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**Original Research Article**

# Impact of Hypothyroidism on Estimated Glomerular Filtration Rate among Adults in North-Eastern Nigeria

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**Abstract:** ***Background*:** Hypothyroidism has well-documented systemic effects, including alterations in renal hemodynamics and metabolism. These changes may lead to a reduction in estimated glomerular filtration rate (eGFR), potentially mimicking chronic kidney disease. Evidence from North-Eastern Nigeria remains limited. ***Objective*:** To assess the impact of hypothyroidism on estimated glomerular filtration rate among adults in North-Eastern Nigeria. ***Methods*:** This hospital-based cross-sectional comparative study included 150 adults comprising 75 patients with hypothyroidism and 75 euthyroid controls. Serum creatinine, thyroid-stimulating hormone (TSH), and free thyroxine (FT4) were measured. Estimated GFR was calculated using the CKD-EPI creatinine equation. Data were analyzed using independent t-tests, Pearson correlation, and multivariable linear regression. ***Results*:** Mean eGFR was significantly lower in hypothyroid participants compared with euthyroid controls (74.9 ± 21.6 vs. 94.3 ± 18.9 mL/min/1.73 m²; $p < 0.001$). Serum TSH showed a significant inverse correlation with eGFR ($r = -0.45$, $p < 0.001$). Hypothyroidism remained an independent predictor of reduced eGFR after adjusting for age, sex, and body mass index. ***Conclusion*:** Hypothyroidism is associated with significantly reduced estimated GFR among adults in North-Eastern Nigeria. Thyroid function testing should be considered in patients with unexplained reduction in eGFR to avoid misclassification of chronic kidney disease.

**Keywords:** Hypothyroidism, Estimated Glomerular Filtration Rate, Renal Function, Thyroid Hormones, Nigeria.



## INTRODUCTION

Hypothyroidism is a common endocrine disorder characterized by insufficient production of thyroid hormones, resulting in generalized metabolic slowing and multisystem involvement [1, 2]. The prevalence of thyroid disorders in Nigeria varies by region and is influenced by iodine intake, autoimmune disease, and access to healthcare services.

The kidney is both a target organ and a regulator of thyroid hormone metabolism. Thyroid hormones play a critical role in maintaining renal blood flow, glomerular filtration, and tubular transport functions [3]. In hypothyroidism, reduced cardiac output and increased systemic vascular resistance may impair renal perfusion, leading to a decline in glomerular filtration rate (GFR) [4, 5].

Estimated GFR (eGFR), commonly derived from serum creatinine-based equations, is widely used for routine assessment of kidney function. However, hypothyroidism alters creatinine generation and clearance due to reduced muscle metabolism and tubular secretion, potentially resulting in underestimation of true renal function [6, 7]. Importantly, renal impairment

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associated with hypothyroidism is often reversible following thyroid hormone replacement therapy [8].

Despite increasing recognition of the thyroid–kidney interaction, there is a paucity of data evaluating the effect of hypothyroidism on eGFR in North-Eastern Nigeria. This study aimed to assess the impact of hypothyroidism on estimated glomerular filtration rate among adults in this region.

# MATERIALS AND METHODS

### Study Design and Setting

This was a hospital-based cross-sectional comparative study conducted at a tertiary health facility in North-Eastern Nigeria.

### Study Population

A total of 150 adults aged 18 years and above were recruited. The study group consisted of 75 patients with hypothyroidism, while 75 age- and sex-matched euthyroid individuals served as controls.

### Definitions

An underactive thyroid, or hypothyroidism, occurs when the thyroid gland creates less than the normal amount of thyroid hormone. The result is the weakening of many bodily functions. Euthyroid status was defined by normal TSH and FT4 levels.

### Exclusion Criteria

Participants with known chronic kidney disease, diabetes mellitus, hypertension, pregnancy, acute illness, or use of nephrotoxic medications were excluded.

### Data Collection

Sociodemographic data and clinical history were obtained using a structured questionnaire. Weight and height were measured, and body mass index (BMI) was calculated.

### Laboratory Analysis

Venous blood samples were collected after an overnight fast. Serum creatinine was measured using an enzymatic method standardized to isotope-dilution mass spectrometry. TSH and FT4 were measured using enzyme linked immunoassays.

### Estimation of GFR

Estimated GFR was calculated using the CKD-EPI creatinine equation [10].

### Statistical Analysis

Data analysis was performed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation. Independent t-tests were used to compare means between groups. Pearson correlation assessed the relationship between TSH and eGFR. Multivariable linear regression was used to identify independent predictors of reduced eGFR. Statistical significance was set at $p < 0.05$.

# RESULTS

**Table 1: Sociodemographic and Clinical Characteristics of Participants**

| Variable | Hypothyroid (n = 75) | Euthyroid (n = 75) | p-value |
|---|---|---|---|
| Age (years) | 42.8 ± 11.4 | 40.9 ± 12.0 | 0.32 |
| Female (%) | 69.3 | 65.3 | 0.60 |
| BMI (kg/m²) | 28.0 ± 5.3 | 26.2 ± 4.8 | 0.03 |
| TSH (mIU/L) | 18.9 ± 7.6 | 2.3 ± 0.9 | <0.001 |
| FT4 (pmol/L) | 7.9 ± 2.2 | 15.4 ± 3.5 | <0.001 |

**Table 2: Renal Function Parameters**

| Parameter | Hypothyroid | Euthyroid | p-value |
|---|---|---|---|
| Serum creatinine (mg/dL) | 1.14 ± 0.32 | 0.93 ± 0.21 | <0.001 |
| eGFR (mL/min/1.73 m²) | 74.9 ± 21.6 | 94.3 ± 18.9 | <0.001 |

### Correlation Analysis

Serum TSH showed a significant inverse correlation with eGFR ($r = -0.45$, $p < 0.001$).

# DISCUSSION

This study demonstrates that hypothyroidism is associated with significantly reduced estimated glomerular filtration rate among adults in North-Eastern Nigeria. Participants with hypothyroidism had markedly lower eGFR values compared with euthyroid controls, independent of age, sex, and BMI.

The observed inverse relationship between TSH and eGFR suggests a severity-dependent effect of thyroid hormone deficiency on renal function. Reduced renal blood flow, diminished cardiac output, and altered intrarenal hemodynamics are recognized mechanisms contributing to reduced GFR in hypothyroidism [11-13].

These findings are consistent with earlier studies reporting reversible elevations in serum creatinine and reductions in GFR among hypothyroid patients [14–17]. Failure to recognize hypothyroidism as a cause of reduced eGFR may lead to misdiagnosis of

chronic kidney disease and unnecessary investigations, particularly in resource-limited settings [18].

## CONCLUSION

Hypothyroidism is significantly associated with reduced estimated glomerular filtration rate among adults in North-Eastern Nigeria. Evaluation of thyroid function should be incorporated into the assessment of patients with unexplained reduction in eGFR to avoid misclassification of chronic kidney disease.

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