ORIGINAL RESEARCH PAPER

Biochemistry

STUDY TO EVALUATE THYROID LEVELS IN CHRONIC KIDNEY DISEASE PATIENTS

KEY WORDS:

Dr. Afsheen Mariam Khatoon Postgradute, final year MD Biochemistry, Osmania Medical College, Hyderabad.

Dr. Ganesh Associate Professor of Department of Biochemistry, Osmania Medical College,Hyderabad

Dr. P. Kiranmai Professor of Department of Biochemistry, Osmania Medical College, Hyderabad

Dr. N Jaya Professor and HOD of Department of Biochemistry, Osmania Medical College,Hyderabad

ABSTRACT

Background- Chronic kidney disease is a highly prevalent condition with heightened risk for cardiovascular diseases, infections, impaired physical functions and death. Low T3 levels are the most common lab findings followed by subclinical hypothyroidism in CKD patients. Patients with hypothyroidism have clinically important reductions in glomerular filtration rate. Hypothyroidism can also lead to hyperlipidemia & atherosclerosis in coronary and peripheral vessels. Studies indicated that subclinical and clinical hypothyroidism were the risk factors for all cause mortality and CVD death. **Objective-** To evaluate thyroid levels in Chronic Kidney Disease Patients. **Methodology-** Study was conducted in Osmania General Hospital. 40 cases of CKD patients formed the study group and 40 normal healthy individuals formed the control group. T3, T4, TSH levels were estimated using Chemiluminiscence Immunoassay. **Results-** T3 levels were found low in cases (< 0.87ng/ml) as compared to controls. TSH levels were found high (>5.60 micro IU/ml) in cases as compared to controls. No significant difference was found between groups in T4 levels. **Conclusion-** Patients who are appropriately treated for thyroid diseases have a less chance of developing renal dysfunction. Thus, clinicians should be well educated on the role of thyroid hormones in relation to CKD so that proper treatment can be delivered to the patient.

BACKGROUND

Chronic kidney disease (CKD) is becoming a serious health problem; the number of people with impaired renal function is rapidly rising, especially in industrialized countries [1]. Recent reports, however, suggest an abrupt rise in CKD in developing countries from Asia due to increase in concomitant diseases such as type 2 diabetes, hypertension and cardiovascular diseases (CVDs) [2].

Kidneys play an important role in the metabolism, degradation and excretion of thyroid hormone. On the other hand, Thyroid hormones influence renal development, kidney structure, renal hemodynamics, GFR, the function of many transport systems along the nephron, and sodium and water homeostasis.[3]

Thyroid functional disorders are commonly observed in chronic kidney disease (CKD) patients.[4] Primary hypothyroidism, which is typically identified by biochemical tests including an elevated serum thyrotropin (TSH) level in conjunction with a low or normal thyroxine (T4) level (defined as overt and subclinical hypothyroidism, respectively),[5] is disproportionately more prevalent in patients with advanced kidney dysfunction compared to those with normal function.[6]

The kidney normally contributes to the clearance of iodine, primarily by glomerular filtration. Thus iodide excretion is diminished in advanced renal failure, leading sequentially to an elevated plasma inorganic iodide concentration and an initial increment in thyroidal iodide uptake. [7]

Increased total body inorganic iodide can potentially block thyroid hormone production by affecting the pituitary-thyroid axis and peripheral metabolism of thyroid hormones. Such changes explain higher frequency of hypothyroidism in patients with chronic kidney disease. So, Thyroid dysfunction is a commonly seen endocrine abnormality among CKD patients.[8]

Hypothyroidism and hyperthyroidism affect renal function by direct renal effects as well as systemic, hemodynamic, metabolic and cardiovascular effects. Most of renal manifestations of thyroid dysfunction are reversible with treatment.

Patients with hypothyroidism have clinically important reductions in glomerular flitration rate. Hypothyroidism can also lead to hyperlipidemia & atherosclerosis in coronary and peripheral vessels.

Dyslipidemia has been established as a well-known traditional risk factor for CVD in CKD and large-scale observational studies have shown that total and low-density lipoprotein (LDL) cholesterol are the most important independent predictors of cardiovascular morbidity and mortality [9]. Several factors contribute to the development dyslipidemia associated with chronic renal impairment. Patients with CKD have a reduction in the activity of lipoprotein lipase and hepatic triglyceride lipase. This interferes with uptake of triglyceride rich, apolipoprotein B containing lipoproteins by the liver and in peripheral tissue, yielding increased circulation of these atherogenic lipoproteins [10]. Progression of CKD is accompanied by the development of specific alterations of the lipoprotein metabolism [11]. Reports show that mortality due to CVD was 10–30 times higher in dialysis patients than in the general population.

There is growing evidence that abnormalities in lipid metabolism may contribute to renal disease progression [10]. Thyroid dysfunction and dyslipidemia in CKD may further increase CVD risk leading to increased morbidity and mortality. Hence, early diagnosis of thyroid and lipid disorders by regular screening, and treatment of such disorders in CKD patients may be highly beneficial to slow the progression of CKD, in addition to the prevention of CVD risk [10, 12]. Studies indicated that subclinical and clinical hypothyroidism were the risk factors for all cause mortality and CVD death.

The objective of our study is to evaluate thyroid levels in Chronic Kidney Disease Patients.

MATERIAL AND METHODS

Sample size- 40 cases and 40 controls.

Study Design- Case-control study .

Inclusion criteria-

All consented cases who were diagnosed clinically and biochemically as Chronic Kidney Disease, attending Nephrology Department of Osmania General Hospital in the age group 40-70 years.

Age matched healthy controls were taken.

Methodology-

- 3 ml of serum sample was collected in both cases and controls and serum creatinine levels were measured by enzymatic method on Beckman coulter AU5800 .
- 5ml of serum sample was collected in both cases and controls and T3, T4 and TSH levels were measured by Siemens chemiluminescence immuno assay.

Statistical Analysis-

- From our data, the mean , percentage , standard deviation, chi-square test and multiple correlation were done by using SPSS-10.
- The P value was used to compare the cases mean value with control mean value and the p value of < 0.05 was considered statistically significant.

RESULTS

- The study included 40 cases and 40 controls.
- 18 (45%) males and 22 (55%) females in case group and 24 (60%) males and 16 (40%) females in control group.
- The mean age of study population (Mean + SD) in cases was 48.21+ 13.76 and in controls was 45.93+ 12.03 years.
- Thyroid dysfunction was considered if patients thyroid hormones fall outside the reference range; T3-(0.87-1.78ng/ml),T4-(6.09 -12.23ug/dl) TSH-(0.34-5.60uIU/ml).

Thyroid function tests in cases and controls

THYROID FUNCTION	CASES (MEAN)	CONTROLS (MEAN)	P VALUE
TOTAL T3 (ng/ml)	0.69±0.38	1.13±0.15	<0.001
TOTAL T4(ug/dL)	6.07±2.55	7.54±1.38	<0.001
TSH(uIU/ml)	7.42±4.25	2.13±0.87	<0.001

- The T3 levels of the cases and controls had mean of 0.69 ± 0.38 and 1.13 ± 0.15 respectively.
- The T4 levels of the cases and controls had mean of 6.07 ± 2.55 and 7.54 ± 1.38 respectively.
- Mean TSH levels of the cases and controls were 7.42 ± 4.25 and 2.13 ± 0.87 respectively.
- Therefore we observe that the T3 levels were found low in cases as compared to controls. TSH levels were found high in cases as compared to controls. No significant difference were found between groups in T4 levels.

CONCLUSION

- Patients who are appropriately treated for thyroid diseases have a less chance of developing renal dysfunction.
- Thus, clinicians should be well educated on the role of thyroid hormones in relation to CKD so that proper treatment can be delivered to the patient.

REFERENCES

1. Olechnowicz-Tietz S, Gluba A, Paradowska A, Banach M, Rysz J. The risk of atherosclerosis in patients with chronic kidney disease. Int Urol Nephrol. 2013;45(6):1605–12. doi: 10.1007/s11255-013-0407-1.
2. Tsukamoto Y, Wang H, Becker G, Chen HC, Han DS, Harris D, et al. Report of the Asian Forum of Chronic Kidney Disease Initiative (AFCKDI) 2007. "Current status and perspective of CKD in Asia": Diversity and specificity among Asian countries. Clin Exp Nephrol. 2009;13(3):249–56. doi: 10.1007/s10157-009-0156-8
3. Mariani LH, Berns JS. The renal manifestations of thyroid disease. J Am Soc Nephrol 2012. Jan;23(1):22-26. 10.1681/ASN.2010070766
4. Rhee CM, Brent GA, Kovesdy CP, et al. Thyroid functional disease: an under-recognized cardiovascular risk factor in kidney disease patients. Nephrology, dialysis, transplantation: official publication of the European Dialysis and Transplant Association – European Renal Association. 2015;30:724–737. This is a comprehensive review of studies of thyroid functional disease and cardiovascular outcomes in the pre-dialysis and dialysis-dependent CKD populations.
5. Ladenson PW. Diagnosis of Hypothyroidism. In: Braverman LE, Cooper DS, editors. Werner and Ingbar's The Thyroid. 10th. Philadelphia: Lippincott Williams and Wilkins; 2013. pp. 6064–611. [Google Scholar]
6. Lo JC, Chertow GM, Go AS, Hsu CY. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. Kidney international. 2005;67:10474–1052
7. Ramírez G, Jubiz W, Gutch CF, et al. Thyroid abnormalities in renal failure. A study of 53 patients on chronic hemodialysis. Ann Intern Med 1973; 79:500.
8. J. J. Carrero , A. R. Qureshi , J. Axelsson ,M.I. Yilmaz, et al. Clinical and biochemical implications of low thyroid hormone levels (total and free forms) in euthyroid patients with chronic kidney disease. J Intern Med. 2007 Dec;262(6): 690-701..
9. Collaboration PS, Lewington S, Whitlock G, Clarke R, Sherlinker P, Emberson J, Halsey J, et al. Blood cholesterol and vascular mortality by age, sex and blood pressure a meta-analysis of individual data from 61 prospective studies with 55,000 vascular deaths. Lancet. 2007;370(9602):1829–39. doi: 10.1016/S0140-6736(07)61778-4.
10. Thomas R, Kanso A, Sedor JR. Chronic kidney disease and its complications. Prim Care. 2008;35(2):329–44. doi: 10.1016/j.pop.2008.01.008.
11. Attman PO, Samuelsson O, Alaupovic P. The effect of decreasing renal function on lipoprotein profiles. Nephrol Dial Transplant. 2011;26(8):2572–5. doi: 10.1093/ndt/gfq762.
12. Lo JC, Chertow GM, Go AS, Hsu CY. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. Kidney Int. 2005;67(3):1047–52. doi: 10.1111/j.1523-1755.2005.00169.x.