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ORIGINAL ARTICLE

Thyroid stimulating hormone (thyrotrophin) and its relationship with chronic kidney disease before dialysis.

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ABSTRACT… Objective: To measure glomerular filtration rate, free thyroxin, and thyrotrophin in chronic kidney disease patients and to find out the correlation between glomerular filtration rates, free thyroxin and thyrotrophin in these patients. **Study Design:** Cross Sectional Analytical study. **Setting:** Bacha Khan Medical Complex Swabi. **Period:** November 2018 to November 2019. **Material & Methods:** Sixty five patients were included in the study. Serum Creatinine, TSH and Free T4 were measured; Thyroid function tests TSH, FT4 were measured in these chronic kidney disease patients through enzyme linked immunosorbant assay method. GFR was calculated through Cock-croft-Gualt formula and the relevant data was entered in a predesigned Proforma. **Results:** In the study total 65 chronic kidney disease patients were taken. Out of which thirty six (55.4%) were male and twenty nine (44.6%) were female. Thirty five (53.8%) CKD patients whose TSH level was above the normal limit while in the remaining patients the TSH values were in the normal range. Eight patients (12.3%) out of sixty five patients in whom FT4 values were below the normal limit while in the remaining fifty seven patients (87.6%) FT4 values were within the reference range. Those eight patients whose FT4 was below the normal value, their TSH values were above the normal value too. Thirty five patients, whose TSH levels were above the normal limit, their mean age was 50.60± 11.95, mean serum creatinine was 4.73± 2.94 mg/dl, mean GFR was 22.17± 12.48 ml/min/1.73m^2, mean TSH was 6.68± 0.87 mIU/L and mean FT4 was 0.97± 0.35 ng/dl. The p-value of TSH was < 0.001 and FT4 was < 0.05 in comparing with control group. Glomerular filtrations rate with TSH and FT4 the co-efficient of correlation (r) value for 35 patients was – 0.713 and 0.47 for TSH and FT4 respectively. Their p- values were 0.000 and 0.004 respectively, and $p < 0.001$ collectively. This was found to be statistically significant. Linear regression line was obtained between GFR and FT4 in CKD patients. **Conclusion:** Chronic kidney disease is associated with biochemical thyroid dysfunctions causing most commonly subclinical hypothyroidism.

Key words: Chronic Kidney Disease, Free Thyroxin, Glomerular Filtration Rate, Thyrotrophin.

INTRODUCTION

Chronic kidney disease is the condition of abnormal renal function and defined as decreased glomerular filtration for more than 3 months. The estimated glomerular filtration can be calculated either by Cockcroft- gault formula or modification of diet in renal disease.[1] It has becoming a very serious health issue in developed countries, the number of people with deranged renal functions are rapidly increasing. According to recent data in the developing countries like Asia the CKD patients are rising due to concomitant disease e.g. hypertension, cardiovascular disorders and type-2 diabetes mellitus. CKD is associated with number of complications like impaired physiological functions, dyslipidemia, infections, cardiovascular disorders and affect thyroid gland.[2,3]

In chronic renal failure kidney cannot filter the blood adequately. Chronic renal failure affects thyroid gland physiology in so many ways like low level of thyroid hormone concentration, inadequate binding to carrier proteins, alteration in peripheral tissue metabolism and decrease of thyroid hormone content in tissues.[2]

Thyroid is one of the most important gland of the body because it controls and modulate most of normal body actions.

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It produces primary hormones (tri-iodothyronine, thyroxin) that have a vital role in development, metabolism, proteins synthesis and synchronize other hormones.[3]

It has been seen that thyroid functions like TSH, FT4 and T3 becomes deranged in cases of advanced chronic renal disorders. Chronic kidney disease reflects thyroid hormone regulation, synthesis and metabolism.[4]

Many aspects of the kidney like its development and hemodynamics are effected by the thyroid hormone. It has been hypothesized that subclinical hypothyroidism and thyroid dysfunction occurs in advanced stage renal disease but still there is controversy on this statement. By experimental studies it has been suggested that decrease in thyroid hormone may reduce glomerular filtration rate by reducing sodium reabsorption, renal blood flow and cardiac output.[5] Increased level of thyroid stimulating hormone has been related with decreased glomerular filtration rate and high risk of developing CKD even in euthryoid state.[6]

MATERIAL & METHODS

This was a cross-sectional descriptive study conducted at Pathology department of Bacha Khan Medical Complex Swabi from November 2018 to November 2019. Informed consent has been taken from the ethical research committee of Bacha Khan Medical Complex Swabi (GKMCs/EC/015). Sixty-five (65) CKD patients were included in this study. The sample size was calculated by open-epi software with 95% confidence interval and 5% margin of error.

Inclusion Criteria

All known CKD patients before dialysis visiting Bacha Medical Complex Swabi. Patients who were on dialysis, pregnant, known thyroid disorder and those who were taking thyroid medication were excluded. Two ml blood was drawn from the vein keeping aseptic measures. The blood was centrifuged and serum kept for analysis of TSH and serum creatinine. Thyroid function tests TSH, FT4 were measured in these chronic kidney disease patients through enzyme linked immunosorbant assay method using abbot kit by ERBA machine. GFR was calculated through Cock-croft-Gualt formula and the relevant data was entered in a predesigned Proforma.

RESULTS

In the current study total 65 chronic kidney patients were taken. They were subdivided into male and female, thirty-six (55.4%) were male and twenty-nine (44.6%) were female. According to (Table-I) these sixty-five chronic kidney disease patients were distributed into five age groups. In first age group (20-29years) one (3%) male and four (14%) were female. In second age group (30-39 years) four (11%) male and two (7%) were female. In third group (40-49years) five (14%) male and eight (28%) were female. In fourth group (50-59 years) nine (25%) male and eleven (38%) were female. In fifth age group (60-69 years) seventeen (47%) male and four (14%) were female.

(Table-II) represents the distribution of 65 chronic kidney disease patients according to their age, serum creatinine, GFR, TSH, and FT4. Thirty CKD patients whose TSH was normal, their mean age was 50.30±12.66 (years), serum creatinine was 3.79±2.51 mg/dl, GFR was 31.59±21.29 ml/min/1.73m^2, TSH was 1.84±0.89 mIU/L, FT4 was 1.14±0.23 ng/dl while in the 35 patients whose TSH was above the normal limit, their mean age was 50.60±11.95 (years), serum creatinine was 4.73±2.94 mg/dl, GFR was 22.17±12.48 ml/min/1.73m^2,TSH was 6.68±0.87 mIU/L and FT4 was 0.97±0.35 ng/dl. P-value of TSH was < 0.001 and FT4 was <0.05 in comparison with normal TSH and FT4 which were significant.

Linear regression line was obtained between GFR and TSH in CKD patients. It represents that as GFR decreased TSH was increased. It means that there was inverse relationship between GFR and TSH in chronic kidney disease patients (Figure-1).

DISCUSSION

Rhee CM. conducted a study in 2016 on the interaction between thyroid and kidney disease for which he took eighty patients. His result demonstrates that CKD affects thyroid functions.

Age	Male		Female		Total	
(years)	n	%	n	%	n	%
20-29	1	3	4	14	5	8
30-39	4	11	2	7	6	9
40-49	5	14	8	28	13	20
50-59	9	25	11	38	20	31
60-69	17	47	4	14	21	32
Total	36	100	29	100	65	100

Table-I. Distribution of chronic kidney disease patients by gender and age.

Group	TSH Normal (n=30)	TSH increase (n=35)	Total (n=65)
Age (year)	50.30±12.66	50.60±11.95	50.46±12.19
Serum creatinine (mg/dl)	3.79±2.51	4.73±2.94	4.29±2.77
GFR (ml/min/1.73m^2)	31.59±21.19	22.17±12.48*	26.51±17.57
TSH(mIU\L)	1.84±0.89	6.68±0.87***	4.45±2.59
FT4(ng/dl)	1.14±0.23	0.97±0.35*	1.05±0.31

Table-II. Age, Serum creatinine, GFR, TSH and FT4 in chronic kidney disease patients. Mean± SD is given. Figure in parenthesis indicate number of cases in each group on the basis of TSH levels.
***P< 0.05, ***P <0.001**

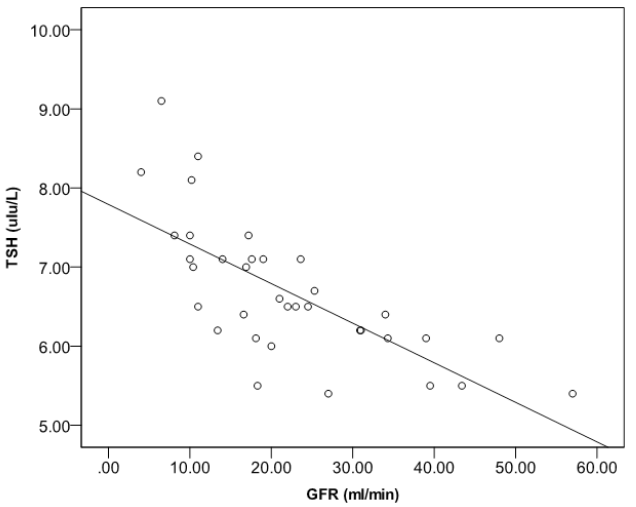

Figure-1. Regression line between GFR and TSH of chronic kidney disease patients.

Similarly in our study we took sixty five patients and thyroid functions are influenced by stage wise decrease in GFR of Chronic renal patients.[6]

In the present study we took the chronic kidney patients with age range from 20-65 years similarly Schultheiss, UT et; al conducted a study published in 2021. In this study he took CKD patients with age range from 18-76year. Like in our study Schultheiss, UT et; al also described in his study that there is association between higher value of TSH with lower eGFR.[16]

Thyroid functions can be best assessed by measuring TSH level. There is inverse relationship between estimated glomerular filtration rate and thyroid stimulating hormone a study carried out by Toda A et; al 2019 and Stan MN and Drake MT in 2018. Their study results and concluding remarks matches with our study.[9,17]

In the present study we saw that an increased TSH was associated with reduced eGFR. These results were similar with the previous studies. Chang et al 2018 reported that the odd ratio and 95% confidence interval of subclinical hypothyroidism for CKD was 1.74 after analyzing 74.356 patients from Taiwan. Toda et al suggested too that with 95% confidence interval TSH value is equal to 2.41-4.26 mIU/L and > 4.26 mIU/L for CKD P<0.001 in Japanese patients. However no known studies have find out the non-linear correlation between TSH and eGFR.

CONCLUSION

From the results it has been concluded that chronic kidney disorder affects thyroid functions and reflects that thyroid stimulating hormone

(thyrotrophin) is inversely related to CKD. This results in biochemical subclinical hypothyroidism.

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If you live for people’s acceptance, you will die from their rejection.

Lecrae

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Asif	Title & Discussion & Analysis.	
2	Masood-uz-Zaman	Introduction & Results introduction.	
3	Amir Hamza	Material & Methods.	
4	Abdul Haq	Analysis & References.	