



## CEREBROVASCULAR DISEASE IN HYPOTHYROIDISM

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### ✓ *Resume*

*Endocrinopathy is one of the significant risk factors for cerebrovascular diseases. The number of such patients is increasing in all economically developed countries of the world. Disease associated with thyroid hormones (TH) is common in the elderly and is associated with cognitive impairment. However, pathological correlates are not well understood. We studied the pathological and clinical factors associated with hypothyroidism, the most common form of TG disease. The purpose of this review is to summarize research on the relationship between thyroid disease and cerebrovascular disease, and to discuss the main findings of overt hyperthyroidism and hypothyroidism.*

*Keywords: thyroid gland, cognitive, cerebrovascular diseases, subclinical thyroid dysfunction.*

## ЦЕРЕБРОВАСКУЛЯРНОЙ БОЛЕЗНИ ПРИ ГИПОТИРЕОЗЕ

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### ✓ *Резюме*

*Одним из существенных факторов риска цереброваскулярных заболеваний являются эндокринопатии. Число таких больных увеличивается во всех экономически развитых странах мира. Заболевание, связанное с гормонами щитовидной железы (ТН), часто встречается у пожилых людей и связано с когнитивными нарушениями. Однако патологические корреляты изучены недостаточно. Мы изучали патологические и клинические факторы, связанные с гипотиреозом, наиболее распространенной формой заболевания ТГ. Целью этого обзора является обобщение исследований взаимосвязи между заболеваниями щитовидной железы и цереброваскулярными заболеваниями, а также обсуждение основных результатов явного гипертиреоза и гипотиреоза*

*Ключевые слова: щитовидной железы, когнитивные, цереброваскулярные заболевания, субклиническая дисфункция щитовидной железы.*

## GIPOTIROZDA MIYA-QONTOM KASALLIKLARI

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### ✓ *Rezyume*

*Endokrinopatiya serebrovaskulyar kasalliklar uchun muhim xavf omillaridan biridir. Dunyoning barcha iqtisodiy rivojlangan mamlakatlarida bunday bemorlar soni ortib bormoqda. Qalqonsimon bez gormonlari (TH) bilan bog'liq kasallik keksalarda tez-tez uchraydi va kognitiv buzilishlar bilan bog'liq. Biroq, patologik korrelyatsiyalar yaxshi tushunilmagan. Biz TG kasalligining eng keng tarqalgan shakli bo'lgan hipotiroidizm bilan bog'liq patologik va klinik omillarni o'rgandik. Ushbu sharhning maqsadi qalqonsimon bez kasalliklari va serebrovaskulyar kasalliklar o'rtasidagi bog'liqlik bo'yicha tadqiqotlarni umumlashtirish va ochiq hipertiroidizm va hipotiroidizmning asosiy natijalarini muhokama qilishdir.*

*Kalit so'zlar: qalqonsimon bez, kognitiv, serebrovaskulyar kasalliklar, qalqonsimon bezning subklinik disfunktsiyasi.*

## Introduction

The thyroid gland is the only organ that synthesizes organic substances containing iodine. It is located between thyroid cartilage and 5-6 tracheal rings on the anterior surface trachea. The mass of the thyroid gland in an adult is 12-25 g. The thyroid gland consists of the left and right lobes, connected isthmus between them. The dimensions of each lobe are 2.5-4 cm in length, 1.5-2 cm wide and 1-1.5 cm thick. Less common accessory lobes of the thyroid gland. The thyroid gland is enclosed in connective tissue membrane, consisting of outer and inner capsules, in the space between which there are vessels, returnable nerve and parathyroid glands. Sometimes cases of hypothyroidism, when the process of thyroid biosynthesis hormones proceeds normally only up to the stage of condensation, while the process of formation of T3 and T4 is sharply inhibited. As the thyroglobulin molecule, all tyrosine residues are iodinated, followed by the formation of tyrosines and thyronins, it moves into the lumen follicle where they accumulate. When the level drops thyroid hormones in the blood serum are activated centers, controlling the secretion of TSH and leading to its stimulation release. Thus, the biosynthesis of thyroid hormones is completely under the control of TSH. Also control of biosynthesis Thyroid hormones are carried out by the CNS and the Whether patients with hyperthyroidism who have SD should receive anticoagulant therapy is controversial. In each patient, the risk of bleeding must be weighed against the risk of systemic embolization. Some authors conclude that the epidemiological data suggest that the rate of thromboembolism in patients with thyrotoxic SD exceeds that for nonthyrotoxic nonvalvular SV, but the majority agree that that thyrotoxic SD is not a more potent risk factor for stroke than other causes of SD. Among major randomized control trials of stroke prevention with warfarin,<sup>7</sup> only the Copenhagen AFASAK Study included patients with hyperthyroidism: 16 (5%) in the warfarin arm, 12 (4%) in the aspirin arm, and 13 (4%) in the placebo group. These data appear insufficient to draw a conclusion. Therefore, because the incidence of thromboembolic events in patients with thyrotoxic SD appears to be similar to other etiologies of SD, antithrombotic therapies should probably be chosen based on associated risk factors and the risk of bleeding, as stated by international guidelines. <sup>7</sup> Patients with hyperthyroidism are particularly sensitive to anticoagulant effects of warfarin, and lower-than-normal warfarin doses are usually required because hyperthyroidism is associated with increased clearance of vitamin K-dependent clotting factors.

The purpose of this review is to summarize research on the relationship between thyroid disease and cerebrovascular disease, and to discuss the main findings of overt hyperthyroidism and hypothyroidism.

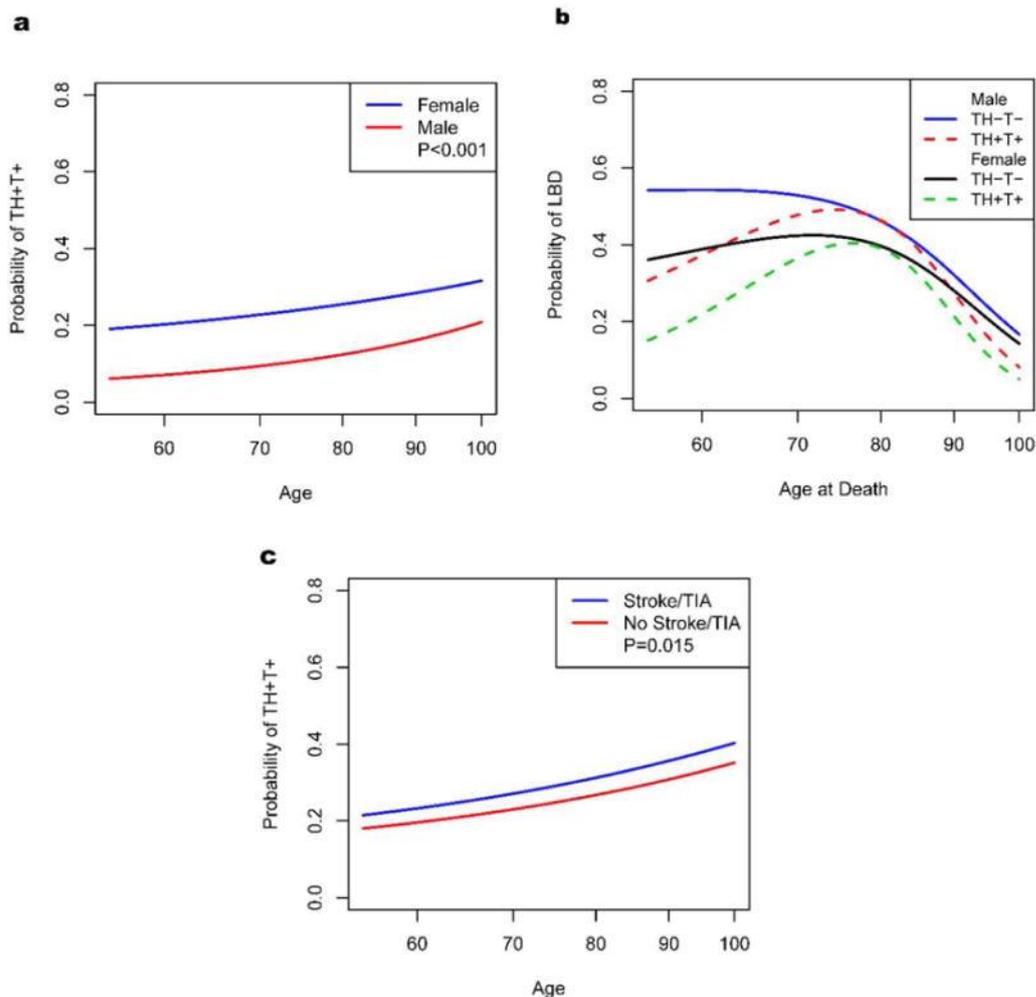
## Materials and methods

Data were obtained from Regional Hospital of Bukhara (RHOB) on participants who had been prospectively evaluated at one of past and present between September 2019 and May 2021. Participants were evaluated annually at RHOB using a standardized clinical protocol. Participants enrolled with any level of cognition from normal to demented. Individual recruit and enroll participants according to their own protocols. Data were collected annually via trained clinicians or interviewers through in-person office visits at each RHOB. At each visit, subjects received physical and neurological examinations, plus a battery of neuropsychological assessments. Neuropathology data were collected from neuropathologists based on autopsy results for subjects who died and had consented to autopsy evaluation at RHOB. Individual received institutional review board approval and written informed consent was obtained from all participants and their study co-participants.

## Results and discussion

There were 65 participants with treated hypothyroidism and 45 without known thyroid disease. These participants were followed an average of 2.8 years (SD: 2.3 years) and a majority were demented by their last visit (78%). There were 4,598 clinical participants with treated hypothyroidism without thyroid disease, who were followed an average of 2.8 years (SD: 3.0 years) and 32% were demented at the time of enrollment.

Participants with thyroid disease were more likely to be older, female, Caucasian, and to have a history of vascular risk factors and disease. Predicted probability of thyroid disease by age at death is shown in for males and females. Before controlling for other factors, participants with thyroid disease were less likely to be demented, and were less likely to have high ADNC or LBD (; in terms of cerebrovascular pathologies, gross infarcts and atherosclerosis were more common in those with reported thyroid disease.



### Clinical vascular disease and hypothyroidism

Hypercholesterolemia, atrial fibrillation, and cerebrovascular disease were associated with hypothyroidism in subsamples. Only atrial fibrillation was associated with hypothyroidism in those autopsied 2019–2021 although odds ratios were similar to results from those autopsied after 2021. Among participants who were evaluated since 2021 (with a newer form), hypercholesterolemia and gross infarcts were significantly associated with hypothyroidism but the associations with atherosclerosis were no longer significant. Additionally, in the clinical sample, hypercholesterolemia and diabetes were associated with hypothyroidism in those without dementia at baseline. In those with dementia, cerebrovascular disease was also associated with hypothyroidism in those with dementia, with increased QR for atrial fibrillation and congestive heart failure.

The increased cardiovascular morbidity in hypothyroid patients has been attributed to the traditional cardiovascular risk factors: elevated low-density lipoprotein (LDL) cholesterol levels and diastolic hypertension. Important associations have been identified for other risk factors for atherosclerosis (eg, hyperhomocysteinemia and endothelial dysfunction) in individuals with overt hypothyroidism and, in some cases, subclinical hypothyroidism.

### Conclusion

Conclusion, overt hypothyroidism has a clear influence on lipids, especially on LDL cholesterol, whereas mild thyroid hormone deficiency may have a limited effect.

Overt hypothyroidism may alter blood pressure, in particular diastolic values. In a study of 169 women with overt hypothyroidism, the prevalence of hypertension was nearly 3× higher than in a euthyroid control group (14.8% versus 5.5%), and euthyroid normotensive patients had an increase in diastolic blood pressure after thyroidectomy-induced hypothyroidism. In a survey of consecutive hypertensive outpatients, 3.6% were found to be hypothyroid, and in this subset, diastolic blood pressure fell significantly after adequate thyroid replacement therapy.

Our analyses highlight an association between hypothyroidism and risk for cerebrovascular disease, but not SV pathology. Hypothyroidism was associated with severe atherosclerosis pathology and with gross

infarcts in a subset of participants. In both the autopsy sample and the clinical sample, hypothyroidism was associated with hypercholesterolemia and cerebrovascular disease. In the clinical sample, hypothyroidism was associated with stroke and transient ischemic attacks among those with dementia at baseline. Approximately one-quarter of all the research subjects reported some type of TH-linked disease. These results indicate that further study on the link between causes of dementia and thyroid disease is merited to provide guidance for clinicians to optimize management of TH levels in the elderly.

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