure on conservative management and regular hemodialysis. East Afr. Med J. 1992; 69:333-6.
16. Avasthi G *et al*. Study of Thyroid function in patients of chronic renal failure. Indian Journal of Nephrology. 2001; 11:165-170.
17. Spector DA *et al*. Thyroid function and metabolic rate in chronic renal failure. Ann Intern Med. 1976; 85:724-30
18. Quion-verde *et al*. Prevalence of thyroid disease in chronic renal failure and dialysis patients. IXt1' mt Congr of Nephrol, 1984, 120.