Available Online at http://www.recentscientific.com

ISSN: 0976-3031

International Journal of Recent Scientific Research
Vol. 6, Issue, 4, pp.3412-3415, April, 2015

International Journal of Recent Scientific Research

RESEARCH ARTICLE

HOSPITAL BASED STUDY ON THYROID FUNCTION IN PATIENTS WITH CHRONIC KIDNEY DISEASE IN KOSI REGION OF BIHAR

Rakesh Kumar*[1], Mrityunjay Pratap Singh[2] and Mehre Darakhshan Mehdi[3]

[1,2]Department of General Medicine Katihar Medical College Katihar Bihar
[3]Department of Pharmacology North Bengal Medical College Darjeeling West Bengal

Received 5th, March, 2015 Received in revised form 12th, March, 2015 Accepted 6th, April, 2015 Published online 28th, April, 2015

INTRODUCTION

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function, and a progressive decline in glomerulus filtration rate (GFR). CKD is a clinical syndrome due to irreversible kidney dysfunction leading to excreatory, metabolic and synthetic failure culminating into accumulation of non-protein nitrogenous substances and presenting with various clinical manifestations[1-3].Two studies reported the prevalence of CKD in India. It was 0.79% in a study from Delhi which screened 4972 adults. This study used a serum creatinine cut-off >1.8 mg/dl to define CKD and hence underestimating the prevalence[4]. Another study by Mani *et al*. in a south Indian village reported the prevalence of GFR <15 ml/min (CKD stage 5) to be 0.09%[5].Based on the current Indian population of 1.2 billion, even a conservative estimate of end stage kidney disease(ESRD) burden in India would suggest that about 1,650,000 to 2,200,000 people develop ESRD every year.

Thyroid function has been extensively evaluated in patients with chronic kidney disease, however the results are variable, an increased incidence of goitre in those patients has been reported in studies conducted in China and Turkey, while other centers such as United States, Canada, Great Britain and Australia found the reverse[6-8]. Primary hyperthyroidism is extremely rare, while the prevalence of hypothyroidism is increased in patients with chronic renal failure[9-12].

The kidney normally plays an important in the metabolism, degradation, and excretion of several thyroid hormones. It is not surprising therefore that impairment in kidney function leads to disturbed thyroid physiology, all levels of the hypothalamic-pituitary-thyroid axis may be involved, including alteration in hormone production, distribution, and excretion, epidemiologic data suggest that predialysis patients with chronic kidney disease have an increased risk of hypothyroidism; many cases are subclinical[13,14].Several clinical features of both hypothyroidism and CKD are similar, hence differentiating both the conditions clinically is a challenging task. It implies that, all the CKD patients with symptomatology of hypothyroidism should be screened for hypothyroidism[15].

Thus, the present study was planned to compare the status of thyroid hormones (serum T_3,T_4 and TSH) in CKD patients on regular haemodialysis and on conservative treatment with controls.

MATERIAL AND METHODS

The present study was conducted in the Department of Medicine, Katihar Medical College and Hospital, Katihar. The study was carried out for a period of one year from January 2014 to January 2015 which was pre approved by the Ethical Committee of this institution review Board. Fifty-four patients with no previous history of thyroid dysfunction and with varying grades of chronic kidney disease were included in this study. Twenty-four patients were on conservative treatment. Remaining thirty patients were on regular haemodialysis treatment (RDT). Twenty-five volunteers with normal renal function and no previous history of thyroid dysfunction were included in this study as a control group. All patients and controls were assessed for possible thyroid dysfunction on detailed clinical history and physical examination. Pallor, weight loss, palpitation, tremor, neurological symptoms and other manifestations of thyroid dysfunction may also occur in uraemia, so they are not regarded as signs of possible thyroid dysfunction in the study group.

The usual precautions in the collection of venipuncture samples were observed. For accurate comparison to established normal values,a fasting morning serum sample was obtained.

The blood was collected in a plain redtop venipuncture tube without additives or anti-coagulants, allowed to clot and centrifuged to separate the serum. The samples were refrigerated at 2-8^{0}C for amaximum period offive days. If the specimen could not be assayed within this time, the samples were stored at -20^{0}C for up to 30 days. The use of contaminated devices, and repetitive freezing and thawing was avoided. The quantitative determination of serum T_3, T_4 and TSH was done by microplate enzyme immunoassay[16].Serum urea and creatinine were estimated by urease method[17] and Jaffe's alkaline picrate method[18] respectively. Normal ranges of values in serum were T_3: 1-3.3 nmol/L, T_4: 65-155nmol/L,

*Corresponding author: **Rakesh Kumar**
Department of General Medicine Katihar Medical College Katihar Bihar

TSH: 0.3-3.75 nmol/L, Urea: 2.5-6 mmol/L and Creatinine: 55-120 µmmol/L.

Statistical analysis: The paired *t* test was used to compare patients of CKD with controls in each group, while unpaired *t* test was used for comparing changes in different parameters of each group. A *p* value of <0.05 was considered to be statistically significant.

RESULTS AND OBSERVATIONS

Observations are presented in tables.

Table 1 shows, the total participants included 54 patients (30 on regular haemodialysis and 24 on conservative treatment involving peritoneal dialysis) and 25 healthy volunteers as control group. There were 58 male and 21 females in age range of 22-62 included in the study. 29(96.66%) on regular haemodialysis and 17(79.16%) on conservative treatment were hypertensive while2 (8%) controls was hypertensive. Again, 20(66.66%) on regular haemodialysis and 18(75%) on conservative management were diabetics.

Mean duration of uremia was2.9 years and 1.4 years in haemodialysis group and conservative group respectively. Table 2 shows, both group either on regular haemodialysis or conservative management had anemia with more or less similar levels of PCV in contrast with those from the control group who have PCV levels within normal range(p<0.0001). Blood urea and serum creatinine were in better controlled in patients on regular haemodialysis (p<0.0001). Table 3 shows, there was significant reduction of serum T_3,T_4 mean in comparison of controls (p<0.0001),however there was no significant reduction observed in TSH in comparison to controls(p>0.05).

Table 1 The demographic feature of uremic and control groups.

Parameters		Haemodialysis group N=30	Conservative group N=24	Control N=25
Age range(years)		24-60	26-62	22-55
Age mean		41.2	43.6	42.4
Sex	Male	22(73.33%)	16(66.66%)	20(80%)
	Female	08(26.66%)	08(33.33%)	05(20%)
Hypertension	Yes	29(96.66%)	19(79.16%)	02(8%)
	No	01(3.33%)	05(20.8%)	23(92%)
Diabetes mellitus	Yes	10(33.33%)	06(25%)	0
	No	20(66.66%)	18(75%)	25(100%)
Mean of duration of uremia		2.9 years	1.4 years	0

Table 2 The result of the laboratory investigation for the patients & control groups.

Investigations	HD patients N=30	Patients on conservative treatment N=24	Control groups N=25	p-value 1	p-value 2	Normal values
PCV(packed cell volume)	33.3±2.4	30.2±2.1	44.3±3.8	<0.0001	<0.0001	40-54
Blood urea mmol/L	30.8±2.4	36.2±6.4	3.9±1.8	<0.0001	<0.0001	2.5-6
Serum creatinineµmmol/L	486±80	520±84	78±42	<0.0001	<0.0001	55-120

Table3 Serum T_3, T_4 and TSH mean values for the patients and control groups

Hormones (nmol/L)	Haemodialysis Patients N=30	Conservatively treated group N=24	Control Group N=25	*p* value 1	*p* value 2	Normal values
T_3	O.56±0.46	0.84±0.38	2.4±0.3	<0.0001	<0.0001	1-3.3
T_4	52±18	46±14	96±36	<0.0001	<0.0001	65-155
TSH	2.72±0.8	2.14±0.2	2.4±0.32	0.0661	0.0014	0.3-3.75

DISCUSSION

There is significant reduction of serum T_3,T_4 mean in comparison of controls ,this finding 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[19-22]this reduction in thyroid hormone may be due to the effect of chronic renal failure on the thyroid hormones which include altered peripheral metabolism like impairment of peripheral deiodination of T_4 which is the main source of T_3. Due to reduced deiodinase activity, tissue and circulating levels of the active form of the thyroid hormone, T_3, are low in kidney failure[23]. In contrast, the thyroid –pituitary feedback loop seems to remain intact, because steady-state plasma TSH remains substantially normal and TSH undergoes the expected rise after thyroidectomy in these patients[24] and hence it support our study. Toxic uremic solute such as urea, creatinine, indoles and phenols inhibits protein binding of T_4[25]. Furthermore, studies in the last decade showed that systemic inflammation[26,27] and metabolic acidosis[28] may alter thyroid function in CKD patients. Low serum T_4 is the most frequent alteration of the thyroid hormone profile observed in CKD. This alteration has long been considered an innocent metabolic adaptation to chronic illness. However, low T_3 associated with endothelial dysfunction, a harbinger of atherosclerosis, in stage 3 and 4 CKD patients[29],as well as cardiomyopathy[30]and with high risk of death in stage 5 CKD patients[31]. It is found that significant deference in TT3 and TT4 between the patients on conservative management and those on hemodialysis these findings are similar to the study done by Pagliacci *et al*[32] and differ from Verger *et al*[33] who noticed that slight or no decrease of thyroid hormone in patients with peritoneal dialysis in contrast to hemodialysed patients, this variation with current

study might be due to the different definition of conservative therapy (in this study conservative therapy refers to dietary and pharmacological treatment plus peritoneal dialysis as required) while that of the studies done abroad, conservative therapy comprises mainly continuous ambulatory peritoneal dialysis plus the dietary and pharmacological intervention. Lastly, it would have been better include a larger study population and hence further study required.

CONCLUSION

The present study demonstrates that alteration in thyroid profile does occur in patients with CKD irrespective of mode of management. Thyroid dysfunction is an often ignored aspect in CKD, but it should be kept in mind for better management of patients of CKD.

References

1. Bargman JM, Skorecki K. Chronic kidney disease. In: Fauci AS, Kasper DL, Lascalzo J, Braunwald E, Hauser SI, Jamson JL, editors. Harrison's Principles of Internal Medicine, 17th ed: vol.2: McGraw Hill; London; 2008.pp.1761-1771.
2. Kaptein EM, Quion-Verde H, Chppljian CJ, Tang WW, Friedman PE, Rodriquez HJ, *et al*. The thyroid in end stage kidney disease. Medicine (Baltimore) 1988; 67:187-97.
3. Bargman JM, Skorecki K. Chronic kidney disease. In:Longo DL, Fauci AS, Kasper DL. Harrison's Principles of Internal Medicine,Vol. 2, 18th edn., 2011;2011;McGraw Hill, London, pp. 2289-2313
4. Agarwal SK, Dash SC, Irshad M. Prevalence of chronic kidney failure in adults in Delhi, India. Nephrol Dial Transplant 2005;20:1638-1642.
5. Mani MK. Prevention of chronic kidney failure at the community level. Kidney Int 2003; 63(Suppl 83):586-589.
6. Lin CC, Chen TW, Ng YY, Chou YH, and YangWC. Thyroid dysfunction and nodular goitre in haemodialysis and peritoneal dialysis patients. *Perit Dial Intl*, 1998;18(5):516-521.
7. Kutley S,Atli T, Kosegullari O, Nergizoglu G, Duman N, and Gullu S. Thyroid disorder in haemodialysis patients in an iodine deficient community. *Artif Org*,2005;29(4):329-332.
8. Silverberg DS, Ulan RA, Fawcett DM, Dossiers JB, Grace M, Bettcher K. Effect of chronic haemodialysis on thyroid function in chronic renal failure.*Can Med Assoc J*,1973 Aug 18;109(4):282-6.
9. Gomez-pan A, Alvarez-ude F, Yeo PB, Hall R, Evered DC, Kerr DN. Function of the hypothalamic-hypophyseal-thyroid axis in chronic renal failure.*Clin Endocrinol*, 1996;2: 567-574.
10. Kaptein EM, Quion- Verde H, Chooljian CJ, Tang WW, Friedman PE, Rodriquez HJ, *et al*. The thyroid in end stage renal disease. *Medicine (Baltimore)*, 1998 May; 67(3):187-97.
11. Takeda SI, Michigishi T and Takazakura E. Iodine-induced hypothyroidism in patients on regular dialysis treatment. *Nephron*,1993; 65:51-55.
12. Shirota Y, Shinoda T, Mizukami T, Katakura M, Takasu N, *et al*. Primary hypothyroidism and multiple endocrine failures in association with hemochromatosis in a long term hemodialysis patients. *Clin Nephrol*, 1992 AUG;38(2): 105-9.
13. Lo JC, Chertow GM, Go AS, and Hsu CY. Increase prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. *Kidney Int*, 2005 Mar; 67(3):1047-52.
14. Chonchol M, Lippi G, Salvagno G, Zoppini G, Muggeo M, Targher G. Prevalence of subclinical hypothyroidism in patients with chronic kidney disease.*Clin J Am Soc Nephrol*, 2008 Sep; 3(5): 1296-300.
15. Weissel M, Stummvoll HK, Kolbe H, Höfer R. Basal and TRH stimulated thyroid and pituitary hormone in various degree of insufficiency. Acta Endocrinol 1979;90:23-32.
16. Jain R, Issac RM, Gottschalk ME. Transient central hypothyroidism as a cause of failure to thrive in newborns and infants. *J Endocrinol Invest* 1994;17:631-637.
17. Webster D. Autozyme urea reagent set of determination of urea/blood urea nitrogen based on enzymatic method using urease. Clin Chem 1977;23:663.
18. Bowers LD, Worg ET. Kinetic serum creatinine assays.II. A critical evaluation and review. Clin Chem 1980;26:55-561.
19. Becket GJ, Henderson CJ, Elwes R, Seth J, and Lambie AT. Thyroid status in patient with chronic renal failure. Clin Nephrol, 1983; 19(4): 172-178.
20. Kayima JK, Otieno LS, Gitau W, and Mwai S. Thyroid hormone profile in patient with chronic renal failure on conservative management and regular hemodialysis. *East Afr Med J*, 1992; 69(6): 333-336.
21. Mehta HJ, Joseph LJ, Desia KB, Samuel AM, Almieda AF, Acharya VN. Total and free thyroid hormone level in chronic renal failure. *J Postgrad Med*, 1991; 37: 79-83.
22. Hoschestetler LA, Flanigan MJ, and Lim VS. Abnormal endocrine tests in hemodialysis patient. *J Am Soc Nephrol*, 1994; 4(10): 1754-1759.
23. Kaptein EM. Thyroid hormone metabolism and thyroid diseases in chronic kidney failure. Endocr Rev 1996; 17: 45–63.
24. Spaulding SW, Gregerman RI. Free thyroxine in serum by equilibrium dialysis: Effects of dilution, specific ions and inhibitors of binding. *J Clin Endocrinol Metab* 1972;34: 974–982.
25. Zoccali C, Tripepi G, Cutrupi S, Pizzini P, Mallamaci F. Low triiodothyronine: A new facet of inflammation in end-stage kidney disease. *J Am Soc Nephrol* 2005;16: 2789–2795.
26. Carrero JJ, Qureshi AR, Axelsson J, Yilmaz MI, Rehnmark S, Witt MR *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; 262: 690–701.
27. Wiederkehr MR, Kalogiros J, Krapf R. Correction of metabolic acidosis improves thyroid and growth hormone axes in haemodialysis patients. Nephrol Dial Transplant 2004; 19: 1190-1197. 28.Yilmaz MI,

Sonmez A, Karaman M, Ay SA, Saglam M, Yaman H, *et al*. Low triiodothyronine alters flowmediated vasodilatation in advanced nondiabetic kidney disease. *Am J Nephrol* 2011; 33: 25-32.

28. Zoccali C, Benedetto F, Mallamaci F, Tripepi G, Cutrupi S, Pizzini P, *et al*. Low triiodothyronine and cardiomyopathy in patients with end-stage kidney disease. *J Hypertens* 2006; 24: 2039-2046.
29. Zoccali C, Mallamaci F, Tripepi G, Cutrupi S, Pizzini P. Low triiodothyronine and survival in end-stage kidney disease. Kidney Int 2006; 70: 523–528.
30. Song SH, Kwak S, Lee DW, Kang YH, Seong EY, Park JS *et al* . The prevalence of low triiodothyronine according to the stage of chronic kidney disease in subjects with a normal thyroid-stimulating hormone. Nephrol Dial Transplant 2009; 24:1534–1538.
31. Pagliacci MC, Pelicci G, Grignani F, Giammartino C, Fedeli L, Carobi C, *et al*. Thyroid function tests in patients undergoing maintenance dialysis: characterization of the "low T4 syndrome" in subject on regular hemodialysis and continuouse ambulatory peritoneal dialysis. Nephron, 1987; 46(3): 225-30.
32. Verger M, Verger C, Hatt-Magnien D, Perrone F. Relationship between thyroid hormones and nutrition in chronic failure. Nephron, 1987; 45: 211- 215

How to cite this article:

Rakesh Kumar., Hospital Based Study On Thyroid Function In Patients With Chronic Kidney Disease In Kosi Region Of Bihar. *International Journal of Recent Scientific Research Vol. 6, Issue, 4, pp.3412-3415, April, 2015*

****