

Prevalence of antithyroid antibodies and thyroid-stimulating hormone concentration in young people

Yui Sekitani¹, Naomi Hayashida¹, Irina V. Karevskaya², Inna A. Zubareva², Alexander Kozlovsky³, Shunichi Yamashita⁴ and Noboru Takamura¹

¹Department of Radiation Epidemiology and ⁴Department of Molecular Medicine, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan.

²Bryansk Consultative-Diagnosis Center, Klinty City, Bryansk Oblast, Russian Federation.

³Gomel State Medical University, Gomel, Belarus.

Corresponding Author

Noboru Takamura, M.D., Ph.D.

Professor and Chairman of Department of Radiation Epidemiology,

Nagasaki University Graduate School of Biomedical Sciences

1-12-4 Sakamoto, Nagasaki 852-8523, JAPAN

TEL: +81-95-819-7170

FAX: +81-95-819-7172

E-mail: takamura@nagasaki-u.ac.jp

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Subclinical thyroid disease is common, particularly in the middle-aged and the elderly. There is mounting evidence to suggest that subclinical thyroid dysfunctions may contribute to significant clinical conditions. Symptoms often develop unnoticed and therefore identifying thyroid disease clinically can sometimes be difficult. Thyroid dysfunction is common in adulthood, but is also present in childhood, although the incidence has been considered to be low (1). Thyroid hormone plays an important role as a regulator of nervous system myelination, growth and puberty, metabolism, and organ functions. Although subclinical hypo- and hyperthyroidism in young people has not been widely studied, it is very important to identify thyroid dysfunctions due to the influence on growth and development during childhood and adolescence. Previous studies have shown that serum thyroid-stimulating hormone (TSH) level is useful for determining the prevalence of abnormal thyroid dysfunction in a general population (2). Loviselli *et al.* also showed that antithyroid antibody is associated with an increased prevalence of subclinical hypothyroidism in schoolchildren (3). Therefore, it is also important to investigate the prevalence of the antithyroid antibodies, antithyroperoxidase antibody (TPOAb) and antithyroglobulin antibody (TGAb), among this age group. In the present study, we examined the serum TSH level and the prevalences of TPOAb and TGAb in children and young adults in Bryansk Oblast,

Russian Federation.

The subjects were 2,111 children and young adults (750 males and 1,361 females, 6-22 years of age) examined from 1998 to 2006 at Bryansk Consultative-Diagnosis Center, located in Klincy City, Bryansk Oblast. Serum TSH levels were measured with an Amerlite hormone analyzer (Amersham, Bunkyo-ku, Tokyo, Japan) using commercial assay kits. The normal concentration of TSH was between 0.4 and 4.0 $\mu\text{U/ml}$. Titers of TPOAb and TGAb were determined by the electrochemiluminescence immunoassay using commercial assay kits (Fujirebio, Tokyo). Each prevalence of positive TPOAb and TGAb were evaluated by χ^2 test. All statistical analysis was performed using SPSS Statistics 18.0[®] software (SPSS Japan, Tokyo, Japan). Probability values less than 0.05 were considered indicative of statistical significance.

The prevalence of positive TPOAb in study participants divided by serum TSH concentration is shown in Fig. 1. In females, the prevalence of TPOAb was significantly higher both in TSH concentrations less than 0.4 $\mu\text{U/ml}$ ($P = 0.02$) and in TSH concentrations more than 4.0 $\mu\text{U/ml}$ ($P = 0.01$) than in normal serum TSH concentrations. On the other hand, there were no significant differences in males ($P = 0.14$ and $P = 0.64$, respectively). The prevalence of positive TGAb in study

participants divided by serum TSH concentration is shown in Fig. 2. In females, the prevalence of TGAb was significantly higher in TSH concentrations less than 0.4 $\mu\text{U/ml}$, than in normal serum TSH concentrations ($P = 0.043$), although not in TSH concentrations more than 4.0 $\mu\text{U/ml}$ ($P = 0.14$). Moreover, there were no significant differences in males ($P = 0.56$ and $P = 0.15$, respectively).

We showed that there is a sex difference in prevalences of TPOAb and TGAb among abnormal TSH concentrations. In those of the United States population 12 years of age or older, TSH $<0.4 \mu\text{U/ml}$ was associated with positive TPOAb but not with positive TGAb (4). Loviselli *et al.* showed that the prevalence of positive antithyroid antibody was significantly higher in children with serum TSH greater than 5.0 $\mu\text{U/ml}$ when compared to that found in children with normal serum TSH (0.2-5.0 $\mu\text{U/ml}$) (3). Kaloumenou *et al.* reported that girls 5-18 years of age with increased TSH values had increased positive TPOAb levels as compared to those with normal TSH values (0.3-5.0 $\mu\text{U/ml}$). Moreover, there was a significant difference in the prevalence of TGAb in girls with increased TSH compared to normal TSH values. On the other hand, there was no significant difference in the prevalence of TPOAb or TGAb in boys between increased and normal TSH values (5). In children 16 years of age or younger, positive TPOAb and TGAb levels were detected in 60.4% of those with highly

elevated TSH ($>10 \mu\text{U/ml}$), 23.6% of those with elevated TSH ($5.5\text{-}10 \mu\text{U/ml}$), and 39.3% with low TSH ($<0.35 \mu\text{U/ml}$), compared to only 15.9% of the children with normal TSH levels ($0.35\text{-}5.5 \mu\text{U/ml}$) (6). Even though the reference ranges of TSH concentrations vary among studies, these previous studies show the association with abnormal TSH concentration and the increased prevalence of antithyroid antibody.

Mounting evidence indicates that subclinical thyroid dysfunction has important clinical effects and prognostic implications. Subclinical hypothyroidism has been associated with an increased risk for coronary and other heart disease and peripheral arterial disease, various biochemical abnormalities, including elevated low density lipoprotein cholesterol and depression. In addition, the major concern is the development of overt hypothyroidism over time. The annual risk for developing overt hypothyroidism after 20 years is 4.3% in women with increased TSH concentrations and antithyroid antibody and 2.6% in women with subclinical hypothyroidism without thyroid antibodies (7). This also indicates the value of examining antithyroid antibody in young people.

The influence of subclinical hyperthyroidism on health is not yet clear. However, evidence is accumulating that it has clinical importance, such as adverse effects on cardiac function, and more significantly, a higher incidence of arterial

fibrillation and a decrease in bone density. Furthermore, subclinical hyperthyroidism may be associated with disproportionate mortality. Biondi *et al.* showed that early treatment of persistent endogenous subclinical hyperthyroidism should be considered not only in the elderly but also in the young and middle-aged to improve their quality of life and avoid the consequences of long-term exposure of the cardiovascular system to small increases in thyroid hormone (8). In addition, children with hyperthyroidism usually present with behavioral disturbances such as attention problems, difficulty in concentration, and hyperactivity, which may lead to poor cognitive performance (9). However, attention disturbances in children with hyperthyroidism become attenuated once euthyroidism is achieved through treatment (10). These results suggest the necessity to detect subclinical thyroid dysfunction at an early age.

In conclusion, we examined the serum TSH level and the prevalences of TPOAb and TGAb among children and young adults in a relatively large cohort. We found that the prevalence of TPOAb was significantly different in TSH concentrations less than 0.4 $\mu\text{U/ml}$ and more than 4.0 $\mu\text{U/ml}$, and that the prevalence of TGAb was significantly different in TSH concentrations less than 0.4 $\mu\text{U/ml}$ compared to normal serum TSH concentrations in females. On the other hand, there were no significant differences in prevalences of TPOAb and TGAb among TSH concentrations in males.

The early identification of patients whose thyroid function might progress to overt hypo- and hyperthyroidism is important. We recommend that patients with values falling outside the reference TSH concentrations should be further evaluated.

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Figure Legends

Fig.1. The prevalence of positive TPOAb divided by serum TSH concentration

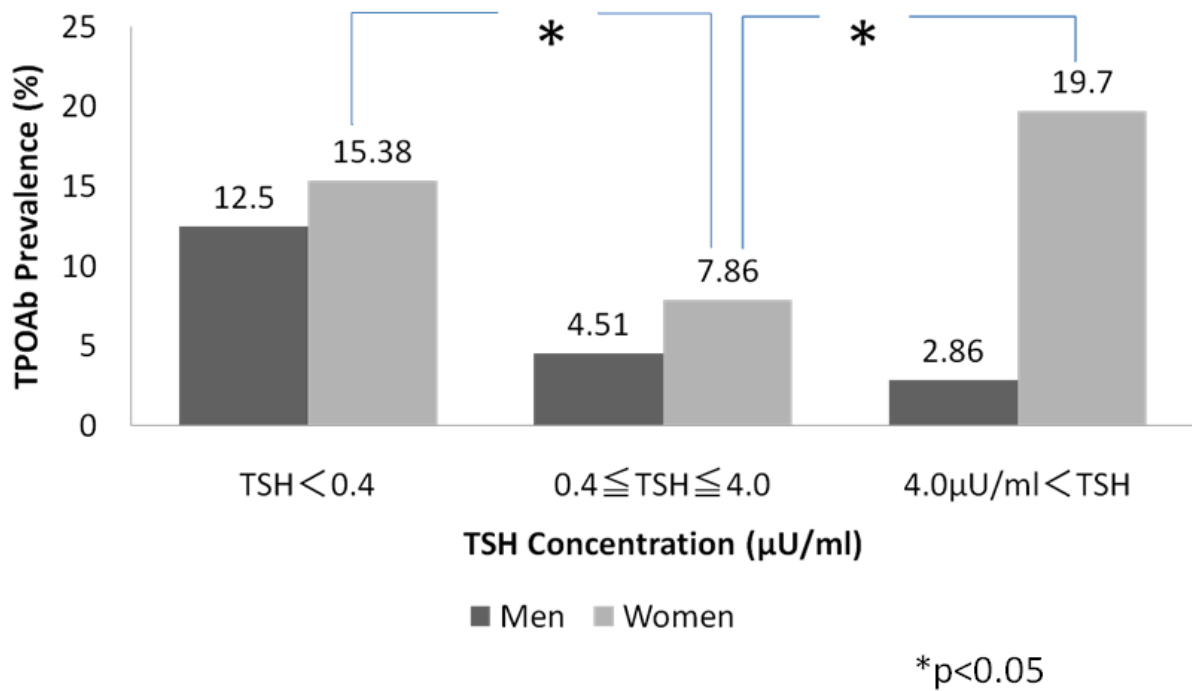


Figure 1: Comparison of the prevalence of positive TPOAb in TSH concentrations divided by serum TSH concentrations; less than 0.4 µU/ml, normal serum TSH concentrations (between 0.4 and 4.0 µU/ml), and more than 4.0 µU/ml.

Fig. 2. The prevalence of positive TGAb divided by serum TSH concentration

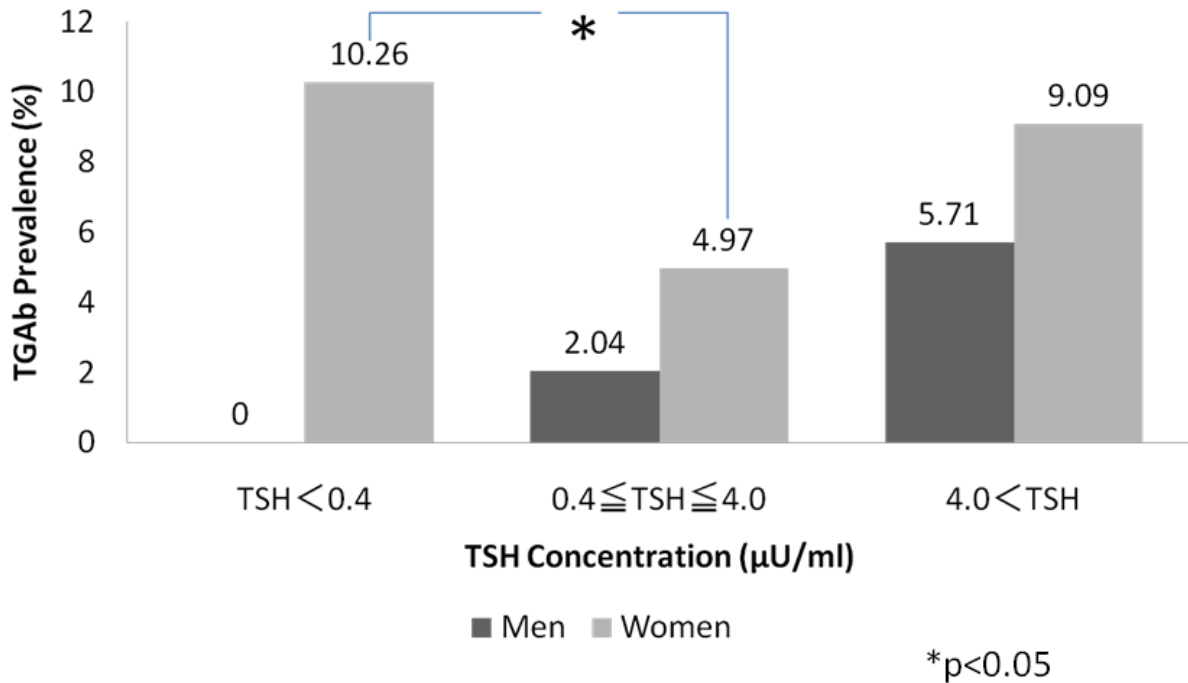


Figure 2: Comparison of the prevalence of positive TGAb in TSH concentrations divided by serum TSH concentrations; less than 0.4 µU/ml, normal serum TSH concentrations (between 0.4 and 4.0 µU/ml), and more than 4.0 µU/ml.