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## Original Research Article

# Impact of Thyroid Dysfunction on Renal Glomerular Filtration Rate, Sodium and Potassium among Sudanese Patients Attending Ribat Teaching Hospital

**Riham Hashim[1], Siddig B. Mohamed[2], Rimaz A. Gurashi[1], Gad Allah Modawe[3], AbdElkarim A. Abdrabo[1]**
[1]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Al-Neelain University, Khartoum, Sudan.
[2]Faculty of Medical Technology, University of Al-Zawia, Surman, Libya.
[3]Department of Biochemistry, Faculty of Medicine, Omdurman Islamic University, Sudan.

***Corresponding author**
Abd Elkarim A. Abobaker
Email: abdrabokarim@gmail.com

**Abstract:** Thyroid hormones (TH) are essential for an adequate growth and development of the kidney. Thyroid dysfunction causes remarkable changes in glomerular, tubular functions, electrolyte and water homeostasis. The aim of this study was to assess alteration in glomerular filtration rate (GFR) and electrolyte (Na+ and K+) in patients with thyroid dysfunction. Case control study conducted in Khartoum State at Alribat Hospital, during May to August 2015. A hundred and fiveheparinized plasma samples divided into study group (70 samples) and control groups(35 samples).Thyroid dysfunction patients as study group subdivided into 35 samples from hyperthyroidism patient and 35samples from hypothyroidism, matched in age (18-60 years) and sex with apparently healthy individuals as control group, and GFR was calculated using Cockcroft-Gault equation, plasma creatinine level which determine enzymaticlly by using (BS MINDRAY380), and Na+ and K+ were estimated by Easylyte in mmol/l instrument while thyroid hormone ( T3, T4 and TSH) were estimated by enzyme linked immunosorbent assay (ELISA). GFR in ml/min (mean±SD) in hypo, hyperthyroidism and normal respectively (56.08 ± 15.2, 81.14±17.5, and 105.6±9.02)ml/min. Na+mmol/l (140.5± 4.75, 138.4±7.53, and 139.3.+2.3)mmol/l. While K+mmol/l (4.09 ± 0.49, 4.9 ± 0.57and 4.04±0.3) mmol/l. In summary, Thyroid dysfunction and GFR are interrelated significant reduction of GFR in both hypo and hyperthyroidism when comparing with control group and there is insignificant relation between Thyroid dysfunction and electrolyte (Na+, K+) when comparing with control group.
**Keywords:** Glomerular Filtration Rate, Electrolyte, Thyroid hormone, Sudanese.

## INTRODUCTION

Thyroid hormones are essential for an adequate growth and development of kidney [1].The kidney is not only for metabolism and elimination of thyroid hormone but also target organ of some of the iodothyronine action [2]. Effect of thyroid hormone on renal in development it influence protein synthesis and cell growth thyroid hormone effected the functioning renal mass (measured as a kidney to body mass ratio) with hypothyroidism reduced this ratio and hyper thyroid hormone increased it [3]. Thyroid dysfunction caused remarkable changes in glomerular and tubular functions, electrolytes and water homeostasis [3]. The most common kidney derangements associate with hypothyroidism were elevation serum creatinine levels reduction glomerular filtration rate(GFR)and renal plasma flow [4]. Thyroid dysfunction disorder of thyroid and kidney may co-exist with common etiological factor [5]. On hyperthyroidism thyroid hormone increased cardiac output and increased GFR and RBF [5]. With hypothyroidism decreased thyroid hormone decreased cardiac output decrease (GFR and RBF) [6]. The Thyroid hormone is necessary to maintenance of electrolyte and water homeostasis [8]. The objective of this study to estimate GFR, Na+ and K+ how thyroid dysfunction affected on renal function test.

## MATERIALS AND METHODS

This study was case control, conducted in Khartoum State at Alribat Hospital, during May to August 2015. A 105 samples were collected, 70 samples of Thyroid patients as case study and 35 as control group were collected in heparin container. The age range between 18-60 years, Creatinine concentration was estimated by full automation machine(BS MINDRAY-380) to calculate GFR, Na+ and K+ were estimated by Easylyte instrument, while ELISA used for estimation Thyroid Hormone ( T3, T4 and TSH).

**Sampling**

35 samples were collected from hyperthyroidism patients, 35 sample were collected from hypothyroidism patients in heparin container, 35 sample were collected from control group in heparin container and were been centrifuged 1500 rpm for 2 min.

**Quality control**

Quality control procedure was done and control was used where batches running

**Ethical confederation**

Ethical confederation was done by Alnealian university committee.

**Statistical analysis**

This study was analyzed using SPSS Program (compare meaning ANOVA test).

**RESULTS**

**Table 1: (The MEAN ± SD)GFR, Na+, K+in this study population using one way ANOVA**

| Parameters | Means ± SD | | | p- value |
|---|---|---|---|---|
| | hyperthyroid Patients N =( 35) | hypothyroid Patients N =( 35) | Control N=(35) | |
| GFR | 81.1±17.0 | 56.0±15.2 | 105.6±9.0 | 0.000 |
| Na+ | 138.4±7.5 | 140.5±4.7 | 139.3±2.3 | 0.246 |
| K+ | 4.9±5.7 | 4.0±0.4 | 4.0±0.3 | 0.431 |

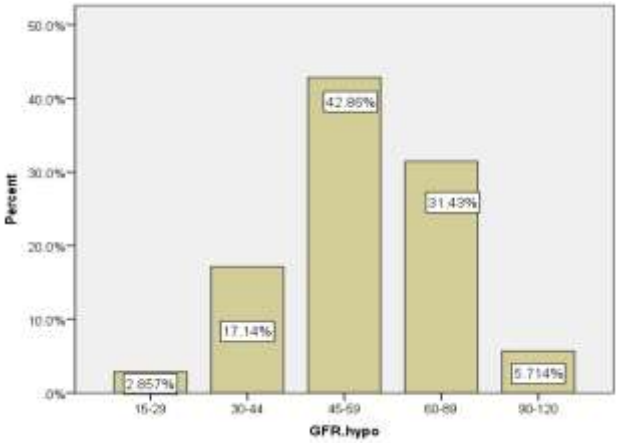


**Fig. 1: The level of GFR in hypothyroid patients**

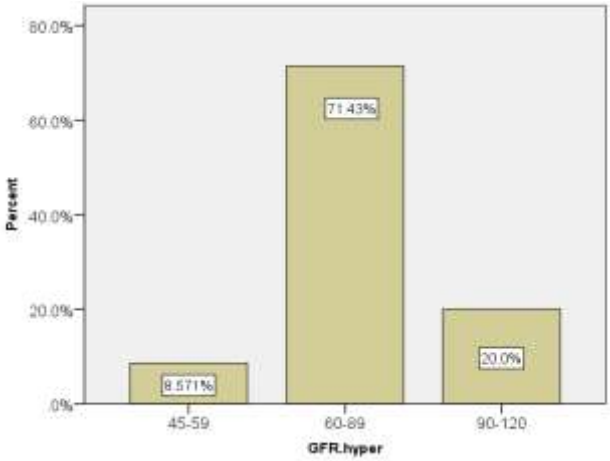


**Fig. 2: The level of GFR in hyperthyroid patients**

**DISCUSSION**

In this study 35 samples was collected from hypothyroidism patients and creatinine estimation was done using Jaffe's reaction then GFR was been calculated which was reflected the reduction in GFR, 35 samples were collected from hyperthyroidism creatinine

was estimated and then GFR was calculated which was reflected increasing GFR, Na+,K+ was not affected. 35 samples were collected as control group and creatinine level was done and GFR calculated the result showed that no changing in GFR and Na+, K+. From the previous results concluded that the Thyroid hormones are controlled GFR by increasing it in hyperthyroidism resulting in increasing cardiac output and decrease GFR in hypothyroidism patients by decrease cardiac output. Thyroid hormones affect renal clearance of water load by their effects on the GFR [9]. Thyroid hormone influence Na+ re-absorption at the proximal convoluted tube (PCT) by increasing Na+K+ ATPase [10].The GFR is reversibly reduced by about 40% and in hypo-thyroidism[11]. Hyperthyroidism GFR increased by about 18-25% [12], the previous study were agreement with this study in GFR affecting but were opposite in(Na+ and K+).

## CONCLUSION

In summary, Thyroid dysfunction and GFR are interrelated significant reduction of GFR in both hypo and hyperthyroidism when comparing with control group. There is insignificant relation between Thyroid dysfunction and electrolyte (Na+, K+) when comparing with control group.

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