

Original Article

A Study of Thyroid Dysfunction in Chronic Kidney Disease at Tertiary Care Hospital in South Gujarat

Prerak V Chaudhary¹, Chinmay A Patel², Nilesh M Doctor³

Authors' affiliation: ¹Resident Doctor; ³Additional Professor, Department of General Medicine, SMIMER, Surat, Gujarat.

Correspondence: Dr. Chinmay Patel, Email: chinmay_107@yahoo.co.in, Mobile No.:8460980490

ABSTRACT

Objective - To study thyroid function abnormalities in patients with CKD. To correlate the thyroid function abnormalities with stage and duration of CKD.

Methods - The cross-sectional study was carried out on 53 patients above the age of 18 years presenting with CKD in OPD/wards of medicine department at Tertiary Care Center, South Gujarat.

Result- Most common abnormality in thyroid hormones found in our study was low T3. Female cases were equally affected with thyroid hormone abnormalities as male cases. No statistically significant difference in T3, T4 and TSH hormone levels was noted with respect to duration of CKD.

Conclusion - There are no considerable variations in T3 and TSH hormone levels with respect to stage and duration of CKD, however there is statistically significant decline T4 hormone levels with increasing severity of renal failure.

Key words: Chronic Kidney Disease, TSH, Thyroid

INTRODUCTION

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR).^{1,2} Chronic kidney disease (CKD) is a clinical syndrome due to irreversible renal dysfunction leading to excretory, metabolic and synthetic failure culminating into accumulation of non-protein nitrogenous substances and presents with various clinical manifestations.

End stage renal disease is described as a terminal stage of chronic kidney disease that without replacement therapy would result in death. Despite various etiologies, CKD is the final common pathway of irreversible destruction of nephrons ultimately resulting in alteration of 'Milieu interieur' that affects every system in the body.

One such system in the body is thyroid hormonal system. Kidney is closely related to thyroid in the fact that it is the only other organ that competes with iodide clearance.³

Patients with CKD have many signs and symptoms suggestive of thyroid dysfunction like edema, dry skin, cold intolerance, decreased BMR, asthenia and hypo-reflexia. So in cases of CKD, it is difficult to exclude thyroid gland dysfunction on mere clinical background. Hence, the aim of this investigation is to study thyroid gland dysfunction in chronic kidney disease patient and its correlation with stage and duration of CKD.

METHODS

This cross-sectional study conducted among OPD and indoor patients admitted to our tertiary care hospital. Af-

ter ethical approval, study was conducted from January 2019 to June 2020, a period of 15-18 months was required to attain the desired sample size and 6 months for compiling, tabulating, analyzing and finalizing the results. K/C/O chronic kidney disease and recently diagnosed chronic kidney disease were included in this study.

Nephrotic range of proteinuria, Hypoalbuminemia, any other kidney disease, Other conditions like acute illness, recent surgery, trauma, burns, liver diseases, Drugs altering thyroid profile like Amiodarone, beta-blocker, Steroids, Iodine containing drugs etc., Patients not willing to participate in the study., Patients below the age of 18 years were excluded from the study. All patients with CKD meeting the inclusion criteria coming to OPD/wards of our tertiary care hospital during the study period were included.

Sample size was calculated by considering the proportion of abnormal thyroid function tests in patients with CKD. $p =$ proportion of abnormal TFT in CKD patients = 65%, $q = p-1$, $l =$ allowable error = 14% and $n = z^2\alpha/2 p q = 53$

Data was entered in MS EXCEL Spread sheet and analyzed with the help of Open-epi version 3.01 updated 2013/04/06 & SPSS software version 20. The statistical analysis was done by appropriate Statistical method. Descriptive statistic was explained by frequency and percentage. Descriptive Analysis applied to represent data. Qualitative data represented by percentage whereas quantitative data represented by mean and Standard deviation (SD). Independent t-test applied to compare the mean of two independent groups at 95% level of confidence. ANOVA applied to compare the mean of more than two independent groups at 95% level of confidence.

RESULTS

Total 53 cases were studied during 1 year period at tertiary care center of South Gujarat. Most of the patients (72%) were between 30-60 years. Rest two age group (less than 30 years age and more than 60 years age) have similar proportion of cases, 13% and 15%, respectively. Mean age of the study population was 45.01 years.

In present study, out of 53 cases, 32(60.4%) were males and 21(39.6%) were females. Approximately two thirds of the patients were males, while only one third were females. T3, T4 and TSH hormone levels were studied and analysed along with other parameters and were analysed according to stage and duration of CKD.

Cut off values of thyroid hormones for hypothyroidism according to the laboratory of our tertiary care hospital were; T3<0.8 ng/ml, T4<5.1 µg/dl and TSH>4.2 µIU/ml. Most common abnormality in thyroid hormones found in our study was low T3. Female cases were equally affected with thyroid hormone abnormalities as male cases. No statistically significant difference in T3, T4 and TSH hormone levels was noted with respect to duration of CKD. No statistically significant difference in T3 and TSH hormone levels was noted with respect to stage of CKD; however statistically significant(p=0.03) difference was noted T4 hormone levels with respect to stage of CKD, with progressive decline in hormone levels with increasing severity of renal failure.

DISCUSSION

Cases are divided into 3 groups; less than 30 years age group, 30 to 60 years age group, more than 60 years age group. 15% of cases belong to the age group of less than 30 years, maximum number of cases, 72%, belongs to the age group of 30 to 60 years of age, whereas 13% of the cases belong to the age group of more than 60 years. Mean age of all the cases is 45.01 years, which matches with the mean age of the population 45.22 years in Screening and Early Evaluation of Kidney Disease Study by Singh AK, Farag YM, Mittal BV, Subramanian KK, Reddy SR, Acharya VN, et al.⁴

In present study, out of 53 cases, 32(60.4%) were males and 21(39.6%) were females. Approximately two thirds of the patients were males, while only one third were females. Male/Female ratio was 1.52:1; which matches with the sex ratio of Surat city which is 1.35:1. This sex ratio is because most of Surat city's population is migratory and is formed by males migrating from different areas of the state and the country.

Cases are distributed among two group; duration of disease less than 60 months (5 Years) and duration of disease more than 60 months. Among the study population, 72% of the cases have duration of CKD less than 60 month, whereas 28% of the cases have CKD duration more than 60 months.

In our study, 67.9% of the patients have low T3 levels i.e. T3 level less than 0.8 ng/ml and 32.1% of the patients have normal T3 levels i.e. T3 level between 0.8 ng/ml to 2 ng/ml. None of the patients have elevated level of T3 hormone i.e. T3 levels more than 2 ng/ml. Mean T3 levels of all the cases was 0.706, which is subnormal. Similar

observations were made in other studies as well. Low T3 had been reported in study by Pon Ajil Singh et al⁵ and many others.

In our study, 32.1% of the patients have low T4 levels i.e. T4 level less than 5.1 µg/dl and 67.9% of the patients have normal T4 levels i.e. T4 level between 5.1 µg/dl to 14.1 µg/dl. None of the patients have elevated level of T3 hormone i.e. T4 levels more than 14.1 µg/dl. Mean T4 levels of all the cases is 5.90, which is within normal range.

In our study, 50.9% of the patients have high TSH levels i.e. TSH level more than 4.2 µIU/ml and 49.1% of the patients have normal TSH levels i.e. TSH level between 0.27 µIU/ml to 4.2 µIU/ml. None of the patients have elevated level of TSH hormone i.e. TSH levels more than 4.2 µIU/ml. Mean TSH levels of all the cases is 6.62, which is more than normal.

66.7% of the female cases have subnormal T3 levels, whereas rest of the female cases have normal T3 levels. Similarly, 68.75% of male cases have low T3 levels, whereas rest of the male cases have normal T3 levels. None of the male or female cases have elevated T3 levels. This suggests that there is no significant difference in level of T3 in two gender among CKD patients.

28.5% female patients have subnormal T4 levels, whereas rest of 76.2% female patients have normal T4 levels. Similarly, 37.5% of the male patients have subnormal T4 levels, whereas 62.5% of the male patients have normal T4 levels. None the male or female patients have elevated T4 levels. There is significant difference in proportion cases having subnormal T4 levels between two genders among cases.

52.4% female patients have elevated TSH levels, whereas rest of 47.6% female patients have normal TSH levels. Similarly, 50% of the male patients have subnormal TSH levels, whereas 50% of the male patients have normal TSH levels. None the male or female patients have elevated TSH levels. There is no statistically significant difference between TSH values between two genders among cases.

In cases with less than 60 months duration of CKD, 71.1% cases have low T3 levels, whereas rest 28.9% patients in this group have normal T3 levels. Among cases with more than 60 months duration of CKD, 60% has low T3 levels, whereas rest 40% patients in this group have normal T3 levels. None of the cases in any group have elevated T3 levels. This suggests that there is no proportionate increase in cases with low T3 with increase in duration. Which means there is no increase in T3 abnormality with increase in duration of CKD.

In cases with less than 60 months duration of CKD, 31.6% cases have low T4 levels, whereas rest 68.4% patients in this group have normal T4 levels. Among cases with more than 60 months duration of CKD, 33.3% has low T3 levels, whereas rest 66.7% patients in this group have normal T4 levels. None of the cases in any group has elevated T4 levels. There is no statistically significant difference in proportion of cases with abnormal T4 between two groups.

In cases with less than 60 months duration of CKD, 47.4% cases have high TSH levels, whereas rest 52.6% patients in this group have normal TSH levels. Among cases with more than 60 months duration of CKD, 60% has high TSH levels, whereas rest 40% patients in this group have normal TSH levels. None of the cases in any group has low TSH levels. Hence, there is no statistically significant difference in proportion of cases with TSH abnormality between two groups.

There is no statistically significant difference in CKD stage wise mean of T3 and TSH. But there is statistically significant difference in CKD stage wise mean of T4, with progressive decline in T4 levels with each stage. Ramirez and Spector et al^{6,7} study showed linear correlation between mean serum T3 and T4 and severity of renal failure. TSH level doesn't show any linear correlation with the severity of renal failure. This is consistent with the study conducted by Spector and Ramirez et al^{6,7}, Dudani et al⁸, Karunanidhi et al⁹. These studies demonstrated abnormality in hypophyseal mechanism of TSH release in uraemic patients as the TSH response to the TRH was blunted.

There is no statistically significant difference in mean values of T3, T4 and TSH between two groups (Duration less than 60 months and more than 60 months). Which suggests that none of the abnormalities in T3, T4, or TSH has any correlation with duration of CKD.

In present study, the difference in mean T3 and T4 values between cases of two genders is statistically not significant. But the difference in mean TSH values between cases of two genders is statistically significant.

In our study, among CKD stage 3 cases there is only 1 case of Clinical hypothyroidism and subclinical hypothyroidism each. In CKD stage 4 there is only 1 case of Clinical hypothyroidism and 7 cases of subclinical hypothyroidism. In CKD stage 5 there are 9 cases of clinical hypothyroidism and 2 cases of subclinical hypothyroidism each. The difference in number of clinical and subclinical hypothyroidism in different stages of CKD is not significant.

There are 7 cases of clinical hypothyroidism and 6 cases of subclinical hypothyroidism among cases with duration of CKD less than 60 months. There are 4 cases of clinical hypothyroidism and 4 cases of subclinical hypothyroidism among cases with duration of CKD more than 60 months. The difference in number of clinical and subclinical hypothyroidism between two groups cases is not significant.

Ramirez et al⁶ reported high prevalence of goiter in patients with CKD especially those on chronic dialysis. Incidence were increased in end stage renal disease. The possible explanation is due to accumulation of iodides in Thyroid gland due to decreased renal clearance in CKD patients. Apart from goiter, study conducted by Hegedus et

al¹⁰ showed thyroid gland volume was significantly increased in patients with CKD. In our study, none of the patients had goitre.

CONCLUSION

There are no considerable variations in T3 and TSH hormone levels with respect to stage and duration of CKD, however there is statistically significant decline T4 hormone levels with increasing severity of renal failure.

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