



Correlation Analysis of Thyroid Function and Autoantibody in Healthy Population Living in the Area of Water-Source-Originated High Level Iodine

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To cite this article:

Hou Zhenjiang, Mu Zhaoxin, Wang Fengling, Li Hongyan, Zhang Jingyu, Fan Hong, Wang Huaxin. Correlation Analysis of Thyroid Function and Autoantibody in Healthy Population Living in the Area of Water-Source-Originated High Level Iodine. *Science Journal of Public Health*. Vol. 5, No. 3, 2017, pp. 198-204. doi: 10.11648/j.sjph.20170503.17

Received: January 20, 2017; Accepted: March 1, 2017; Published: March 20, 2017

Abstract: In order to know about the correlation between thyroid function and autoantibody of urban residents in Cangzhou, the author chose 3218 health examinations as the respondents from Cangzhou to do a research. First of all, fasting venous blood was taken from elbow in the morning. Secondly, serum was separated by centrifugation. Moreover, the positive rates of TSH, FT3, FT4, TPOAb and TgAb in serum were tested by use of Germany Roche chemiluminescence immune detection system. It finally turns out that thyroid dysfunction and positive rate of autoantibody are 7.71% and 16.19%, respectively, which have been increasing sharply along with the growth of the age, and the positive rate of female is higher than that of the male ($P < 0.001$). Besides, the prevalence rates of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism, and subclinical hypothyroidism are 0.81%, 0.68%, 1.83% and 4.38%, respectively. The prevalence rate of subclinical thyroid disease (5.07%) is significantly higher than that of clinical thyroid disease (2.64%), and the prevalence rate of clinical hypothyroidism is the highest, accounting for 56.9% of thyroid dysfunction. Positive rates of TPOAb and TgAb are 14.57% and 12.74%, respectively, while the simultaneous positive detection rate of TPOAb and TgAb is 11.12%. Through the analysis of test data, the author comes to the conclusion that thyroid dysfunction and positive rate of autoantibody have been increasing year by year, which has a great relationship with gender and age. As a result, it is important to put the determination of thyroid function and autoantibody into the routine testing and it is necessary for normal thyroid function and positive autoantibody to conduct a dynamic monitoring, follow-up or intervention in time, which is beneficial to early diagnosis, differential diagnosis and prophylaxis and treatment.

Keywords: Thyroid Hormone, Thyroid Dysfunction, Thyroid Autoantibody, Health Examination

1. Introduction

Thyroid disease is a common and frequently-occurring disease in endocrine system. With the continuous improvement of detection method and the application and popularization of automatic analyzer, using sensitive and rapid electro-chemiluminescence immunoassay (ECLIA) determination to determine thyroid hormone has become the comparatively ideal choice and development trend [1].

Thyroid diseases, including hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism, with or without significant clinical manifestations, and laboratory tests are often accompanied by thyroid dysfunction. The diagnosis shall refer to the medical history, clinical manifestations and laboratory tests, especially the serum thyroid hormone test results [2].

The level of thyroid stimulating hormone (TSH), serum free triiodothyronine (FT3), serum free thyroxine (FT4), thyroid peroxidase antibody (TPOAb) and thyroglobulin antibody

(TgAb) measured by ECLIA is very important for the diagnosis and differential diagnosis of thyroid diseases, especially the diagnosis of auto-immune thyroid diseases (AITD) [3] [4] [5]. The sensitivity and specificity of other joint detection of TSH, TPOAb and TgAb for the AITD and non-AITD differential diagnosis were higher than the single index. Therefore, the determination of serum thyroid hormone and autoantibody levels contribute to the diagnosis, differential diagnosis, efficacy observation and prognosis monitoring of AITD. Cangzhou City belongs to the water-source-originated high level iodine area [6], Guan Haixia and Li Yushu *et al* [7] [8] have conducted epidemiological investigation of thyroid disease and autoantibody in Huanghua, Cangzhou and other places. The paper focuses on the thyroid hormone and autoantibody detection in urban resident healthy population in Cangzhou, to provide objective basis for the prevention and treatment of thyroid and related diseases.

2. Materials and Methods

2.1. General Information

Collected the information of 3218 urban residents in Cangzhou, who performed physical examination, thyroid palpation, ultrasound, and thyroid function and autoantibody examination in physical examination center from January 2013 to December 2015, including 1686 women, 1532 men, with the average age of (46.29 ±10.96) years old. The patients were divided into 6 groups according to their ages: 348 cases in 20-29 years, 485 cases in 30-39 years, 634 cases in 40-49 years, 781 cases in 50-59 years, 672 cases in 60-69 years and 298 cases larger than 70 years old. Inclusion criteria: (1) No family history, past history of thyroid disease or other autoimmune diseases; (2) No history of pituitary or hypothalamic disease; (3) No goiter or obvious nodules; (4) No thyroid ultrasound abnormalities; (5) Without taking drugs affecting thyroid hormone, such as phenytoin sodium; (6) No family history of hyperlipidemia, recently did not take hypolipidemic drugs; (7) No chronic diseases (diabetes, liver dysfunction, renal dysfunction, cardiac insufficiency, chronic infectious disease, etc.), malignant neoplasms; (8) pregnancy excluded.

2.2. Laboratory Examination

Healthy subjects were fasting for more than 12h, and took

venous blood at 7:30 - 9:30 in the morning, separating serum timely. Determined the level of serum TSH, FT3, FT4, TPOAb and TGAb with Immuno-chemiluminescence Detector and supporting reagents produced by the German Roche Co., Ltd.. Diagnosis of thyroid disease is mainly based on test results of serum TSH, FT3 and FT4, the diagnostic criteria are as follows [9]: (1) hyperthyroidism: with hypothyroidism symptoms or signs, TSH<0.27mIU/L, FT3>7.1pmol and/or FT4>22pmol/L; (2) subclinical hyperthyroidism: without hyperthyroidism symptoms or signs, TSH <0.27mIU /L, normal FT3 and FT4; (3) hypothyroidism: with hypothyroidism symptoms or signs, TSH> 4.2mIU/ L, FT3<2.8pmol/L and/or FT4<12pmol/L; (4) subclinical hypothyroidism: without hyperthyroidism symptoms or signs, TSH>4.20mIU/L, normal FT3 and FT4; TPOAb and TGAb were positive of > 34 IU /mL and> 115 IU/mL, respectively.

2.3. Statistical Analysis

Adopted SPSS 17.0 software to implement statistical analysis. Used χ^2 test for comparison between groups of thyroid dysfunction and TPOAb, TGAb positive rate, as well as positive rates of autoantibody in a variety of thyroid diseases, with P <0.05 for the statistically significant. The risk of thyroid dysfunction (OR) was calculated using the unconditional Logistic Regression in patients with positive thyroid autoantibody.

3. Results

3.1. Comparison of Thyroid Dysfunction and Autoantibody Positive Rate of Healthy Subjects in Different Years

The total prevalence of thyroid dysfunction in healthy subjects of this investigation was 7.71% (248/3218). The prevalence of hyperthyroidism was 1.49% (hyperthyroidism and subclinical hyperthyroidism were 0.81%, 0.68%, respectively), and the prevalence of hypothyroidism was 6.22% (hypothyroidism and subclinical hypothyroidism were 1.83% and 4.38%, respectively). The ratio of hyperthyroidism and hypothyroidism was 1:4.2. The prevalence of clinical thyroid dysfunction (2.64%, 85/3218) was significantly lower than the prevalence of subclinical thyroid dysfunction (5.07%, 163/3218, P <0.001). See Table 1.

Table 1. Comparison of thyroid dysfunction and autoantibody positive rate of healthy subjects in different years [n (%)].

Year	N	(M/F)	Average age (Years)	Hyperthyroidism	Subclinical hyperthyroidism	Hypothyroidism	Subclinical hypothyroidism	Total
2013	879	(426/453)	45.16 ±11.52	3(0.34)	2(0.23)	6(0.68)	13(1.48)	24(2.73)
2014	1086	(514/572)	46.33 ±9.89	7(0.64)	5(0.46)	17(1.57)	42(3.87)	71(6.54)
2015	1253	(592/661)	46.27 ±10.73	16(1.28)	15(1.20)	36(2.87)	86(6.86)	153(12.21)
In total	3218	(1532/1686)		26(0.81)	22(0.68)	59(1.83)	141(4.38)	248(7.71)
χ^2		3.759	2.086	6.189	9.498	14.427	37.726	69.443
P		0.153	0.239	0.045	0.009	0.001	<0.001	<0.001

The total positive rate of thyroid autoantibody in healthy subjects was 16.19% (521/3218), and the positive rate of TPOAb and TgAb was 14.57% and 12.74%, respectively,

and the simultaneous positive detection rate of TPOAb and TgAb was 11.12%. The thyroid dysfunction, positive rate of TPOAb and TgAb and simultaneous positive detection rate of

TPOAb and TgAb were significantly increased with the increase of year, and it was significantly different in 2013 compared with 2014 and 2015 ($P < 0.001$). The gender and average There was no statistically significant difference in

groups of sex and average age ($\chi^2 = 3.759, 208.6, P = 0.153, 0.239$, respectively), and there was no significant difference in simultaneous positive detection rate of TPOAb and TgAb between 2014 and 2015 ($P = 0.199$). See Table 2.

Table 2. Positive rate of TPOAb and TgAb and simultaneous positive detection rate of TPOAb and TgAb of healthy subjects in different years [n (%)].

Year	N	(M/F)	Average age (Years)	TPOAb	TgAb	TPOAb and TgAb	
2013	879	(426 /453)	45.16 ±11.52	76(8.65)	68(7.75)	59(6.71)	203(23.09)
2014	1086	(514 /572)	46.33 ±9.89	154(14.18)	137(12.62)	126(11.60)	417(38.40)
2015	1253	(592 /661)	46.27 ±10.73	239(19.01)	205(16.36)	173(13.81)	617(49.24)
In total	3218	(1532/1686)		469(14.57)	410(12.74)	358(11.12)	
	χ^2	3.759	2.086	45.236	34.588	26.677	149.256
	P	0.153	0.239	<0.001	<0.001	<0.001	<0.001

3.2. Comparison of Positive Rate of Thyroid Dysfunction in Different Sex and Age Groups of Healthy Subjects

The ratio of male to female with thyroid dysfunction in healthy subjects was 1:5.4. The prevalence of male and female was the lowest in the age group of 20-29 (2.4% VS

6.63%), while the highest prevalence of male appeared in the age group of 40-49 (4.36%). For female, there were two peaks, in the age group of 40-49 and larger than 70, 15.48% and 16.99%, respectively. See Table 3.

Table 3. Comparison of detection rate of thyroid dysfunction in different sex and age groups [n (%)].

Age group (Year)	N(M/F)	n	Prevalence rate (%)	Hyperthyroidism (M/F)	Subclinical hyperthyroidism (M/F)	Hypothyroidism (M/F)	Subclinical hypothyroidism (M/F)	χ^2	P
20~29	348	16	4.60	1(0/1)	1(1/0)	3(1/2)	11(2/9)	3.551	=0.06
30~39	485	31	6.39	3(1/2)	2(1/1)	10(2/8)	16(3/13)	8.330	<0.004
40~49	634	65	10.25	8(3/5)	9(2/7)	17(3/14)	31(5/26)	21.200	<0.001
50~59	781	64	8.19	7(2/5)	5(1/4)	13(3/10)	39(8/31)	18.005	<0.001
60~69	672	41	6.10	4(1/3)	3(1/2)	11(2/9)	23(2/21)	19.381	<0.001
≥70	298	31	10.40	3(1/2)	2(1/1)	5(1/4)	21(2/19)	14.655	<0.001
In total	3218	248	7.71	26(8/18)	22(7/15)	59(12/47)	141(22/119)	66.950	<0.001

Note: (1) Comparison of female positive rate of thyroid dysfunction in different age groups $\chi^2 = 15.457, P = 0.009$; (2) Comparison of male positive rate of thyroid dysfunction in different age groups $\chi^2 = 3.979, P = 0.552$.

3.3. Comparison of Positive Rate of Thyroid Autoantibody in Different Sex and Age Groups of Healthy Subjects

The positive rate of TPOAb in male was significantly lower than that in female (6.92% VS 21.53%, $\chi^2 = 137.634, P < 0.001$), increased along with the increase of age, while the highest positive rate in male was in the age group of 50-59 (9.49%), and the positive rate peak in female was in the age group of larger than 70 (28.10%). The positive rate of TGAb in male was significantly lower than that in female (5.68% VS 19.16%, $\chi^2 = 131.169, P < 0.001$), while the highest positive rate in male was in the age group of 50-59 (7.32%),

and the highest positive rate in female was in the age group of larger than 70 reached 19.16%. The simultaneous positive rate of TPOAb and TgAb was 11.12%, and it was significantly lower in male than that in female (5.03% VS 16.67%, $\chi^2 = 110.002, P < 0.001$). while the highest positive rate in male was in the age group of 50-59 (5.15%), and the positive rate peak in female was in the age group of larger than 70 (20.26%). The differences of positive rate of TPOAb, TGAb and simultaneous positive rate of TPOAb and TgAb between age groups larger than 30 and younger than 30 in male and female were significant ($P < 0.001$). See Table 4.

Table 4. Comparison of positive rate of thyroid autoantibody in different sex and age groups of healthy subjects [n (%)].

Age Group	N	TPOAb (positive)		TgAb (positive)		TPOAb and TgAb (positive)		χ^2	P
		M	F	M	F	M	F		
20~29	348	6(3.59)	19(10.50)	7(4.19)	24(13.26)	5(1.80)	15(8.29)	23.012	<0.001
30~39	485	14(6.06)	50(19.69)	12(5.19)	41(16.14)	11(2.60)	35(13.78)	61.170	<0.001
40~49	634	21(7.05)	71(21.13)	15(5.03)	62(18.45)	13(3.02)	56(16.67)	106.731	<0.001
50~59	781	35(9.49)	94(22.82)	27(7.32)	87(21.12)	26(5.15)	76(18.45)	117.186	<0.001
60~69	672	21(6.52)	86(24.57)	19(5.90)	75(21.42)	15(4.66)	68(19.43)	160.656	<0.001
≥70	298	9(6.21)	43(28.10)	7(4.83)	34(22.22)	7(4.83)	31(20.26)	90.506	<0.001
In total	3218	106(6.92)	363(21.53)	87(5.68)	323(19.16)	77(5.03)	281(16.67)		

Note: (1) Comparison of total positive detection rate of thyroid autoantibody between different male and female $\chi^2 = 535.427, P < 0.001$; (2) Comparison of female positive detection rate of thyroid autoantibody in different age groups $\chi^2 = 16.310, P = 0.006$; (3) Comparison of male positive detection rate of thyroid autoantibody in different age groups $\chi^2 = 78.343, P < 0.001$.

3.4. Comparison of Positive Rate of Thyroid Autoantibody in Different Age Groups of Healthy Subjects

The positive rate of thyroid autoantibody in all age groups was significantly different ($P < 0.05 \sim < 0.001$). See Table 5.

Table 5. Comparison of positive rate of thyroid autoantibody in different age groups of healthy subjects.

Age Group	N	TPOAb (positive)		TgAb (positive)		TPOAb and TgAb (positive +)	
		χ^2	P	χ^2	P	χ^2	P
20~29	348	6.210	0.013	8.802	0.003	4.493	0.034
30~39	485	19.605	<0.001	14.894	<0.001	11.459	<0.001
40~49	634	25.253	<0.001	26.652	<0.001	24.652	<0.001
50~59	781	25.086	<0.001	27.735	<0.001	22.282	<0.001
60~69	672	40.813	<0.001	33.610	<0.001	33.797	<0.001
≥70	298	24.782	<0.001	18.984	<0.001	15.939	<0.001

3.5. Comparison of Positive Rate and OR of Autoantibody in Subjects with Thyroid Dysfunction

The positive rate and OR of TPOAb, TgAb and simultaneous positive rate of TPOAb and TgAb between groups of hyperthyroidism, subclinical hyperthyroidism,

hypothyroidism and subclinical hypothyroidism were significantly different ($P < 0.001$), with the highest of hypothyroidism, followed by hyperthyroidism, subclinical hypothyroidism and subclinical hyperthyroidism. See table 6.

Table 6. Comparison of positive rate and OR of autoantibody in subjects with thyroid dysfunction.

Group of disease	N	TPOAb		TgAb		TPOAb and TgAb	
		Positive [n(%)]	OR	Positive [n(%)]	OR	Positive [n(%)]	OR
Hyperthyroidism	26	15(57.69)	9.582	14(53.85)	10.433	12(46.15)	8.602
Subclinical hyperthyroidism	22	5(22.73)	2.067	6(27.23)	3.354	4(18.18)	2.230
Hypothyroidism	59	43(72.88)	18.885	37(62.71)	15.040	31(52.54)	11.11
Subclinical hypothyroidism	141	36(25.53)	2.409	40(28.37)	3.542	31(21.99)	2.828
Population without thyroid dysfunction		2970(12.46)	1.000	3122(10.06)	1.000	3145(9.06)	1.000
χ^2		2115.615		2125.258		2371.196	
P		<0.001		<0.001		<0.001	

4. Discussions

The thyroid gland is the largest endocrine gland in the human body, and its secreted hormones play an important role in regulating human growth, development and metabolism. In recent years, with the changes in diet, increased mental stress, accelerated pace of life and the increase of environmental factors influencing on the thyroid function, the incidence of thyroid disease is on the rise. The study found that, the thyroid dysfunction, positive rate of TPOAb and TgAb and simultaneous positive detection rate of TPOAb and TgAb were significantly increased with the increase of year, and it was significantly different in 2013 compared with 2014 and 2015 ($P < 0.001$). The above-mentioned results are consistent with published literature [10] [11] [12], including that the incidence of thyroid disease and TPOAb, TgAb positive rate showed a significant rising trend, and the thyroid autoantibody baseline level of middle-aged and elderly people increased year by year, as well as there was a significant difference of TgAb and TPOAb between 3 years, with a trend of increase along with the year, which further confirmed that thyroid autoantibody was involved in the pathogenesis of AITD.

There were some differences in the epidemiological findings of thyroid disease among different authors. Guan Haixia *et al* [7] found that the prevalence of thyroid dysfunction in a certain village in Huanghua City was

10.34%, while the prevalence of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism were 1.21%, 1.12%, 1.96% and 6.05%, respectively. The ratio of prevalence of hyperthyroidism to hypothyroidism (including subclinical hypothyroidism) was 1:3.4. The prevalence of subclinical hypothyroidism was the highest, 1.41 times of other thyroid diseases. Yuan Shuai *et al* [13] reported that the prevalence of thyroid dysfunction in Shanghai residents was 3.98%, while the prevalence of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism were 0.47%, 0.62%, 0.34% and 2.55%, respectively. The ratio of prevalence of hyperthyroidism to hypothyroidism was 1:2.6. The prevalence of subclinical hypothyroidism was the highest, 1.78 times of other thyroid diseases. Wen Xiao *et al* [14] reported that the prevalence of thyroid dysfunction was 8.42%, while the prevalence of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism were 0.45%, 0.92%, 0.27% and 6.78%, respectively. The ratio of prevalence of hyperthyroidism to hypothyroidism was 1:5.1. The prevalence of subclinical hypothyroidism was the highest, 4.13 times of other thyroid diseases. Results of this study showed that the prevalence of thyroid dysfunction was 7.71%, while the prevalence of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism were 0.81%, 0.68%, 1.83% and 4.38%, respectively. The ratio of prevalence of hyperthyroidism to hypothyroidism was 1:4.2.

The prevalence of subclinical hypothyroidism was the highest, 1.32 times of other thyroid diseases, which is consistent with the highest prevalence of subclinical hypothyroidism [9]. There are some differences in the prevalence of thyroid dysfunction and the proportion of various thyroid diseases in different reports, which may be associated with the difference of the number of sample population, sex ratio, age distribution, iodine nutritional status, genetic background, geographical environment, detection method and diagnostic criteria and other factors, but most believed that hypothyroidism, especially the subclinical hypothyroidism had the highest prevalence, while female was higher than male.

The prevalence of thyroid dysfunction varies with sex and age. Results of this study showed that, the prevalence of thyroid dysfunction (3.2%) was significantly lower in male than that in female (11.80%, $P < 0.001$), with a ratio of 1:4.1. The prevalence of hyperthyroidism, subclinical hyperthyroidism, hypothyroidism and subclinical hypothyroidism in female were 1.07%, 0.89%, 2.79% and 7.06%, respectively, and those of male were 0.52%, 0.46%, 0.78% and 1.44% respectively. The prevalence of hyperthyroidism was higher than that of subclinical hyperthyroidism, with the highest prevalence of subclinical hypothyroidism, followed by subclinical hyperthyroidism, hypothyroidism, subclinical hypothyroidism, significantly lower in male than in female ($P < 0.001$). The lowest prevalence of thyroid dysfunction both in male and female was in the age group of 20-29 (2.4% and 6.63%, respectively), and the highest prevalence of male appeared in the age group of 40-49 (4.36%), while for female, there were two peaks, in the age group of 40-49 and larger than 70, 15.48% and 16.99%, respectively, which is consistent with the report of Wu Xiaoqing et al [15], that is, the prevalence of male thyroid disease was significantly lower than that of women, increased with age, and differences in all age groups were statistically significant ($P < 0.01$).

Research material [16] [17] [18] indicated that, the prevalence of hypothyroidism was 6%-17%, while female was higher than the male. With the increase of TSH in serum, the prevalence of hypothyroidism was 7.3% to 78% within 10 years. With the high sensitivity TSH detection technology, the prevalence of hyperthyroidism was as high as 20%. The prevalence of hypothyroidism among the elderly was higher than that of the young, and the prevalence of hypothyroidism in the elderly people over 60 years (6.28%) was about 1.5 times that of the middle-aged and young people. The prevalence of hypothyroidism in female over the age of 50 was 8% to 11%, up to 21% when reaching 74 years or elder. Follow-up of 154 cases of female patients with hyperthyroidism found that, 1/3 of subclinical hypothyroidism will turn into hypothyroidism 10 years later. Results of this study found that, the positive rate of female thyroid dysfunction was significantly different in different age groups ($\chi^2=15.457$, $P=0.009$), and the prevalence of subclinical hypothyroidism was the highest (4.38%), while the prevalence of subclinical hypothyroidism in age group of larger than 40 was significantly higher than that of the age

group of younger than 40. The prevalence of male subclinical hypothyroidism increased along with the increase of age from 20 to 59 years old, reaching a peaking in the age of 50-59 (4.36%). The prevalence of subclinical hypothyroidism in female was 5.41 times of that of male, accounting for 84.4% (119/141). The results of the study were consistent with the prevalence of subclinical hypothyroidism in the general population of China of 0.91%~6.05%, increased with age, female predominated [19], and the study result of that the clinical and subclinical hypothyroidism risk may be increased with the iodine intake [20].

TPOAb and TGAb are the markers of secondary immune response after thyroid injury. It is an important index for the diagnosis of AITD and determination of etiology of primary hypothyroidism. The positive rate of serum TPOAb and TgAb in the general population were 10% ~ 15% and 3% ~ 11.5%, respectively, reaching 11.8% and 11.9% in age of 30-40, 20.2% and 22.4% in 60-70, which were significantly higher in female than in male, low positive of two autoantibodies simultaneously [21]. Li Yushu et al [8] carried out a study on thyroid autoantibody in 3761 residents of 3 Chinese rural communities, and found that the positive rate of TPOAb and TGAb were 9.81% and 9.09%, respectively, which in female (11.71%, 11.21%) were significantly higher than those in male (4.07% and 2.68%). A survey of 6112 residents showed that TPOAb and / or TgAb levels were elevated in 17.42% of female with normal serum thyroid hormone levels, approximately 2.91 times higher than male (5.99%) [13]. The total positive rate of thyroid autoantibody in healthy subjects was 16.19% (521/3218), and the positive rate of TPOAb and TgAb was 14.57% and 12.74%, respectively, which were consistent with results reported by Li Haiqiang et al [22], the positive rate of TPOAb and TgAb in adults were 15.0% and 13.0%, respectively, and the positive rate of autoantibody was 17.96% in 1 220 healthy subjects in Deyang, Sichuan Province [23], and higher than the results reported by Guan Haixia et al [7], that positive rate of TPOAb and TgAb were 11.6% and 9.3%. The study also found that the positive rate of TPOAb in female was significantly higher than that in male (21.53% VS 6.92%, $\chi^2 = 137.634$, $P < 0.001$), with the peak appearing in the age equal to or larger than 70 (28.10%), and the highest positive rate of TPOAb in male appeared in the age of 50-59 (9.49%). The positive rate of TGAb in female was significantly higher than that in male (21.16% VS 5.68%, $\chi^2=131.169$, $P < 0.001$), with the peak appearing in the age equal to or larger than 70 (22.22%), and the highest positive rate of TGAb in male appeared in the age of 50-59 (7.32%). The positive rate of TPOAb, TgAb in female was significantly higher than that in male, consistent with the above research results [8] [12] [13]. The simultaneous detection rate of TGAb and TPOAb in female was significantly higher than that in male (16.67% VS 5.03%, $\chi^2=110.002$, $P < 0.001$), with the peak appearing in the age equal to or larger than 70 (20.26%), and the highest simultaneous detection rate of TGAb and TPOAb in male appeared in the age of 50-59 (5.15%). The positive rates of TPOAb, TGAb and simultaneous detection rate of TPOAb

and TgAb in male and female and different age groups increased with the increase of age, of which the difference were statistically significant ($P < 0.001$).

TPOAb and TGAb positive easily lead to thyroid dysfunction. Prummel *et al* [24] found that positive rate of TPOAb in population with normal thyroid function may reach 12% to 26%, often accompanied by TGAb positive, of which positive rates were similar [25], and patients with high titers of TGAb were more likely to develop hypothyroidism [26]. In this study, the positive rates of TPOAb, TGAb and simultaneous detection rate of TPOAb and TgAb were 39.92% (99/248), 39.11% (97/248) and 31.45% (78/248) respectively in the patients with thyroid dysfunction, which is consistent with the results reported by Zhao Rencheng [27], subclinical hypothyroidism patients with autoantibody positive accounting for 1/3 to 1/2, indicating that thyroid autoantibody involved in the pathogenesis. The positive rate and OR of TPOAb, TGAb and simultaneous detection rate of TPOAb and TgAb of hypothyroidism were the highest, followed by hyperthyroidism, subclinical hypothyroidism and subclinical hyperthyroidism, which is consistent with the results in Beijing reported by Wen Xiaoheng *et al* [28], but the positive rate of autoantibody and OR of different thyroid diseases were different, for example, the positive rate and OR of TPOAb, TGAb and simultaneous detection rate of TPOAb and TgAb of subclinical hyperthyroidism and hyperthyroidism were higher than Beijing, while the TGAb of hyperthyroidism and simultaneous detection rate of TPOAb and TgAb and OR of hypothyroidism were lower than Beijing, which may be related to geographical area, number of study cases, sex ratio and diagnostic criteria.

TPOAb, TgAb-positive patients with subclinical hyperthyroidism is easy to evolve into hypothyroidism. A follow-up study of 4 to 8 years found that 20% to 50% of patients with subclinical hyperthyroidism would evolve into hypothyroidism. Patients who are larger than 65 years old, especially thyroid autoantibody-positive, the probability of subclinical hypothyroidism evolving into hypothyroidism within 4 years is up to 80% [29], indicating that thyroid autoantibody is a risk factor for thyroid dysfunction [30]. The simultaneous detection rate of TPOAb and TGAb is lower than that of any single antibody in population with thyroid dysfunction, but it is more likely to lead to the occurrence of AITD, indicating that the two antibodies play a synergistic role in the thyroid damage. Gao Jianhua *et al* [31] carried out follow-up on subjects with normal thyroid function but autoantibody-positive and found that the prevalence of hypothyroidism and hyperthyroidism after 1 year was 5.2% and 3.7%, respectively. The prevalence of hypothyroidism in TPOAb-positive patients (5.5%) was significantly higher than that in TPOAb-negative patients (31% TPOAb (0.5%), which is consistent with the results that subclinical hypothyroidism is more likely to occur in TPOAb and TGAb positive patients [32]. Whickham *et al* [33] had conducted a follow-up for 20 years and found that antibody-positive patient with normal thyroid function evolved into hypothyroidism at the rate of 2% ~ 4% every year. The peak

of antibody appeared in the age period from 60 to 70 (70 excluded), 10 years earlier than the peak of incidence of hypothyroidism [28], confirmed that thyroid damage caused by autoantibody was a potential, chronic progressive process.

5. Conclusion

Cangzhou City, as a water-source-originated high level iodine area, with high detection rate of thyroid dysfunction and autoantibody-positive rate, especially the prevalence of subclinical hypothyroidism, not related to the sex and age. Usually subclinical hypothyroidism does not have obvious clinical manifestations [34], it is easy to be ignored, found mostly in thyroid function tests. TPOAb and TGAb were important indexes in the diagnosis of AITD. TPOAb in blood of AITD susceptible population will increase firstly, and then TSH increases, changes of FT4 and other thyroid hormone appear later. Therefore, it is important to incorporate the thyroid function and autoantibody testing as a routine physical examination of healthy people. Strengthen the screening of thyroid disease is conducive to early diagnosis and differential diagnosis, especially the dynamic monitoring and follow-up for autoantibody-positive patients with normal thyroid function will contribute to disease prevention and treatment.

Acknowledgements

This study was supported by a Natural Science Project of Cangzhou Medical College (No. 14Z001), a Science and Technology Program Fund Project of Hebei in China (No. 15277796D).

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Biography



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