Original Article

Is there a relationship between the urinary iodine of pregnant and diabetic patients?

Mine Öztürk

Department of Endocrinology and Metabolism, KTO Karatay University Medicine Faculty Hospital, Konya, Turkey

Abstract

Objectives: We investigated the iodine status in this study in pregnant women, diabetic women–men, and nondiabetic men–women living in our region. **Methods:** A total of 385 cases who applied to the endocrine clinic between 2015 and 2020 were reviewed retrospectively. The gender, age, free T3 (pg/ml), free T4 (ng/dl), TSH (μIU/mL), anti-TPO antibody (IU/ml), anti-thyroglobulin antibody (IU/ml), and random urine iodine concentration (μg/L) levels of cases were recorded. The cases were grouped as pregnant, female, male, diabetic female, and diabetic male. Cases with overt thyroid disease, heart failure, liver failure, and kidney failure were excluded. **Results:** There were 6.75% (n = 26) pregnant, 54.8% (n = 211) nondiabetic female patients, 18.9% (n = 73) diabetic female patients, 12.7% (n = 49) nondiabetic male, and 4.15% (n = 16) diabetic male patients. The random urinary iodine level was significantly higher in nondiabetic women (112.9 ± 77.21) and diabetic women (140.7 ± 97.8) than in pregnant women (77.8 ± 31.8) (P = 0.00 and P = 0.03). There was no significant relationship between random urine levels of pregnant women and nondiabetic men (104.1 ± 82.6) (P = 0.16). The random urinary iodine level was significantly higher in diabetic men (170.0 ± 112.1) than in pregnant women (P = 0.00). **Conclusions:** In our region (xxx Region), pregnant women had iodine deficiency. The iodine level in men and women was very close to the lower limit. The urinary iodine level was higher in diabetic women and diabetic men than in both pregnant women and nondiabetic women and nondiabetic men. The results brought us the question: Could the high spot urinary iodine level in diabetic patients be a clue to nephropathy?

Keywords: Diabetic men, diabetic women, pregnant, urinary iodine

Introduction

Iodine is the most important element for hormone synthesis in the thyroid gland.[1] This situation is necessary for fetal neurological development.[2] Living in areas of iodine deficiency in pregnant women is particularly at risk, such as Turkey. The harmful effects of severe iodine deficiency are known.[2] Severe iodine deficiency has been associated with pregnancy and neonatal losses.[3] The median urinary iodine concentration is looked at to assess the iodine status of a population.[4]

Address for correspondence: Dr. Mine Öztürk, Endocrinology - Metabolism and Internal Medicine, KTO Karatay University Medicine Faculty Hospital, Feritpaşa Mah. Gürz Sok. No. 1 Selçuklu, Konya, Turkey.
E-mail: drmineozturk@gmail.com

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During pregnancy, metabolic changes occur in the thyroid gland.[5] Iodine intake increases by 50% in pregnant women.[6] Thyroxine-binding globulin increases during pregnancy.[5,6] Total T3 and T4 levels also rise during pregnancy.[6] With the action of human chorionic gonadotropin, thyroid-stimulating hormone is suppressed, and thyroid hormones increase.[5,6] Deiodinization of T3 and T4 increases in the placenta. Thus, both the production and destruction of T3 and T4 are increased.[6]

Due to the increase in glomerular filtration during pregnancy, renal iodine excretion increases.[6] Thyroid hormone synthesis and iodine passage to the fetus increases. For all these reasons, iodine need increase in pregnant women.[6] In cases of iodine deficiency, this metabolic adjustment cannot be achieved in a healthy way.[5] Goiter may occur in the thyroid gland.[5] Iodine deficiency in pregnant women causes goiter not only in the mother but also in

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the baby.[5] It may cause neuropsychiatric and mental retardation in the fetus.[5] Early iodine supplementation for pregnant women prevents goitrogenesis in the mother and fetus.[5]

In case of iodine deficiency, iodine uptake in the thyroid gland increases up to 80%.[6] This ratio remains at 10% in sufficient iodine intake.[6] More than 90% of dietary iodine is excreted in urine.[6] Measurement of urinary iodine concentration shows the amount of iodine taken by the person in the last 24 hours.[6]

Materials and Methods

In our study, 385 cases who applied to the endocrine clinic between 2015 and 2020 were reviewed retrospectively in xxx. The Chemiluminescent Microparticle Immunological Examination (CMIA) method was used with ARCHITECT i2000SR (ABBOTT, USA) and inductively coupled plasma mass spectrometry (ICP-MS) device for the tests. The gender, age, free T3 (pg/ml), free T4 (ng/dl), TSH (μIU/mL), anti-TPO antibody (IU/ml), anti-thyroglobulin antibody (IU/ml), and random urine iodine concentration (μg/L) levels of cases were recorded. The cases were grouped as pregnant, female, male, diabetic female, and diabetic male. Cases with overt thyroid disease, heart failure, liver failure, and kidney failure were excluded. Iodine deficiency was accepted as random urine iodine concentration of less than 150 μg/L in pregnant women, and random urine iodine concentration less than 100 μg/L in other cases.[7] Approval was obtained from the Ethics Committee of xxx University Medical School for this study.

Statistic

The data were analyzed with windows compatible SPSS version 22. $P < 0.05$ was accepted as the limit of significance. The compliance of the data with the normal distribution was determined with the Kolmogorov–Smirnov test. In comparison of variables that are not suitable for normal distribution, the Mann–Whitney U test was used for two groups, and the Kruskal–Wallis test was used for more than two groups. Generally preferred: Spearman correlation analysis was used for the correlation analysis of numerical variables.

Results

A total of 385 cases who came to the endocrine clinic between 2015 and 2020 were included in the study. There were 6.75% (n = 26) pregnant, 54.8% (n = 211) nondiabetic female patients, 18.9% (n = 73) diabetic female patients, 12.7% (n = 49) nondiabetic male, and 4.15% (n = 16) diabetic male patients. Spot urine iodine mean of pregnant women was 77.8 ± 31.8. The random urinary iodine average of women without diabetes was 112.9 ± 77.21. Iodine level was significantly higher in nondiabetic women than pregnant women (P = 0.00). The random urinary iodine average of diabetic women was 140.7 ± 97.8. Iodine level was significantly higher in diabetic women than in pregnant women (P = 0.03). The random urine iodine mean of nondiabetic men was 104.1 ± 82.6. There was no significant relationship between pregnant women and nondiabetic men (P = 0.16). The random urinary iodine average of diabetic men was 170.0 ± 112.1. Iodine level was significantly higher in diabetic men than in pregnant women (P = 0.00). There was no significant relationship between random urine levels of nondiabetic men and nondiabetic women (P = 0.57). There was a significant relationship between random urine levels of diabetic men and diabetic women (P = 0.00). Random urine iodine levels were significantly higher in diabetic men than in diabetic women [Table 1].

Discussion

We investigated the iodine status in this study in pregnant women, diabetic women, diabetic men, nondiabetic men, and women living in our region (xxx Region). Table salt with legal regulations enacted in 2000 in Turkey was iodized. The aim of this study is to see the positive effect of this iodination on iodine deficiency, if any, in pregnant women; to discuss routine iodine supplementation for all pregnant women; to investigate if there is such an iodine deficiency in diabetics as in pregnant women. If there is a high rate of iodine deficiency in diabetics; can we reduce the formation of thyroid nodules in diabetic patients with iodine supplementation; we wondered. If we go further; if iodine deficiency is not seen in diabetic patients, could this be a sign of diabetic nephropathy?

In our country, primary care physicians work in the field of preventive medicine rather than treatment. They advise their patients on the iodination quality of salt and the use of iodized salt to the patient. Primary care physicians cannot check urinary iodine and cannot provide individual iodine supplements to patients.

Table 1: Comparison of pregnant women with diabetic women and men in terms of random urine iodine concentration

	Random urine iodine concentration (μg/L) mean±std deviation	P*
Pregnant (n: 26)	77.8±31.8	0.00
Woman (n: 211)	112.9±77.21	
Pregnant (n: 26)	77.8±31.8	0.03
Diabetic woman (n: 73)	140.7±97.8	
Pregnant (n: 26)	77.8±31.8	0.16
Man (n: 49)	104.1±82.6	
Pregnant (n: 26)	77.8±31.8	0.00
Diabetic man (n: 16)	170.0±112.1	
Pregnant (n: 26)	77.8±31.8	0.16
Woman + Man (n: 260)	111.7±79.3	
Pregnant (n: 26)	77.8±31.8	0.00
Diabetic woman+ Diabetic man (n: 89)	146.0±100.6	
Diabetic woman (n: 73)	140.75±97.87	0.00
Diabetic man (n: 16)	170.04±112.16	
Woman (n: 211)	112.9±77.2	0.57
Man (n: 49)	104.1±82.6	

*Spearman correlation

The improvement in iodine status in the UK over the past 100 years has been described as incidental, and attention is drawn to the recent iodine deficiency.[8]

The iodine status of young girls was found to be close to the lower limit (the average iodine concentration 111 μg/L) in Ireland, where iodine supplement was not applied.[9] In the data obtained from many studies in Europe, it was seen that pregnant women and women were at risk of iodine deficiency.[10]

Turkey is a country where iodine deficiency is a public health problem and endemic goiter.[6] In 2007, in Turkey, urine iodine concentration was measured in school-age children. Urine iodine concentration was found to be 76 μg/L.[6]

Iodine studies in pregnant women in Turkey are limited. In these studies, the median urinary iodine concentration in pregnant women ranges between 77-149-7 μg/L.[6] Iodine deficiency was found in 49–90% of pregnant women.[6] The reason for this wide range may be diet, environmental factors, and metabolic state during pregnancy.

Moderate iodine deficiency during pregnancy causes hypothyroidism in the mother and fetus and increases thyroid-stimulating hormone.[11]

The average urinary iodine concentration in pregnant women in a new study conducted in Turkey, 94 microg/L was found.[12] According to this study, the prevalence of iodine deficiency in pregnant women was 74%.[12]

In a region where salt iodization program was applied, iodine deficiency was observed in 40.9% of pregnant women.[13]

In a study conducted in Tibette, urinary iodine levels were found to be higher in urban areas than in rural areas.[14]

Contrary to our study, the average urinary iodine was found to be high (381μg/L) in Colombia, where salt has been compulsorily iodinated for 50 years.[15]

In the Western region of Saudi Arabia, the average iodine concentration was found to be 112.9 μg/L. It showed mild iodine deficiency.[16]

The mean urine concentration of iodine was found to be 81.6 μg/L in pregnant women in the first trimester in Ankara.[17]

In Taiwan, there was an iodine deficiency in pregnant women (The mean urine concentration of iodine was 124 μg/L).[18]

In our study, urine iodine concentration was 146.0 μg/L in diabetic patients. However, in a study conducted in Japan, this value was reported as 115.4 μg/L.[19] This study found that diabetic patients with low iodine levels had a higher likelihood of diabetic kidney disease.[19]

In a study conducted in East India, urine iodine concentration was found above 100 μg/L in all 100 diabetic patients.[20] In another study, urinary iodine concentration was found to be 152 μg/L in type 1 diabetics.[21] In one study, mild iodine deficiency was less common in diabetics (38.8%) than in nondiabetic subjects (55.1%).[22] In another study, the mean urine iodine concentration in gestational diabetics (21.69 ng/mL) was again higher than the control group (18.38 ng/mL).[23] In a study conducted in Saudi Arabia, unlike our study, urine iodine concentration was found to be low in diabetic patients.[24]

In a study investigating hypothyroidism in patients with diabetic nephropathy, serum iodine level was found to be higher than in patients with nondiabetic nephropathy.[25] The reason for this is the impairment of iodine processing in the kidneys and the prolonged Wolff–Chaikoff effect.[25]

Interestingly, in our study, contrary to expectations, urinary iodine levels were high in diabetic patients. There was not enough literature on this subject. Could iodine excess be the early clue of kidney failure, what could be the effects of this excess on the thyroid gland? It seems that there is a need for new studies that will open our horizons.

Random urine iodine concentration measurement is recommended in community screenings.[6] However, individual measurements are not recommended. This is the most important limitation of our study. The low number of pregnant cases who were examined for iodine and the study being from a single region are other limitations of the study.[6]

As can be understood from this article, iodine deficiency is a public health problem almost all over the world. Vulnerable groups such as pregnant women and children are particularly under greater threat. To prevent this threat, it may be a wise approach to include pregnant women and children in iodine supplementation programs by primary care physicians for a certain period of time in iodine deficiency regions. This form of treatment should not be in the form of iodization of salts and breads, but rather in the form of individual supplements.

In addition, iodine status should be evaluated not only in sensitive groups such as pregnant women and children, but also in chronic diseases such as heart disease, diabetes, and kidney failure, and the method should be determined according to the results.

Conclusions

Despite all the measures taken in our region (xxx Region), pregnant women had iodine deficiency. The iodine level in men and women was very close to the lower limit. Interestingly, the urinary iodine level was higher in diabetic women and diabetic men than in both pregnant women and nondiabetic women and nondiabetic men. The results brought us the question: Could the high spot urinary iodine level in diabetic patients be a clue

to nephropathy? What could be the effects of this excess iodine on the thyroid gland?

What should we do?

Ethics

For this study received permission from xxx University, Faculty of Medicine Ethics Committee.

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Conflicts of interest

There are no conflicts of interest.

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