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ASSESSMENT OF TT3, TT4 AND TSH PROFILE IN CHRONIC KIDNEY DISEASE CONDITION

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ABSTRACT

Kidney normally is an important physiological part in the metabolism, degradation, and excretion of several thyroid hormones. It is an obvious fact that impairment in the kidney function leads to disturbed thyroid physiology. Our prime aim of the present study is to check the variations in the TT3, TT4 and TSH levels in uremia patients on regular hemodialysis and conservative treatment. The study was conducted in hospitals around Vijayawada, India. Fourty patients with no previous history of thyroid dysfunction and with varying grades of chronic renal failure were included in this study. Twenty patients were on conservative treatment and the remaining twenty patients who also had severed renal failure were on regular hemodialysis treatment (RDT). Twenty healthy people were chosen to serve as control group with no previous history of thyroid dysfunction. In conclusion the abnormalities in thyroid function tests, including low TT3 and TT4 values are often observed in clinically euthyroid patients with chronic renal failure, these abnormalities do not appear to change significantly after the institution of regular dialysis.

KEYWORDS: TT3, TT4, TSH, uremia, hemodialysis and hypothyroidism.

INTRODUCTION

Kidney normally is an important physiological part in the metabolism, degradation, and excretion of several thyroid hormones. It is an obvious fact that impairment in the kidney function leads to disturbed thyroid physiology. At all levels of impairments the hypothalamic-pituitary-thyroid axis thought to be involved, including alterations in hormone production, distribution, and excretion. Data suggests that pre-dialysis patients

with chronic kidney disease have an increased risk of hypothyroidism.[1,2] Though the results are variable, thyroid function has been vastly evaluated in patients with chronic kidney disease. An increased occurrence of goiter in those patients has been reported.[3-5] Primary hyperthyroidism is extremely rare, while the prevalence of hypothyroidism is increased in patients with chronic renal failure.[6-9] Some manifestations of uremia include pallor, hypothermia and asthenia may, where the exclusion of diagnosis of hypothyroidism on clinical grounds may be extremely difficult, it's basically based on biochemical tests.[10] Studies on thyroid hormones in clinically euthyroid patients with varying grades of chronic renal failure showed significant decrease in TT3, TT4 and TSH levels compared with control.[11-14] A low T3 and T4 syndrome is evident when glomerular filtration rate (GFR) is reduced below 30±16 ml/min.[15] Normally there is more conspicuous suppression of T3 than of T4.[16] The levels of reverse T3 (rT3), the inactive metabolite of T4 in plasma are normally low, but normal or even elevated values have been reported by some investigators.[16,17] Serum T3 in transplanted patients seems to be higher than control group.[18]

Thyroid binding globulin (TBG) concentrations are usually normal in hemodialysis patients.[19, 20] TBG levels increased significantly after renal transplantation.[21] Studies of thyroid hormone kinetics unraveled normal rates of production of thyroid hormone. Metabolic clearance rates of the hormone may or may not be increased in patients with end stage renal disease.[22-25] Peripheral deiodination of T4 to T3 is impaired [26], this finding is consistent with the more pronounced decrease of T3 than of T4 in progressive renal failure, and instead there is preferential diversion to inactive metabolites.[25]

Many studies confirmed the abnormality in the pituitary-thyroid axis in uremic patients depending on the observation of the normal thyroid-stimulating hormone concentration despite low TT3 and TT4.[27] An abnormal response of thyroid stimulating hormone after administration of exogenous thyrotrophin releasing hormone was also reported.[28-31]

In the present study our extreme focus was on the TT3, TT4 and TSH levels in the uremia patients on regular hemodialysis and conservative treatment.

METHODS

The study was conducted in hospitals around Vijayawada, India. Fourty patients with no previous history of thyroid dysfunction and with varying grades of chronic renal failure were

included in this study. Twenty patients were on conservative treatment and the remaining twenty patients who also had severed renal failure were on regular hemodialysis treatment (RDT). Twenty healthy people were chosen to serve as control group with no previous history of thyroid dysfunction.

All those included in the study underwent estimations of serum total triodothyronine (TT3) and serum total thyroxin (TT4), serum thyrotrophin (TSH), and were performed by Erba thyrokit. These systems provide direct quantitative in vitro administration of L-3,5,3-triodothyronine (T3), thyroxin (T4) and (TSH) human thyroid stimulating hormone in human serum. Patients who were on regular hemodialysis, sample of blood were taken before starting hemodialysis sessions to avoid art factual results caused by heparin.

Furosemide is known to influence thyroid function hence we made sure that all patients and control groups did not receive furosemide before taking blood samples. Basic laboratory investigations which include packed cell volume, blood urea, and serum creatinin were integrated in this study. Results of clinical and hormonal assessment of thyroid dysfunction obtained in patients with chronic renal failure were compared with those of the control group by statistical analysis using t-test, p value < 0.005 considered significant.

RESULTS

The results of the laboratory tests for the patients and control groups

Parameter	Hemodialysis patients	Patients on conservative treatment	Control Group	P value	Normal values
PCV- Male	32.26 ± 1.2	28.7 ± 2.7	47±3.6	< 0.05	40-54
PCV- Female	31.6 ± 2.1	29. 5 ± 2.4	41.4±2.9	< 0.05	37-47
Blood urea mmol/L	29. 8 ± 4.7	38.5 ± 6.1	3.5±2.3	< 0.05	2.5-6
Serum creatinine mg/dL	0.43± 0.06	0.60± 0.10	0.97±0.33	< 0.05	0.62-1.35

PCV = Packed cell volume

TT3, TT4 and TSH mean values for the patients and control groups

Parameter	Hemodialysis patients	Patients on conservative treatment	Control Group	P value -1	P value -2	Normal values
TT3	0.73± 0.26	0.86±0.21	2.1±0.25	< 0.05	< 0.05	1.0-3.3
TT4	47.8±13	41±11	110±22	< 0.05	< 0.05	65-155
TSH	2.62±0.37	2.32±0.40	2.30±0.45	> 0.05	> 0.05	0.3-3.75

DISCUSSION

There is insignificant difference between uremic patients, whether they were kept on hemodialysis or conservative treatment compared with control group in regard to the presence of possible thyroid dysfunction depending on clinical criteria employed in this study. There is significant reduction in TT3 and TT4 levels in patients with uremia regardless the mode of therapy in comparison with those of control group, these findings was similar to most of the results of investigators who have studied thyroid hormones level in clinically euthyroid patients with varying grades of chronic renal failure.[11-14] This reduction in thyroid hormones may be due to the effect of chronic renal failure on the thyroid hormones which include altered peripheral metabolism.

In this study it was found that TSH levels didn't show significant alterations between the uremic patients and the control group and they were within the normal range. The normal TSH level observed in this study may reflect the biochemical euthyroid state of the patients which was also noticed by clinical assessment. In conclusion the abnormalities in thyroid function tests, including low TT3 and TT4 values are often observed in clinically euthyroid patients with chronic renal failure, these abnormalities do not appear to change significantly after the institution of regular dialysis. On the other hand TSH values in clinically euthyroid patients with chronic renal failure were within the normal range, this normal TSH may indicate functional euthyroid status. Its recommend that further studies concentrating on improving clinical and biochemical criteria to diagnose thyroid dysfunction in uremic patients are needed. It is also important to answer the question of what is the effect of thyroxin replacement in uremic patients and diagnosed as to have hypothyroidism.

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