CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

# The relationship between serum albumin and urinary incontinence in home care service patients: A single-center experience

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**Received:** 25 April 2025
**Accepted:** 15 August 2025
**Published:** 28 October 2025

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**Abstract**

**Objective:** This study aimed to evaluate the relationship between serum albumin levels and Thyroid Functions (T4) with urinary incontinence (UI) in elderly individuals receiving home care services.

**Methods:** A retrospective analysis was conducted using data from 49 patients diagnosed with UI and 53 age- and sex-matched controls without UI, who received care at Giresun Training and Research Hospital's HCS between April 15 and May 15, 2024. Demographic and laboratory data were extracted from electronic health records. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Group comparisons were performed using the Chi-square or Fisher's exact test for categorical variables, and independent t-tests for continuous variables. A p-value of <0.05 was considered statistically significant.

**Results:** The mean age of the cohort was 80.6 ± 13.0 years, and 68.6% were female. No significant difference was observed in serum albumin levels between the UI and control groups (37.1 ± 6.8 g/L vs 37.6 ± 5.1 g/L; p = 0.687).Serum T4 levels were significantly lower in the UI group (1.2 ± 0.2 µg/dL vs 1.4 ± 0.4 µg/dL; p = 0.001). Other laboratory parameters did not differ significantly between groups.

**Conclusion:** Serum albumin levels were not significantly associated with UI in this elderly home care population. Significant difference in T4 levels suggests a potential role of thyroid dysfunction in UI pathophysiology. Prospective studies with larger sample sizes are warranted to validate these findings.

**Keywords:** Geriatrics, home care services, serum albumin, thyroid dysfunction, urinary incontinence

You may cite this article as: Ayraler A, Köse İO, Polat Aİ, Gürel Köksal N, Bulut B. The relationship between serum albumin and urinary incontinence in home care service patients: A single-center experience.*Cerasus J Med.* 2025;2(3):153-158. doi: 10.70058/cjm.1681523

## Introduction

Urinary incontinence (UI), defined as the involuntary leakage of urine, represents a significant public health concern, particularly in geriatric populations and individuals receiving home care services (HCS) [1]. Comorbid conditions, clinical prioritization of incontinence, prognostic complexity or impact on treatment protocols, and other associated factors may influence treatment decisions. [2] Large-scale population-based studies have consistently demonstrated an association between low serum albumin levels and increased morbidity and mortality, supporting that serum albumin may serve as an independent prognostic marker in a variety of clinical and research contexts. [3].

Thyroid hormones and TSH are physiologically important for smooth muscle function, vascular homeostasis, glomerular filtration and urinary regulation, and the etiopathogenetic relationship between thyroid pathologies, especially urinary dysfunctions associated with hypothyroidism, and renal/urinary system abnormalities is supported by clinical data. [4]. The prevalence of UI was higher in women with hypothyroidism than in the control group (43.6% vs 39.3%), and a moderate association was shown between hypothyroidism and UI. [5].

Neuromuscular dysfunction due to hypothyroidism may impair synchronous activation of pelvic floor muscle reflexes during micturition. In addition, the development of bladder atony accompanying paralytic ileus in individuals with hypothyroidism has been described in the literature [6].

Urinary incontinence (UI) is considered a common health problem due to its high prevalence in the geriatric population and is defined as an independent factor that increases the risk of falls and fractures in elderly individuals [7]. Urinary incontinence in the geriatric population leads to physical complications such as pressure ulcers, sleep disorders, urinary infections, increased risk of falls and fractures, and these morbidities are important determinants of mortality in advanced age [8]. The relationship between thyroid and kidney disease has become increasingly important in recent years [9].

Given the high prevalence of urinary incontinence in elderly populations and the complex physiological effects of hypothyroidism and changes in albumin levels, it is important to further investigate the relationship of these factors with urinary incontinence in geriatric home care patients. This study aims to investigate the relationship between urinary incontinence and serum albumin levels and thyroid function (T4) in geriatric home care patients using a single-center experience.

**Methods:** The study aimed to collect a sample size calculated using G*Power 3.1 [10].based on the expected medium effect size (Cohen's d = 0.5) for serum T4 and albumin differences between groups; $\alpha = 0.05$ and power $(1-\beta) = 0.80$ [11,12]. However, due to limitations in patient availability during the study period, the final sample size (49 UI patients and 53 controls) fell below the calculated requirement (total n = 128 for independent t-tests). Therefore, the study was initially underpowered to detect the hypothesized effect sizes, increasing the risk of a Type II error. To contextualize the detectable effects with the sample size obtained, a sensitivity analysis was subsequently performed. For the observed group sizes (n = 49 vs. n = 53) and $\alpha = 0.05$, the study had 80% power to detect only large effect sizes ($d \geq 0.72$) for continuous variables (e.g. T4 levels). This means that smaller but clinically meaningful differences may have been missed. Therefore, the findings should be interpreted a priori and confirmed in larger cohorts.

## Study Design and Population

This, study was conducted retrospective reviewing the medical records of patients at Giresun Training and Research Hospital's HCS unit and received institutional ethical approval (approval number: 28.03.2024/04). The medical records of patients followed between April 15 and May 15, 2024, were reviewed. A total of 102 patients aged ≥65 years were included, comprising 49 patients diagnosed with urinary incontinence (UI group) and 53 control patients without UI (control group). The diagnosis of urinary incontinence was based on physician documentation in the electronic health records.

## Data Collection

Data were extracted from the hospital's electronic database. Demographic characteristics (age and gender) and routine laboratory parameters were recorded. UI diagnosis was determined based on physician-established diagnosis codes (ICD-10) in the institution's electronic health record system. Laboratory tests included serum albumin, thyroid function tests (T3, T4, TSH), complete blood count (hemoglobin, white blood cell (WBC) count, platelet count, lymphocyte count), renal function markers (urea, creatinine), inflammatory markers C-reactive protein (CRP), metabolic markers (glucose, cholesterol, HDL, LDL, triglycerides), and liver function markers.

### Statistical Analysis

Data analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD). Between-group comparisons of normally distributed continuous variables were conducted using the independent samples t-test, while Chi-square tests were used for categorical variables. A p-value of less than 0.05 was considered statistically significant.

## Results

### Demographic Characteristics

The study included 102 elderly individuals, with no statistically significant differences observed between the UI group and the control group in terms of age or gender distribution. This suggests that the groups were demographically comparable, reducing potential confounding from these variables.

The study population included 102 elderly individuals, with a mean age of 80.6 ± 13.0 years. Among the participants, 68.6% (n = 70) were female. No statistically significant difference was observed between the UI and control groups in terms of age (79.4 ± 12.8 vs 81.8 ± 13.1 years, respectively; p = 0.351) or gender distribution (67.3% vs 69.8% female, respectively; p = 0.789) (Table 1).

### Laboratory Parameters

A comparative analysis of laboratory parameters between the UI and control groups is presented in Table 2. There was no statistically significant difference between the groups in terms of serum albumin levels (37.1 ± 6.8 g/L vs 37.6 ± 5.1 g/L, respectively; p = 0.687). Similarly, other parameters—including hemoglobin, white blood cell (WBC) count, platelet count, lymphocyte count, glucose, urea, creatinine, C-reactive protein (CRP), thyroid-stimulating hormone (TSH), triiodothyronine (T3), high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, and total cholesterol—did not show significant differences between groups (p > 0.05). However, a significant difference was observed in serum total thyroxine (T4) levels, which were lower in the UI group compared to the control group (1.2 ± 0.2 µg/dL vs 1.4 ± 0.4 µg/dL, respectively; p = 0.001), suggesting a potential association between reduced thyroid function and urinary incontinence in the elderly population.

## Discussion

This study evaluated the relationship between serum albumin, thyroid function (T4), and urinary incontinence (UI) in elderly HCS. Our findings revealed no significant association between serum albumin and UI, while lower T4 levels were significantly associated with UI, suggesting a potential role of thyroid dysfunction in UI pathophysiology.

In our study, no statistically significant difference was observed between the groups with and without UI in terms of serum albumin levels (p=0.687). However, this finding should not be interpreted as an absolute absence of a relationship between albumin levels and UI. Some limitations of the current study may have affected this result. First of all, the albumin levels of the patients in our study population were generally within normal limits (37.1-37.6 g/L). This may have caused insufficient variation to evaluate the potential effects of hypoalbuminemia on UI. There are studies

**Table 1.** Demographic characteristics of study participants

| | Case | | Control | | p |
|---|---|---|---|---|---|
| Age (Mean±SD) | 79.4±12.8 | | 81.8±13.1 | | 0.351 |
| Gender | n | % | n | % | |
| Female | 33 | 67.3 | 37 | 69.8 | 0.789 |
| Male | 16 | 32.7 | 16 | 30.2 | |
| Total | 49 | 100.0 | 53 | 100.0 | |

**Table 2.** Laboratory parameters in UI and control groups

| Parameter | UI Group (mean ± SD) | Control Group (mean ± SD) | *p*-value |
|---|---|---|---|
| Albumin (g/L) | 37.1 ± 6.8 | 37.6 ± 5.1 | 0.687 |
| Hemoglobin (g/dL) | 11.5 ± 2.1 | 11.3 ± 1.6 | 0.533 |
| WBC (×10³/μL) | 8.5 ± 4.8 | 8.1 ± 2.7 | 0.678 |
| Platelets (×10³/μL) | 242.7 ± 87.6 | 278.9 ± 104.9 | 0.063 |
| Lymphocytes (×10³/μL) | 1.7 ± 0.7 | 1.7 ± 0.7 | 0.686 |
| Glucose (mg/dL) | 140.7 ± 76.5 | 126.0 ± 44.2 | 0.234 |
| Urea (mg/dL) | 63.2 ± 42.7 | 57.0 ± 39.1 | 0.445 |
| Creatinine (mg/dL) | 1.0 ± 0.6 | 0.9 ± 0.4 | 0.623 |
| CRP (mg/L) | 20.6 ± 29.9 | 30.4 ± 43.6 | 0.193 |
| TSH (μIU/mL) | 3.1 ± 9.0 | 1.7 ± 3.6 | 0.322 |
| T3 (ng/mL) | 2.1 ± 0.8 | 2.2 ± 0.7 | 0.643 |
| T4 (μg/dL) | 1.2 ± 0.2 | 1.4 ± 0.4 | 0.001 |
| HDL (mg/dL) | 42.5 ± 13.6 | 44.3 ± 14.4 | 0.554 |
| LDL (mg/dL) | 98.5 ± 38.4 | 116.1 ± 38.9 | 0.367 |
| Triglycerides (mg/dL) | 147.3 ± 71.1 | 139.3 ± 61.2 | 0.573 |
| Cholesterol (mg/dL) | 170.2 ± 43.5 | 174.2 ± 46.8 | 0.681 |

*Statistically significant values are indicated in bold ($p<0.05$)

in the literature showing that especially sAlb levels are associated with SUI in women [13]. In addition, the retrospective design and relatively small sample size of our study may have limited the determination of the potential relationship between albumin and UI. Prospective studies with larger samples, especially including patients with significant hypoalbuminemia, may provide a clearer understanding of this relationship.

The most striking finding of our study is that serum total T4 levels were significantly lower in the UI group (p=0.001). This finding supports the relationship between thyroid dysfunction and urinary system dysfunction, which has become increasingly important in recent years. Thyroid hormones are known to have regulatory effects on the contractile properties of the detrusor muscle [6].In a prospective controlled study conducted by Can and Can (2025), it was shown that hypothyroid patients were in the high risk group for stress urinary incontinence (SUI). The study determined that high TSH levels, menopause status and multiparity (multiple vaginal births) were significant risk factors. In addition, the study found that the prevalence of urinary incontinence was statistically significantly higher in elderly individuals with subclinical hypothyroidism than in euthyroid individuals [14]. In our study, the lack of significant differences in TSH and T3 levels between the groups suggests that T4 may have a more specific role in the pathophysiology of UI.

The prevalence of urinary incontinence (UI) remains significantly higher among women across all age groups. This finding is supported by a study in rural China that included elderly individuals and reported a prevalence of UI of 46.8%, with a significantly higher prevalence in women (53.3%) compared to men (35.0%) [15]. Similarly, a cross-sectional study from Saudi Arabia documented a prevalence of UI of 44.2% in women and identified female gender as a statistically significant risk factor [16]. In particular, our analysis of baseline characteristics (mean age: cases 79.4 vs controls 81.8 years, female ratio: 67.3% vs 69.8%, ) confirms that UI prevalence maintains established demographic trends despite no statistical difference in age or gender distribution of these well-matched groups. In addition, older age, obesity and history of hysterectomy are significant predictors of stress urinary incontinence. have been identified as risk factors for SUI in women [17].

Apart from the significant decrease in serum total T4 levels in the UI group, no significant differences were observed between the groups in other laboratory parameters, including inflammatory markers (C-reactive protein [CRP], white blood cell [WBC] count), metabolic indicators (glucose, lipid profile), or hematological indices. These findings suggest that UI in elderly individuals may be more closely related to neuromuscular and hormonal dysfunction rather than systemic inflammation or metabolic imbalances. For example, age-related dysfunction results from disruptions in the brain-bladder axis. Changes in the central nervous system (brain atrophy, vascular insufficiencies) impair bladder control, leading to urinary dysfunction [18].

This case-control study demonstrated a distinct divergence in thyroid and nutritional biomarkers among geriatric home care patients with urinary incontinence. While serum thyroxine (T4) levels were significantly reduced in the UI cohort compared to matched controls serum albumin concentrations showed no statistically meaningful association with incontinence status. Furthermore, a comprehensive analysis of secondary biomarkers—including thyroid-stimulating hormone (TSH), triiodothyronine (T3), inflammatory markers, and metabolic parameters—revealed no significant intergroup differences.

## Study Limitations

There are important methodological limitations that should be taken into consideration when evaluating the findings of this study. Firstly, due to the retrospective single-center design: Urinary incontinence (UI) diagnosis was based only on ICD-10 codes in electronic records, and the heterogeneous structure of UI (stress/urge/mixed types) and the potentially different pathophysiological mechanisms of these subtypes could not be analyzed; The sample size and single-center structure limit the generalizability of the findings. Secondly, the fact that biomarker measurements (albumin, thyroid hormones) were made at a single time point may not be sufficient to reflect biological variability and long-term physiological dynamics. This situation constitutes an important deficiency, especially in evaluating the relationship between fluctuations in thyroid function and UI. Finally, another limitation is that potential confounding factors such as history of pelvic surgery, neurological comorbidities and medication use were not fully controlled.

## Conclusion

This study highlights the important association between low serum T4 levels and urinary incontinence in elderly home care patients, reinforcing the emerging evidence for the role of thyroid dysfunction in the pathophysiology of UI. Although we found no significant association between serum albumin or other metabolic/inflammatory markers and urinary incontinence, the strong T4-UI association suggests that neuromuscular and hormonal mechanisms may outweigh systemic factors in the development of geriatric UI. These findings are consistent with contemporary literature demonstrating the influence of thyroid hormones on detrusor function and the demographic predominance of UI in older women. Prospective longitudinal cohort studies and multicenter designs are recommended for future research to elucidate the molecular and neurogenic mechanisms linking thyroid hormone regulation and bladder function..

**Funding:** There is no institution or person supporting this study.

**Conflict of Interest:** None of the authors have a conflict of interest.

**Authors' contribution:** Concept: A.A, A.I.P., I.I.; Design: N.G.K., A.A., İ.O.K.,Data collection or processing: A.İ.P., İ.O.K.,; Analysis or interpretation: B.B.; Literature search: A.İ.P., A.A.; Writing: A.A.; Editing and supervisory: A.A.

**Ethical Declaration:** Ethics approval for the study was obtained from the Giresun University Clinical Research Ethics Committee (date: 28.03.2024/04) Approval was obtained from the Provincial Health Directorate( E-E-53593568-929-273534045 )

This study was presented as an oral presentation at the 24th National Family Physician Congress.

## References

1. Olagundoye O, Odusanya B, Kung JY, Gibson W, Wagg A. A scoping review of risk factors for urinary incontinence in older men. *BMC Geriatr*. 2023;23(1):534. Published 2023 Sep 2. doi:10.1186/s12877-023-04249-7

2. Duralde ER, Walter LC, Van Den Eeden SK, Nakagawa S, Subak LL, Brown JS, et al. Bridging the gap: determinants of undiagnosed or untreated urinary incontinence in women. *Am J*

*Obstet Gynecol*. 2021;224(6):598.e1–598.e11.

3. Nicholson JP, Wolmarans MR, Park GR. The role of albumin in critical illness. *Br J Anaesth*. 2000;85(4):599–610.

4. Yılmaz Oral D, Güven Ciloğlu B, Gür S. The impact of levothyroxine and testosterone administration on bladder contractility in the rat model of propylthiouracil-induced hypothyroidism. *Urol Res Pract*. 2025;50(4):247–52. doi:10.5152/tud.2025.24099

5. Løwenstein E, Jepsen R, Andersen LL, et al. Hypothyroidism and urinary incontinence: Prevalence and association in a Danish, female sample from the Lolland-Falster Health study. *Eur J Obstet Gynecol Reprod Biol*. 2021;264:232-240. doi:10.1016/j.ejogrb.2021.07.020

6. Oral DO, Ciloğlu BG, Gür S. Bladder contractility and hormonal interplay: insights from a hypothyroidism model. *Urol Res Pract*. 2025;50(4):253–9.

7. Neira-Maldonado C, Coronado JC, Álvarez MA, Negrón R, Ponce-Fuentes F, Cuyul-Vásquez I. Prevalence and Associated Factors of Urinary Incontinence Among Chilean Community-Dwelling Older Adults: A Cross-Sectional Study. *Cureus*. 2025;17(1):e77831. Published 2025 Jan 22. doi:10.7759/cureus.77831

8. Batmani S, Jalali R, Mohammadi M, Bokaee S. Prevalence and factors related to urinary incontinence in older adults women worldwide: a comprehensive systematic review and meta-analysis of observational studies [published correction appears in BMC Geriatr. 2022 May 25;22(1):454. doi: 10.1186/s12877-022-03111-6.]. *BMC Geriatr*. 2021;21(1):212. Published 2021 Mar 29. doi:10.1186/s12877-021-02135-8

9. Adani AA, Siyad MO, Adan AM, Jeele MOO. Prevalence and Determinants of Hypothyroidism in Patients on Routine Hemodialysis in Somalia: A Cross-Sectional Study. *Int J Gen Med*. 2023;16:905-913. Published 2023 Mar 9. doi:10.2147/IJGM.S403950

10. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39(2):175-191. doi:10.3758/bf03193146

11. **Cohen J.** Statistical Power Analysis for the Behavioral Sciences. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988.

12. **Lakens D.** Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Front Psychol.* 2013;4:863. doi:10.3389/fpsyg.2013.00863.

13. Xu, M., Zhou, H., Pan, Y., Xu, Z., & Liu, X. (2023). Serum albumin levels and stress urinary incontinence in females: A retrospective study based on NHANES 2007-2016. *Heliyon*, *9*(11), e21757. https://doi.org/10.1016/j.heliyon.2023.e21757

14. Can B, Can O. The Relationship Between Hypothyroidism and Stress Urinary Incontinence: A Prospective Controlled Study. Med Bull Haseki. 2025;63(2):69-73. doi:10.4274/haseki.galenos.2025.04796.

15. Luo Y, Zou P, Wang K, Li X, Wang J. Prevalence and Risk Factors of Urinary Incontinence Among Elderly Adults in Rural China: A Cross-Sectional Survey. *J Wound Ostomy Continence Nurs*. 2022;49(1):78-86. doi:10.1097/WON.0000000000000829

16. Thabet A, Battecha K, Alayat M, et al. Prevalence of urinary incontinence among women in Saudi Arabia: a cross-sectional study. *Eur Rev Med Pharmacol Sci*. 2023;27(13):6040-6045. doi:10.26355/eurrev_202307_32958

17. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. *J Urol*. 2009;182(6 Suppl):S2-S7. doi:10.1016/j.juro.2009.08.071

18. Hardy CC, Korstanje R. Aging and urinary control: Alterations in the brain-bladder axis. *Aging Cell*. 2023;22(12):e13990. doi:10.1111/acel.13990