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Research Paper

Comparison of T3, T4 and TSH in Different Stages of Chronic Kidney Patients

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ABSTRACT
Chronic kidney disease is defined as also kidney injure or a reduced GFR < 60 ml /min / 1.73 m2 for 3 or additional months. The overall prevalence of chronic kidney disease in India is 17.2% and prevalence of chronic kidney disease stages 1, 2, 3, 4 and 5 are 7%, 4.3%, 4.3%, 0.8% and 0.8%, correspondingly.
In this study patients were selected, from 1st December 2017 to 31st December 2018, participants aged between 18 to 60 years male and female were selected from the medicine OPD & IPD.
RESULTS: The most common thyroid hormone derangement observed was low serum T3 (p=0.01) and high TSH (p=0.001) in the study group as compared to control group. Low serum T3 level (p=0.001) correlated significantly in patients with low eGFR.
CONCLUSION: Our study advances our knowledge thyroid hormone in CRF that these patients have decreased serum T3 and serum T4 & increased serum TSH levels compared to different stages of CKD. These alterations in thyroid hormone may underline many of the aspects of patho-physiology and clinical characteristics of CKD.
KEY WORDS:*T3- Triiodothyronine,T4- Thyroxine, TSH- Thyroid stimulating hormone,CKD-Chronic kidney disease, GFR- Glomerular function rate,*

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I. INTRODUCTION

Chronic kidney disease is defined as also kidney injure or a reduced GFR < 60 ml /min / 1.73 m2 for 3 or additional months [1].The causes of the chronic kidney failure may be due to primary and secondary glomerular illness, tubule-interstitial illness and vascular illness [2].The overall prevalence of chronic kidney disease in India is 17.2% and prevalence of chronic kidneydisease stages 1, 2, 3, 4 and 5 are 7%, 4.3%, 4.3%, 0.8% and 0.8%, correspondingly [3].

The renal play very important role within the metabolism, poverty, and secretion many thyroid hormones, Hence the injury inside renal role in upset thyroid function physiologically; all levels of the hypothalamic-pituitary-thyroid axis could be mixed up, together with alteration into hormone manufacture, circulation, and secretion. Epidemiological information to pre-dialysis patients by chronic renal illness have associate exaggerate risk of hypothyroidism [4, 5].

Thyroid function is widely evaluated within the chronic kidney patient, but result obtained be changeable, raise incidence of goiter in those patients has been reported in studies conducted in China and Turkey, whereas other centers such as U. S., Canada, Great Britain and Australia are found to be reverse [6,7,8].

Thyroid binding globulin (TBG) concentrations are usually normal in haemodialysis patients and low or normal in patients undergo continuous dialysis [9-10]. TBG level increased significantly behind renal transplantation [11]. Studies of thyroid hormone kinetics have found to be normal production of endocrine; metabolic clearance rates of the hormone may or may not be enlarged in patients lead to chronic renal failure [12-15]. Peripheral de-iodination of T4 to T3 is impaired [16], this finding is according to more obvious decrease of T3 than of T4 in progressive renal failure, and as a replacement for beneficial diversion to inactive metabolites.

Chronic renal disorder (CRD) affects thyroid function in multiple ways in which, as well as low circulating thyroid hormone concentration, changed peripheral hormone metabolism, troubled binding to carrier proteins, possible reduction in tissue thyroid hormone substance, as well as additional amount of iodine stoke in thyroid glands[17].

In this study found a connection between different stages of chronic kidney patients (on the basis of estimation of glomerular filtration rate) with thyroid function.

II. MATERIALS AND METHOD

In this study patients were selected, from 1stDecember 2017 to 31st December2018, participants aged between 18 to 60 years male and female were selected from the medicine OPD & IPD. This study conducted Department of Biochemistry and Medicine Teerthanker Mahaveer University,Moradabad atTeerthanker Mahaveer Hospital &Research Centre Moradabad (UP). Comparison of 75 patients of chronic kidney disease on the basis of estimation of glomerular filtration rate. Informed consent was taken from each subject before collecting the blood sample.

INCLUSION CRITERIA:-

The participants having age more than 18 years and less than 60 years and diagnosed as chronic renal failure will be included in the study.

EXCLUSION CRITERIA:-

- Acute renal failure
- Cancer
- The patients already diagnosed with thyroid disorder :-
- Goiter
- Graves disease
- Hashimoto's thyroiditis

Sample collection

Early morning 5ml venous blood sample was collected with aseptic precaution from anticubital vein by the subjects were dispensed in following vials for different biochemical tests:

- Plain vial for serum T3, T4, and TSH hormones estimation.
- Plain vial for serum creatinine, serum urea and serum uric acid.

The blood collected in vial was incubated at 37^0C for 30 minutes for clotting to complete and the serum was separated by centrifugation for biochemical test mentioned above.

Estimation of T3, T4&TSH

The serum totals T3, T4, TSH for thyroid confirmation were estimated by enzyme immunoassay competition method with ELFA technique (Enzyme linked fluorescent assay) by using fully automated VIDAS.

STATISTICAL ANALYSIS

Results of various biochemical parameters were calculated by using SPSS 16. Mean ± SD were measure for each parameter analyzed with compared via student's t-test with linked by calculating Pearson's correlation coefficient. P-values measured significant were as follows:-

P value less than 0.05 – Significant

P value less than 0.001- highly significant

III. RESULTS

The present study is conducted on a total of 140 individuals, out of which 70 are normal healthy individuals comprising the controls group and rest 70 is of chronic kidney disease.
Out of 70 CKD patients, 10 were found age group 18-30 years, 10 were found 31-40 years age group, 23 were found age group 41-50 years and 27 were found age group 51-60 years.

Table no. 1 Comparison of Serum T3, Serum T4 and Serum TSH between different stages of chronic kidney patients

Sr.no	Biochemical parameter	Stage 3 mean±S.D	Stage 4 mean±S.D	Stage 5 mean±S.D
1	Serum T3 (ng/ml)	0.68±0.13	0.70±0.12	0.65±0.13
2	Serum T4(µg/dl)	8.15±0.93	6.08±0.87	4.69±1.17
3	Serum TSH(µIU/ml)	4.44±1.61	5.28±0.86	6.08±2.09

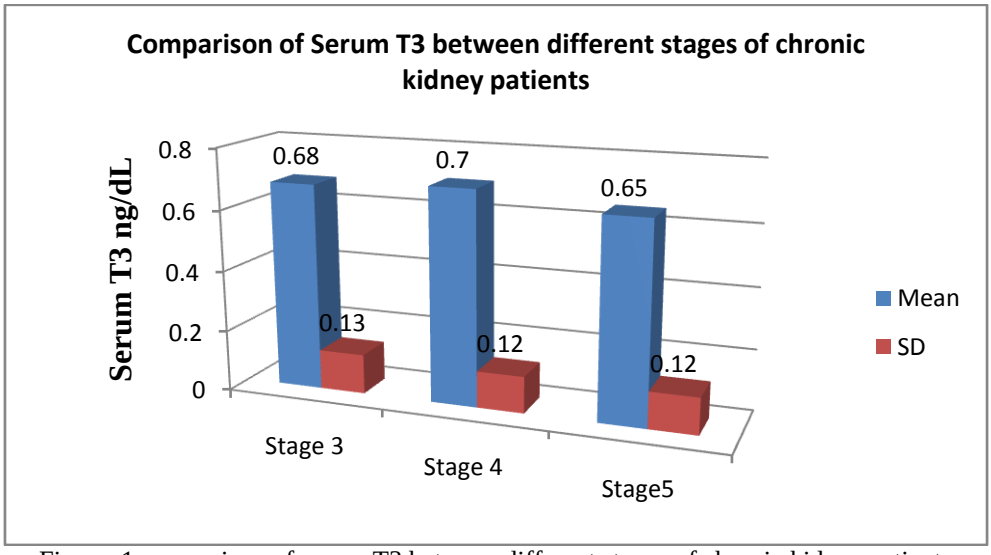

Fig. no.1 comparison of serum T3 between different stages of chronic kidney patients

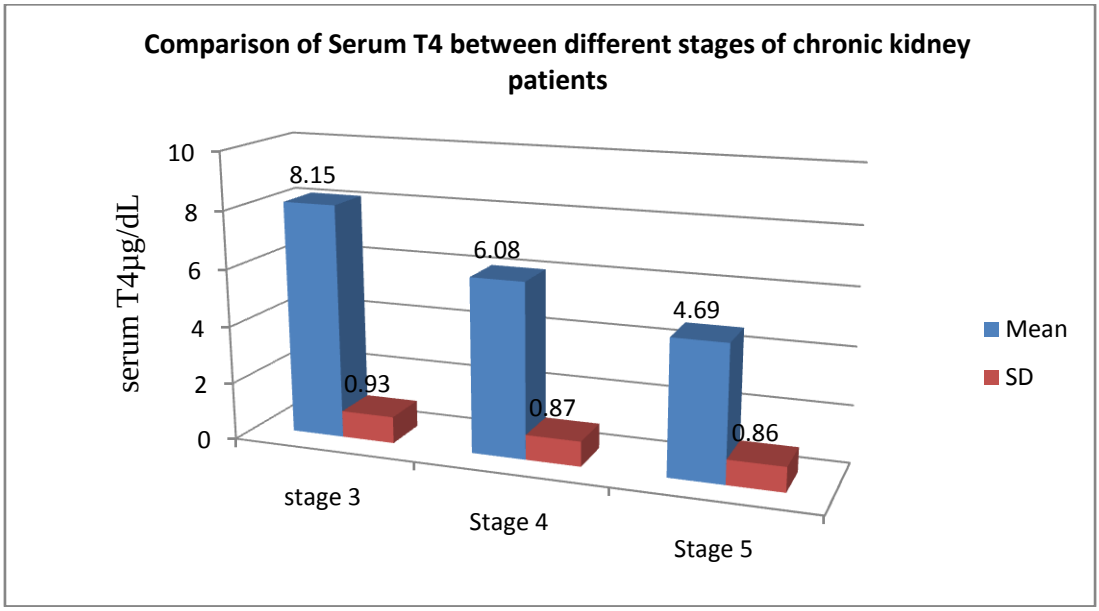

Fig. no.2 comparison of serum T3 between different stages of chronic kidney patients

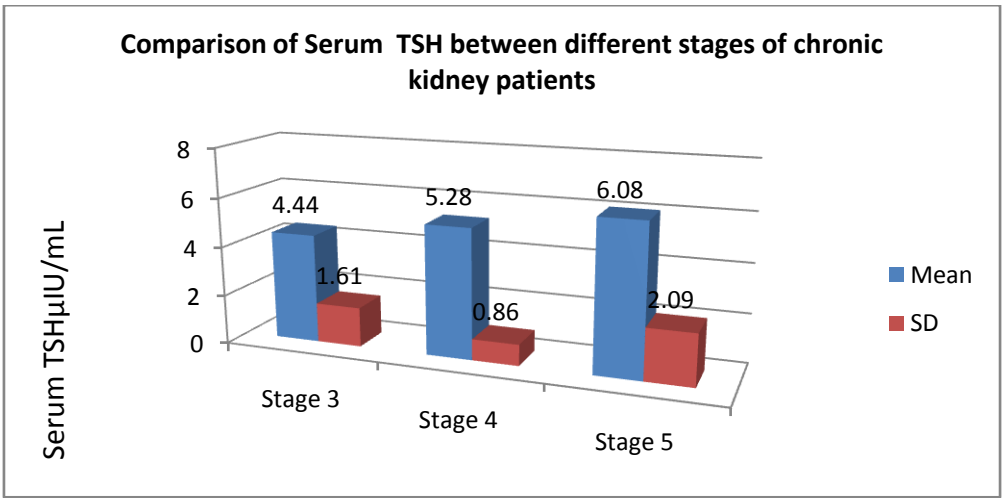

Fig. no. 3 comparison of serum THS between different stage of chronic kidney patients

Table no. 2 Comparison of various biochemical parameters between stage 3 and stage 5 & stage 4 and stage 5of CKD

	Biochemical parameter	Stage3		Stage4	
		Mean difference	p-value	Mean Difference	p-value
Stage 5 Stage 5	Serum Creatinine (mg/dl)	6.16	0.00	4.90	0.00
	Serum Urea (mg/dl)	62.50	0.00	48.05	0.00
	Serum Uric acid (mg/dl)	1.27	0.27	0.34	0.89
	Serum T3 (ng/ml)	-0.03	0.67	-0.05	0.33
	Serum T4 (µg/dl)	-3.46	0.00	-1.39	0.00
	Serum TSH (µIU/ml)	1.63	0.00	0.79	0.16
	e-GFR(ml/min)	-25.83	0.00	-10.08	0.00

Table no. 3 Comparison of various biochemical parameters between stage 3 and stage 4 of CKD

	Biochemical parameter	Stage3	
		Mean difference	p-value
Stage 4	Serum Creatinine (mg/dl)	1.26	0.00
	Serum Urea (mg/dl)	14.45	0.02
	Serum Uric acid (mg/dl)	0.93	0.54
	Serum T3 (ng/ml)	0.02	0.86
	Serum T4 (µg/dl)	-2.06	0.00
	Serum TSH (µIU/ml)	0.84	0.11
	e-GFR(ml/min)	-15.75	0.00

IV. DISCUSSION

CKD is worldwide public health problem and now familiar as a general condition that is related with enlarged risk of CVD and renal failure. Chronic Kidney Disease means progressive loss in renal function over a period of months or years, chronic kidney disease is a spectrum of various patho-physiological processes associated with abnormal kidney function and progressive decline in glomerular filtration rate [20,21].

Kidney is involved in the metabolism and elimination of Thyroid hormone and is a useful target organ for Thyroid hormone actions [18.19]. From a clinical practice viewpoint, both hypothyroidism and

hyperthyroidism are accompanied by remarkable changes in the metabolism of water and electrolytes, as well as in cardiovascular activities. Moreover, the decrease in kidney function is accompanied by changes in the synthesis, secretion, metabolism and elimination of Thyroid hormone.

Song et al; hypothesized that the popularity of decrease T3 syndrome would be raised according to the higher of CKD stages. There was a raised tendency form the people of reduce T3 according to the raised of CKD stage. This study showed that reduced T3 syndrome was very common in CKDand was a significant finding in near the beginning of CKD. Also, serum T3 value was related with cruelty of CKD in normal thyroid stimulating hormone value.

In this study population was divided into different stages of CKD according to eGFR. Patients with eGFR between 31-45 ml/min were put in stage 3. In stage 3 the levels of serum T3 and serum T4 were less as compared to controls, whereas the levels of serum TSH were slightly more as compared to controls. Those with eGFR between the 15-29ml/min lie in stage 4.The thyroid profile in Stage 4 showed Variation as compared to stage 3. There was further decline in value of serum T3 and serum T4 value as compared to Stage 3whereas there was further increase in serum TSH. In last stage of renal disease the e GFR is less than 15ml/min. In this stage the T3 and T4 levels are further decreased as compared to Stage 4 whereas the levels of TSH values were highly increased.

In stage 3 of CKD the eGFR becomes less than 45ml/min. In this stage we observed that the mean value of T3 was 0.68±0.13ng/ml which was less than control.

In stage 4 due to further decline in kidney function the value of serum T3 decreases. The mean value of T3 in this stage was 0.70±0.12ng/ml.

In ESRD very less number of nephrons are functional therefore value further decreases to 0.65±0.13ng/ml in Stage 5.

The mean difference of serum T3 level is -0.03 ng/ml between stage 3and stage 5, the value of which changes to -0.05 ng/ml between stage 4 and stage 5, where as it is 0.02 ng/ml between stage 3 and stage 4. The above mentioned mean differences were not statically significant.

In stage 3 of CKD the eGFR becomes less than 45ml/min. In this stage we observed that the mean value of T4 was 8.15±0.93µg/dl which was less than control.

In stage 4 due to further decline in kidney function the value of serum T4 decreases. The mean value of serum T4 in this stage was 6.08±0.87µg/dl.

In End stage renal disease very less number of nephrons are functional therefore value further decreases to4.69±1.17µg/dl in Stage 5.

We observed mean difference of serum T4 level was -3.46 µg/dl between stage 3and stages 5, it was -1.39µg/dl between stage 4 and stage 5, where as the serum T4 level was -2.06 µg/dl between stage 3 and stage 4. The above-mentioned mean differences were statically significant between stage 3 & stage 5, stage 4 & stage 5 and stage 3& stage 5.

In stage 3 of CKD the eGFR becomes less than 45ml/min. In this stage we observed that the mean value of TSH was 4.44±1.61µIU/ml which was less than control.

In stage 4 due to further decline in kidney function the value of serum T4 decreases. The mean value of serum TSH in this stage was 5.28±0.86µIU/ml.

In End stage renal disease very less number of nephrons are functional therefore value further decreases to 5.28±0.86µIU/ml in Stage 5.

The mean difference serum TSH level was 1.63 µIU/ml between stage 3and stages 5. The above-mentioned mean differences were statically significant between stage and stage5.

V. CONCLUSION

Our study advances our knowledge thyroid hormone in CRF that these patients have decreased serum T3 and serum T4 & increased serum TSH levels compared to different stages of CKD. These alterations in thyroid hormone may underline many of the aspects of patho-physiology and clinical characteristics of CKD.It is worthwhile to check thyroid hormone and T3, T4 and TSH values frequently in CKD patients during the course of the treatment and to treat them accordingly which will result in decreased morbidity and mortality.

Hence it is recommended that strict monitoring of thyroid hormone in CKD patient be done as early detection and treatment of these abnormalities will enhance the quality of life and improve prognosis in such patients.

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