

Association Between Elevated Thyroid-Stimulating Hormone Levels and Reduced Estimated Glomerular Filtration Rate in Older Adults with Increased Cardiovascular Disease Risk

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Abstract

Thyroid dysfunction and impaired kidney function are common clinical conditions in older adults and frequently coexist with cardiovascular disease (CVD) risk factors. Although thyroid-stimulating hormone (TSH) influences renal hemodynamics and glomerular filtration, the relationship between elevated TSH concentrations and reduced estimated glomerular filtration rate (eGFR) in elderly individuals at increased cardiovascular risk has not been fully elucidated. This study evaluated the association between serum TSH levels and renal function in an ageing population predisposed to cardiovascular complications.

Keywords: Thyroid-stimulating hormones, Estimated glomerular filtration rate, Subclinical hypothyroidism, Kidney function, Older adults.

Introduction

The global population is aging rapidly, and with this demographic shift comes a rising burden of coexisting chronic conditions, particularly thyroid dysfunction, chronic kidney disease (CKD), and cardiovascular disease (CVD) [1]. Kidney function declines progressively with age, largely driven by reductions in glomerular filtration rate (GFR) accompanied by structural and hemodynamic changes within the nephron. Because serum creatinine-based estimating equations can be unreliable in elderly populations due to reduced muscle mass, the Berlin Initiative Study (BIS-1) equation was developed and validated specifically for use in adults aged 70 years and older, offering more accurate assessment of renal function in this age group [2].

Thyroid dysfunction, and subclinical hypothyroidism in particular, is also highly prevalent among older adults and becomes increasingly

common with advancing age [3]. Thyroid hormones exert direct and indirect effects on renal physiology, influencing renal blood flow, glomerular filtration, sodium handling, and tubular function. Thyroid-stimulating hormone (TSH) itself has been implicated in modulating renal hemodynamics, and elevations in TSH—even within the upper end of the normal range—have been associated with measurable reductions in glomerular filtration capacity in several population-based studies. Conversely, kidney disease can alter thyroid hormone metabolism and clearance, giving rise to a bidirectional and clinically significant thyroid-renal axis [4].

This relationship carries particular importance in individuals with elevated cardiovascular risk. Hypertension, diabetes mellitus, dyslipidemia, and other CVD risk factors frequently coexist with both thyroid dysfunction and impaired renal function, and each of these conditions may independently and synergistically contribute to vascular and renal injury. Subclinical hypothyroidism

has been linked to adverse cardiovascular outcomes, including increased carotid intima-media thickness, systemic inflammation, and elevated cardiovascular mortality risk [5-8]. Similarly, reduced eGFR and albuminuria are well-established predictors of cardiovascular events and mortality, independent of traditional risk factors [9]. Given the shared pathways of vascular dysfunction, inflammation, and endothelial injury that may underlie both thyroid and renal impairment, elevated TSH could serve as a marker—or potential contributor—of accelerated renal decline in cardio vascularly vulnerable older adults.

Despite growing recognition of the thyroid-kidney relationship, existing evidence in older populations remains inconsistent, and few studies have specifically examined this association in individuals already burdened by elevated cardiovascular risk—a group in whom subclinical renal and thyroid abnormalities may have compounding clinical significance [3,9]. Moreover, previous studies have often relied on creatinine-based equations not optimized for elderly populations, potentially underestimating or misclassifying renal impairment in this age group [10].

Short Communication

A prospective observational study was conducted among adults aged 65 years and older attending an endocrine outpatient clinic. Participants were classified as having increased cardiovascular risk if they presented with at least two established risk factors, including hypertension, diabetes mellitus, dyslipidemia, cigarette smoking, metabolic syndrome, or a previous cardiovascular event. Individuals with known thyroid disorders or receiving thyroid hormone replacement therapy were excluded to minimize confounding effects. Thyroid status was assessed using serum TSH and free thyroxine (FT4) concentrations, with elevated TSH and normal FT4 indicating subclinical hypothyroidism. Kidney function was estimated using the Berlin Initiative Study (BIS-1) equation, which is specifically validated for older populations. Additional clinical assessments included urinary albumin-to-creatinine ratio, inflammatory biomarkers such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), and carotid intima-media thickness as an indicator of subclinical atherosclerosis. Statistical analyses included non-parametric comparisons, correlation analysis, and multivariable linear regression to identify independent predictors of renal function.

Discussion

Participants with elevated TSH levels demonstrated significantly lower eGFR values compared with euthyroid individuals. A modest but statistically significant inverse correlation was observed between serum TSH concentration and eGFR, indicating that higher TSH levels were associated with reduced renal filtration capacity. Individuals with subclinical hypothyroidism also exhibited greater urinary albumin excretion, increased circulating inflammatory markers, and higher carotid intima-media thickness, suggesting a greater burden of vascular dysfunction. After adjustment for age, sex, diabetes, hypertension, lipid profile, body mass index, and other relevant clinical variables, elevated TSH remained independently associated with lower eGFR [11].

Variable	Total Population (n=220)
Age (years)	72.8 ± 5.9
Male, n (%)	108 (49.1)
Female, n (%)	112 (50.9)
Body Mass Index (kg/m ²)	28.3 ± 4.1
Systolic Blood Pressure (mmHg)	141 ± 18
Diastolic Blood Pressure (mmHg)	82 ± 10
Diabetes Mellitus, n (%)	78 (35.5)
Hypertension, n (%)	162 (73.6)
Dyslipidemia, n (%)	146 (66.4)
Current Smokers, n (%)	39 (17.7)
Previous Cardiovascular Event, n (%)	56 (25.5)
TSH (mIU/L)	4.98 ± 2.14
Free T4 (ng/dL)	1.18 ± 0.17
Estimated GFR (mL/min/1.73 m ²)	63.7 ± 14.6
Urinary Albumin/Creatinine Ratio (mg/g)	28.9 ± 18.5
IL-6 (pg/mL)	4.9 ± 1.8
TNF-α (pg/mL)	6.8 ± 2.2
Carotid Intima-Media Thickness (mm)	0.86 ± 0.16

Table 1: Baseline Characteristics of the Study Population.

Conclusion

Higher serum TSH concentrations are independently associated with reduced estimated glomerular filtration rate among older adults with increased cardiovascular disease risk. These findings support the close interaction between thyroid function and renal physiology in aging populations and suggest that routine evaluation of thyroid status may contribute to more comprehensive cardiovascular and renal risk assessment. Early identification of subclinical thyroid dysfunction may facilitate timely intervention aimed at preserving kidney function and reducing long-term cardiovascular complications.

References

1. Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. *Ann Intern Med.* 2009;150(9):604–612.
2. Inker LA, Eneanya ND, Coresh J, et al. New creatinine- and cystatin C-based equations to estimate GFR without race. *N Engl J Med.* 2021;385(19):1737–1749.
3. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney Int.* 2023;105(Suppl):S1–S150.

4. Chaker L, Bianco AC, Jonklaas J, Peeters RP. Hypothyroidism. *Lancet*. 2017;390(10101):1550–1562.
5. Iglesias P, Díez JJ. Thyroid dysfunction and kidney disease. *Eur J Endocrinol*. 2009;160(4):503–515.
6. Gussekloo J, van Exel E, de Craen AJM, et al. Thyroid status, disability and cognitive function in old age. *JAMA*. 2004;292(21):2591–2599.
7. Pasqualetti G, Pagano G, Rengo G, et al. Subclinical hypothyroidism and cardiovascular risk in the elderly. *J Clin Endocrinol Metab*. 2013;98(6):2256–2266.
8. Stott DJ, Rodondi N, Kearney PM, et al. Thyroid hormone therapy for older adults with subclinical hypothyroidism. *N Engl J Med*. 2017;376(26):2534–2544.
9. Coresh J, Selvin E, Stevens LA, et al. Prevalence of chronic kidney disease in the United States. *JAMA*. 2007;298(17):2038–2047.
10. Matsushita K, van der Velde M, Astor BC, et al. Association of estimated GFR and albuminuria with mortality and end-stage renal disease. *Lancet*. 2010;375(9731):2073–2081.
11. Fox CS, Matsushita K, Woodward M, et al. Associations of kidney disease measures with mortality and end-stage renal disease. *Lancet*. 2012;380(9854):1662–1673.