

## Original article

# Alteration of Renal Profile in Patients with Hypothyroidism

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### Abstract

The interplay between thyroid and kidney on each other's function is well known. Maintenance of a balance or homeostasis of metabolic functions in all body organs is critical in the human body. Thyroid dysfunction affects renal physiology and development, whereas kidney diseases could result in thyroid dysfunction. Hence the treatment strategies of one disease may affect those of the other organ. Hence the aim of present study is to assess the effect of thyroid hormone on renal profile in thyroid dysfunction. It is a prospective study. A total of 60 patients were included in the study which is divided into two groups i.e. 30 in control group, 30 hypothyroid patients. The patients were evaluated with the help of questionnaire and general examination followed by biochemical investigation for evaluating their TSH, T3, and T4 for their thyroid function, serum urea and creatinine, serum electrolyte and protein for assessment of kidney function in hypothyroid patients. The analysis shows that, urea and creatinine shows positive correlation (r- Value of 0.67 and 0.5 respectively with p Value of <0.05) with TSH and non-significant positive correlation with potassium and protein (r- Value of 0.29 and 0.2 respectively) and negative correlation with sodium (r- Value of -0.56) in patients of hypothyroidism. Conclusion drawn from present study is that there is significant derangement in renal function in patient's having hypothyroidism in form of deranged urea and creatinine levels.

**Key words:** renal profile, thyroid profile.

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### Introduction

The interplay between thyroid and the kidney in each other's functions is known for many years [1]. Thyroid hormones (TH) are necessary for the growth and development of the kidney and for maintenance of water and electrolyte homeostasis. On the other hand, the kidney is involved in the metabolism and elimination of thyroid hormones [2]. The major function of the kidney is to excrete metabolic waste products as well as maintain water, pH and electrolyte balance. Renal dysfunction is a reflection of tissue hypothyroidism, dissociated with the severity of biochemical hypothyroidism and can manifest in patients with subclinical hypothyroidism [3]. Tests to screen for thyroid dysfunction are T3, T4 and TSH. Tests to screen for kidney dysfunction are serum creatinine, blood

urea, electrolyte and total protein and albumin level. Thyroid dysfunction affects renal physiology and development, whereas kidney disease could result in thyroid dysfunction. Hence the treatment strategies of one disease may affect those of the other organ which are essential to optimally manage the patients

### Aim:

The aim of present study was to determine the renal profile in thyroid dysfunction i.e. hypothyroidism and its correlation with thyroid profile.

### Objectives:

1. To measure the serum levels of thyroid hormones like TSH, T3 and T4 in control and hypothyroidism group.

2. To estimate the serum creatinine & urea concentration in control and hypothyroidism group.
3. To estimate other biochemical renal parameters like serum electrolytes, serum proteins (total and albumin) in control and hypothyroidism group.
4. To find out correlation between renal profile and thyroid hormone in control & hypothyroidism group.

**Materials and methods**

- The study was conducted in department of biochemistry at Dr. D.Y. Patil Medical College and Hospital and Research Centre, Pimpri, Pune.
- The study population included two groups i.e. control & hypothyroidism with 30 subjects in each group.

**Inclusion criteria**

**Observations and results**

**Table 1: comparison of thyroid profile in control and Hypothyroidism group**

VARIABLES	CONTROL n=30	HYPOTHYROIDISM n=30
	MEAN+SD	MEAN+SD
TSH (µIU/ml)	2.17±1.32	33.21±24.8*
T3 (ng/ml)	0.7±0.35	1.02±0.51*
T4 (µg/dl)	9.57±2.0	6.14±4.02*
P value= *0.001		

Table No 1 shows serum TSH levels were significantly increased and serum T3,T4 levels were significantly decreased in hypothyroidism as compare to control group.

VARIABLES	CONTROL n= 30	HYPOTHYROIDISM n= 30
	MEAN ±SD	MEAN ±SD
UREA( mg/dl)	31.2 ± 6.1	35.9 ± 8.9*
CREATININE (mg/dl)	1.01 ± 0.21	1.24 ± 0.37*
TOTAL PROTEIN (g/dl)	6.8 ± 0.52	6.53 ± 0.59
ALBUMIN (g/dl)	4.01 ± 0.53	3.95 ± 0.29
SODIUM (mmol/L)	136.13 ± 7.1	134 ± 5.9
POTASSIUM (mmol/L)	5.59 ± 7.2	4.27 ± 0.4
P Value= *<0.05		

**Table 2: comparison of renal profile in control and hypothyroidism group**

Table no2 shows, urea and creatinine levels were significantly increased in hypothyroidism compared to control. Non-significant changes occur in serum electrolyte, total protein and albumin level in between control & hypothyroid group.

1. Patient with hypothyroidism, giving consent & willing to follow the study protocol.

**Exclusion criteria**

1. Patients with chronic kidney disease, diabetes mellitus etc.
2. Patients taking following drugs: thionamides, lithium, alemtuzumab, lenalidomide, sunitinib etc. [4]

**Methodology :Collection of blood samples :**After 12 hours fast 5 ml venous blood sample were collected in plain bulb under aseptic conditions.

**Methods:Thyroid profile:** T3, T4& TSH by chemiluminescence immuno assay.

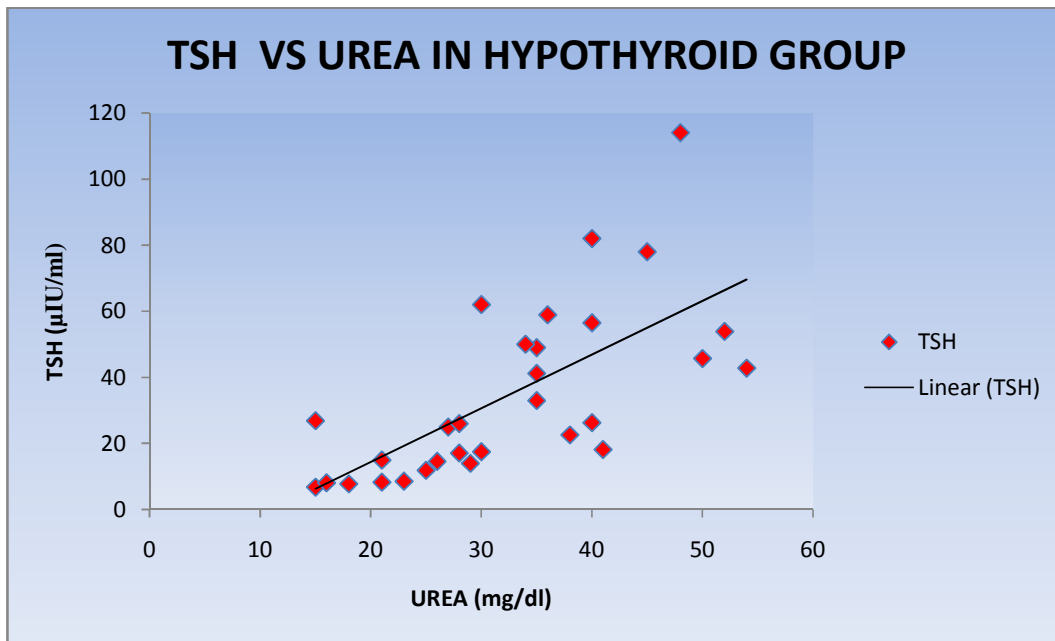
**Renal profile:**Serum urea, Serum creatinine and proteins are done by kit method using autoanalyzer. Serum electrolytes were done by AVL electrolyte analyser.

**Table 3: correlation between thyroid profile and renal profile**

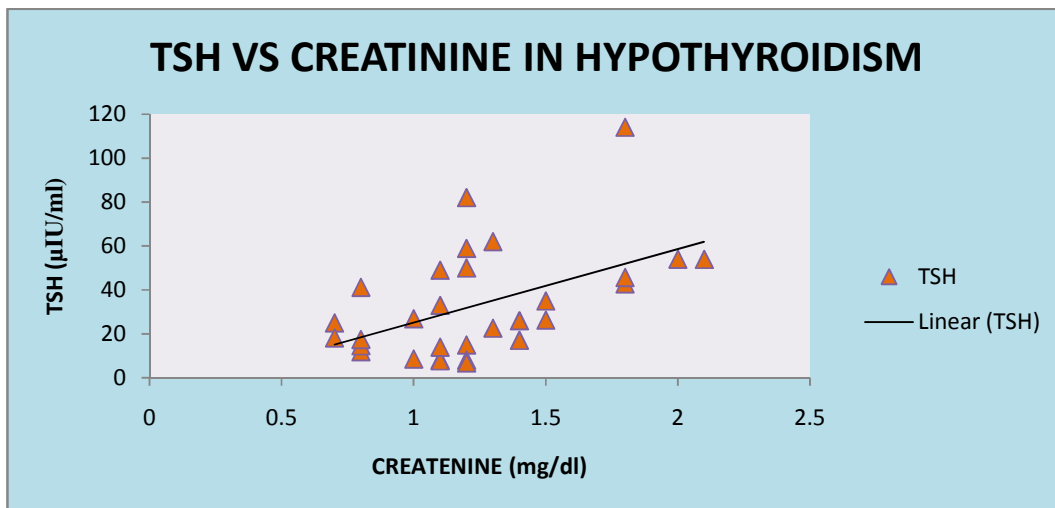
	UREA	CREATENINE	ELECTROLYTE		PROTEIN
			SODIUM	POTASSIUM	
TSH	0.67	0.5	-0.56	0.29	0.2

Table no 3 shows significant positive correlation of TSH with urea & creatinine. Sodium shows negative correlation while potassium shows positive but non-significant correlation with TSH. Serum protein shows positive but non-significant correlation with TSH.

**Chart 1: graphical representation of correlation of tsh with urea in hypothyroid group**



**Chart 2: graphical representation of correlation between tsh and creatinine in hypothyroidism**



### Discussion

In hypothyroidism TSH levels are significantly increased. In hypothyroidism levels of T3 and T4 are decreased in the body which leads to increase secretion of TSH by the anterior pituitary. In hypothyroidism TSH significantly correlated with urea & creatinine. Similar results have been obtained by numerous studies [5]. Hypothyroid associated kidney dysfunction seems to be more related with the decline in thyroid hormone levels rather than thyroid autoimmunity. Among the mechanism involved in hypothyroidism-associated kidney derangements are:

- ✓ Direct effects of thyroid hormones on the cardiovascular system (increased peripheral resistance and reduction of myocardial contractility and stroke volume) and metabolism (hyperlipidaemia).
- ✓ Indirect effects through paracrine or endocrine mediators, such as insulin like growth factor type-1 (IGF-1) and vascular endothelial growth factor (VEGF).

Thyroid dysfunction causes remarkable changes in glomerular and tubular function and electrolyte and water homeostasis. Hypothyroidism is

accompanied by decrease in GFR, hyponatremia, & an alteration of the ability for water excretion. Thyroid hormone leads to increase in nitric oxide levels in blood vessel which causes vasodilatation resulting in increased GFR, however in hypothyroidism there is a decrease level of nitric oxide in blood vessels which increases systemic vascular resistance thus reducing renal blood flow & in turn decreases GFR thus resulting in increase in urea & creatinine blood level. Thyroid hormones influence renal development, kidney structure, renal hemodynamics, GFR, the function of many transport systems along the nephron, and sodium and water homeostasis. Hence present study shows derangement in renal function in patient's having hypothyroidism in form of deranged urea and creatinine levels.

### Conclusion

The present study concluded that there is significant derangement in renal function in patients having hypothyroidism in form of deranged urea and creatinine levels. The findings of the present study are useful for both endocrinologist and nephrologist for optimal management of the patients.

### References

1. Kaptein EM. Thyroid function in renal failure. *Contrib Nephrol.* 1986; 50:64–72.
2. Dr. Abdelmula M. Abdella , Dr Botoual Seroj Ekoon, Dr Gad Allah Modawe. The Impact of thyroid dysfunction on renal function tests. *Saudi J Kidney Dis Transpl.* 2013; 24(1):132-134.
3. Asim M, Esnawi M. Renal dysfunction manifesting in subclinical hypothyroidism—a possible role for thyroxine. *Clinical Kidney Journal.* 2010; 3(3): 282-284.
4. Iglesias P and Diez JJ. Thyroid dysfunction and kidney disease. *European journal of Endocrinology.* 2009; 160: 503-515.
5. Lo CJ, Chertow GM et al. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. *Kidney International* (2005) 67, 1047–1052.