



# INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by Pharmascope Publications

Journal Home Page: [www.pharmascope.org/ijrps](http://www.pharmascope.org/ijrps)

## Assessment of renal damage in hypothyroidism cases

Chaitanya Shree P, Ashok Vardhan N\*, Savitha G

Department of Biochemistry, Saveetha Dental College, Saveetha Institute Medical and Technical Sciences, Saveetha University, Chennai, India

### Article History:

Received on: 11.02.2018  
Revised on: 13.05.2018  
Accepted on: 19.05.2018

### Keywords:

Hypothyroidism  
TSH  
GFR  
Renal damage  
CRF  
CKD

### ABSTRACT

Hypothyroidism is a common disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone. The kidney plays a role in the clearance of iodine, TSH, and thyrotropin-releasing hormone. Thyroid hormones influence the renal development, kidney structure, GFR, sodium, and water homeostasis. It also influences the function of transport systems along the nephron. So, there is a strong correlation between thyroid hormonal status and kidney function. 30 hypothyroidism patients and 30 healthy individuals were used from the OP of Saveetha Dental College. Serum samples were analyzed for the renal status by using a kit method in autoanalyzer. There is a significant increase in serum urea levels ( $p < 0.05$ ) and serum creatinine levels ( $p < 0.05$ ) in hypothyroidism patients. This is due to the thyroid hormones influence renal function. In our study, we observed that there is a strong correlation between thyroid hormones and renal damage, it that changes in thyroid profile can damage the renal system.



### \* Corresponding Author

Name: N. Ashok Vardhan  
Phone: +91 8778469065  
Email: ashokbiochemists@gmail.com

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v9i3.1567>

Production and Hosted by

Pharmascope.org

© 2018 Pharmascope Publications. All rights reserved.

## INTRODUCTION

Hypothyroidism is an endocrinal hormone-related disorder, mostly occurs in children. In this condition, the thyroid gland is unable to produce an adequate amount of thyroid hormones (Hollowell JG *et al.*, 2002). ESRD patients are more prone to hypothyroidism (Connie M. Rhee *et al.*, 2013). Hypothyroidism associated mortality of dialysis patients may be ameliorated by the replacement of thyroid hormones (Connie M. Rhee *et al.*, 2013). Thyroid hormones also associated with the low GFR, a decrease in plasma flow of kidney, less reabsorption of sodium and the improper dilution capacity urine (Eun Oh Kim *et al.*, 2014). Hypothyroidism shows the symptoms like elevation in liver

enzymes, creatinine, goitre, reduction in respiratory rate and cardiac output (Eun Oh Kim *et al.*, 2014, Subramaniam P *et al.*, 2014).

The physiologic determination of renal status is the measured glomerular filtration rate (mGFR) (Neves PD *et al.*, 2013). Reduced GFR is one of the associative factors of hypothyroidism (Neves PD *et al.*, 2013). Kidney takes part its function in clearance of iodine, TSH, and other thyroid-related residues. Thyroid hormones influence development, structure, and function of the Kidney. There is an interrelation between the thyroid functioning and as well as renal function in a different disease condition. Renal defects or problems may be able to cause the alteration in thyroid profile. Thyroid hormones (TH) play a crucial role in the structural and functional development of the kidney.

The kidney is involved in the metabolism and elimination of TH. The decline of kidney function is accompanied by changes in the synthesis, secretion, metabolism, and elimination of TH and leads to thyroid dysfunction (Joshua Becker *et al.*, 2013, Balaji Rajagopalan *et al.*, 2013).

The major function of the kidney is filtering of blood and maintaining the homeostasis it includes excretion of water, metabolic end products like urea, creatinine, as well as foreign particles like

drugs e.tc; By the production 1,25 di hydroxyl cholecalciferol and erythropoietin like hormones it also plays an endocrine role in the living system (Dr. Colin Tidy., 2015). Malnourished and not eating renal impairment patients have relatively normal blood urea levels (Abi Berger *et al.*, 2000). Hypothyroidism is an under-appreciated cause of renal impairment (Andrew Connor *et al.*, 2008).

## MATERIALS AND METHODS

Patients were selected from those attending the outpatient department of Saveetha Dental College and Hospitals and divided into two groups.

Group I- normal healthy individuals- 30 individuals Group II- known hypothyroidism patients-30 individuals

### Inclusion criteria

Normal healthy individual

Known hypothyroidism patients

### Exclusion criteria

Individuals with other systemic illness like cardiovascular disease, Renal failure, Stroke, other endocrine disorders.

Immunocompromised individuals

### Sample collection

Informed consent was obtained from the patient before sample collection. 5ml of fasting venous blood was collected and distributed in plain collection tubes and centrifuges in 3000 rpm for serum. Then the serum was separated, and then it is analyzed for serum urea by Urease method and creatinine by Jaffe's method using ERBA CHEM 5 plus analyzer.

## RESULTS AND DISCUSSION

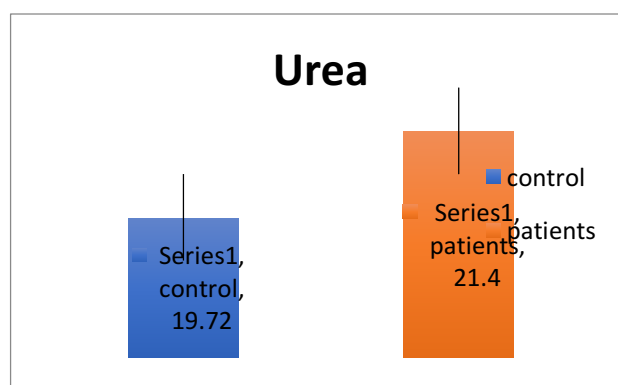
The mean values of urea control and creatinine control are 19.72 and 0.82 respectively. The mean values on urea case and creatinine case are 21.4 and 0.99 respectively. The normal level of urea is 7-20 mg/dl. Normal serum creatinine levels in male are 0.6 to 1.2 mg/dl and 0.5 to 1.1 mg/dl in females. More than two percent of creatine present in the body get converts into the form of creatinine with the help of thyroid hormones. When there is a lack in this TH, the renal system can not able to perform its normal conversion of creatinine (Barb., 2014, Charles Patrick Davis., 2018). This leads to a decreased glomerular filtration rate (GFR) and reduced clearance of creatinine, so creatinine levels start to rise (Barb., 2014, AbhilashChandra., 2016).

Pathological changes in the glomerular structure in hypothyroidism like glomerular basement membrane thickening and mesangial matrix expansion

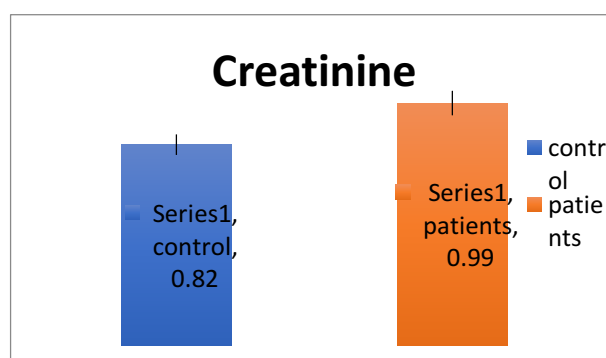
contributes to a reduction in RBF. There is a reversible reduction in the kidney to body weight ratio in hypothyroidism, where the renal mass almost doubles with treatment (Connie M. Rhee., 2016). Hypothyroidism results in a reversible elevation in serum creatinine due to the reduction in GFR as well as possible myopathy and rhabdomyolysis. Hypothyroidism can also result in increased glomerular capillary permeability to proteins. The consequent proteinuria precedes the reduction of GFR in hypothyroidism. Thyroid profile can change due to dialysis and also due to chronic renal failure. Dialysis can also change serum status of TH in patients with renal failure (Gopal Basu *et al.*, 2012, Aarathy Kannan *et al.*, 2017).

**Table 1: Mean, SD and Significance value of Urea, Creatinine in two groups**

parameters	Controls	Hypothyroidism patients	p-Value
Urea	19.72 ± 5.88	21.4 ± 5.89	<0.05*
Creatinine	0.82 ± 0.18	0.99 ± 0.14	<0.05*



**Figure 1: Mean, SD value of Urea in two groups**



**Figure 2: Mean, SD value of Creatinine in two groups**

Persons with CKD (chronic kidney disease) have increased the incidence of primary hypothyroidism and subclinical hypothyroidism (Gopal Basu *et al.*, 2012). Subclinical hypothyroidism is an elevation in serum TSH concentration (Vahab Fatourechi., 2009). With the decline in Glomerular filtration rate (GFR), the prevalence of subclinical

hypothyroidism increases consistently (Mohamed Mohamedali *et al.*, 2014). Within two weeks of the time span, there will be a significant increase in serum creatinine in hypothyroidism (Kreisman SH *et al.*, 1999). In an initial phase of hypothyroidism, there is a chance of normalizing renal profile instantly by the hormonal therapy, but it is not helpful in the prolonged periods of severe hypothyroidism (Laura H. Mariani *et al.*, 2012).

## CONCLUSION

In our study, we observed that there is a strong correlation between thyroid hormones and renal damage, it that changes in thyroid profile can damage the renal system. The prolonged damage to the kidney due to the hormonal imbalance may lead to chronic kidney disease which may also lead to other problems like cardiovascular disease etc.,

## REFERENCES

- Aarathy Kannan, V Sriramakrishnan, B Kannan, Heber Anandan. Thyroid Function Abnormalities in Patients with Chronic Kidney Disease - A Prospective Study. *Int J Sci Stud* 2017;5(4):68-72.
- Abhilash Chandra. Prevalence of hypothyroidism in patients with chronic kidney disease: a cross-sectional study from North India. *Kidney Res Clin Pract.* 2016 Sep; 35(3): 165-168.
- Abi Berger. Renal function and how to assess it. *BMJ* 2000; 321 doi: <https://doi.org/10.1136/bmj.321.7274.1444> (Published 09 December 2000) Cite this as *BMJ* 2000;321:1444
- Andrew Connor, Joanne E. Taylor. Renal impairment was resulting from hypothyroidism. *NDT Plus*, Volume 1, Issue 6, 1 December 2008, Pages 440-441, <https://doi.org/10.1136/bmj.321.7274.1444> Published: 13 October 2008
- Balaji Rajagopalan<sup>1</sup>, Pragna B. Dolia<sup>2</sup>, Veerendra Kumar Arumalla<sup>1\*</sup> and Seshadri Reddy V<sup>1</sup>. Renal function markers and thyroid hormone status in undialyzed chronic kidney disease. *Al Ameen J Med Sci* 2013; 6(1):70-74
- Barb. Kidney (Renal) Function: Why is creatinine level elevated in a hypothyroidism patient? July 24, 2014
- Charles Patrick Davis, MD, Ph.D. Creatinine (Low, High, Blood Test Results Explained). January 2018.
- Connie M. Rhee, Erik K. Alexander, Ishir Bhan, Steven M. Brunelli. Hypothyroidism and Mortality among Dialysis Patients. *Clin J Am Soc Nephrol.* 2013 Apr 5; 8(4): 593-601. Published online 2012 Dec 20. doi: 10.2215/CJN.06920712
- Connie M. Rhee. The Interaction Between Thyroid and Kidney Disease: An Overview of the Evidence. *Curr Opin Endocrinol Diabetes Obes.* Author manuscript; available in PMC 2017 Oct 1. Published in final edited form as *Curr Opin Endocrinol Diabetes Obes.* 2016 Oct; 23(5): 407-415. doi: 10.1097/MED.0000000000000275
- Dr. Colin Tidy. Assessing renal function. 23 Jun 2015
- Eun Oh Kim, Ihn Suk Lee, (...), and Hyeon Seok Hwang. Unresolved Subclinical Hypothyroidism is Independently Associated with Progression of Chronic Kidney Disease. *Int J Med Sci.* 2014; 11(1): 52-59. Published online 2013 Dec 20. doi: 10.7150/ijms.7186
- Gopal Basu and Anjali Mohapatra. Interactions between thyroid disorders and kidney disease. *Indian J Endocrinol Metab.* 2012 Mar-Apr; 16(2): 204-213. doi: 10.4103/2230-8210.93737
- Hollowell JG<sup>1</sup>, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, Braverman LE. Serum TSH, T (4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). *J Clin Endocrinol Metab.* 2002 Feb;87(2):489-99.
- Joshua Becker and Eli Friedman. Renal functions status. (Issue publication date: April 2013) Vol. 200; 4; 827-829.
- Kreisman SH<sup>1</sup>, Hennessey JV. Consistent reversible elevations of serum creatinine levels in severe hypothyroidism. *Arch Intern Med.* 1999 Jan 11;159(1):79-82
- Laura H. Mariani and Jeffrey S. Berns. The Renal Manifestations of Thyroid Disease. *J Am Soc Nephrol* 23: 22-26, 2012
- Mohamed Mohamedali, Srikanth Reddy Madhika, Anix Vyas, Viswanathan Iyer, and Pramila Cheriyath. Thyroid disorders and chronic kidney disease. *International Journal of Nephrology.* Volume 2014 (2014), Article ID 520281, 6 pages
- Neves PD<sup>1</sup>, Bridi RA, Balbi AL, Ponce D. Hypothyroidism and acute kidney injury: an unusual association. *BMJ Case Rep.* 2013; 2013: bcr2013200585. Published online 2013 Aug 9. doi: 10.1136/bcr-2013-200585
- Subramaniam P, \*Jagannathan N. Oral Manifestations of Hypothyroidism. *International Journal of Pharmaceutical and Clinical Research* 2014; 6(4): 281-283

Vahab Fatourechi. Subclinical Hypothyroidism: An Update for Primary Care Physicians. Mayo Clin Proc. 2009 Jan; 84(1): 65-71.