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An assessment of the effectiveness of iodine prophylaxis in pregnant women — analysis in one of reference gynaecological-obstetric centres in Poland

Ocena skuteczności profilaktyki jodowej w ciąży — analiza przeprowadzona w jednym z referencyjnych ośrodków ginekologiczno-położniczych w Polsce

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Abstract

Introduction: Iodine deficiency in pregnant women, even of a mild degree, may have adverse effects on both the mother and the foetus. Despite the obligatory model of functioning iodine prophylaxis in Poland, the iodine supply in women during pregnancy and physiological lactation is insufficient. Therefore, those groups should take additional iodine supplementation at a dose of 150–200 μg/day. The aim of this study was to examine the effectiveness of iodine prophylaxis in pregnant women in Poland.

Material and methods: The assessment of iodine supply, urine iodine concentration (UIC) in the spot urine sample, as well as levels of TSH, fT4, thyroid antibodies, and thyroid volume, was performed at one time point in 115 women (7 in the 1st trimester, 61 in the 2nd trimester, and 47 in the 3rd trimester).

Results: Only 45.2% of women were taking additional amounts of iodine at any time of pregnancy, and the median ioduria was 79.6 μg/L, which pointed to an insufficient supply of iodine. The percentage of women using iodine supplementation increased with the length of pregnancy, which indicates that the recommendations are implemented too late. In women who took iodine supplementation, ioduria was significantly higher than in those not applying iodine supplementation (median 129.4 μg/L *vs.* 73.0 μg/L; $p < 0.001$); however, this was still below recommended values.

Conclusions: The effectiveness of iodine prophylaxis in pregnant women in Poland, evaluated on the basis of the analysis of randomly chosen sample, is not satisfactory in terms of compliance with the recommendations and, possibly, the quality of supplementation. **(Endokrynol Pol 2015; 66 (5): 404–411)**

Key words: *iodine prophylaxis; pregnant women; iodine deficiency; ioduria*

Streszczenie

Wstęp: Niedobór jodu u kobiet w ciąży, nawet łagodnego stopnia, może powodować niekorzystne następstwa zarówno u matki, jak i u płodu. Mimo obligatoryjnego modelu profilaktyki jodowej funkcjonującego w Polsce, podaż jodu u kobiet w okresie ciąży i fizjologicznej laktacji jest niewystarczająca. Dlatego osoby te powinny przyjmować dodatkową suplementację jodu w dawce 150–200 μg/dobę. Celem pracy była ocena skuteczności profilaktyki jodowej u kobiet w ciąży w Polsce na podstawie analizy podaży jodu oraz jodurii.

Materiał i metody: Oceniono w jednym punkcie czasowym podaż jodu, stężenie jodu w przygodnej próbce moczu, stężenia TSH, fT4 i przeciwciał przeciwtarczycowych oraz ultrasonograficznie objętość tarczycy u 115 kobiet (7 w pierwszym trymestrze, 61 w drugim trymestrze oraz 47 w trzecim trymestrze).

Wyniki: Tylko 45,2% kobiet przyjmowało dodatkowe ilości jodu, a mediana jodurii u wszystkich kobiet wyniosła 79,6 μg/l, co wskazuje na niedostateczną podaż jodu. Odsetek kobiet przyjmujących suplementację jodu wzrastał wraz z długością ciąży, co sugeruje, że rekomendacje są wdrażane zbyt późno. U kobiet przyjmujących suplementację jodu, joduria była istotnie wyższa niż u kobiet nieprzyjmujących dodatkowych ilości jodu (mediana 129,4 μg/l *vs.* 73,0 μg/l; $p < 0{,}001$), jednak wartości te wciąż były niższe niż rekomendowane.

Wnioski: Skuteczność profilaktyki jodowej u kobiet w ciąży w Polsce, oceniona na podstawie analizy przekrojowej przypadkowo wybranych osób, nie jest zadowalająca pod względem przestrzegania zaleceń, i prawdopobnie, jakości prowadzonej suplementacji. **(Endokrynol Pol 2015; 66 (5): 404–411)**

Słowa kluczowe: *profilaktyka jodowa; kobiety w ciąży; niedobór jodu; joduria*

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Introduction

Iodine is an essential micronutrient required for thyroid hormone synthesis. Thyroid hormones not only ensure the proper functioning of the body, but during foetal life and childhood they are also responsible for the proper development of the whole organism, the nervous system included [1, 2].

It is documented that iodine deficiency, especially when severe, is one of the most significant, preventable causes of mental retardation in the world [3]. Therefore, the elimination of iodine deficiency has been the aim of actions undertaken by international communities in recent years [4]. Each country should conduct iodine prophylaxis based on the model, which should be developed taking into account its individual circumstances. The most common and relatively inexpensive way of conducting iodine prophylaxis is the use of iodised salt — mandatory or optional [5]. Thanks to iodine prophylaxis, severe iodine deficiency is now less and less common [6]. In contrast, mild-to-moderate iodine deficiency is still considered a major public health concern, even in some developed countries [7].

Pregnant women are particularly susceptible to iodine deficiency because of the higher requirement during pregnancy [8]. Thyroid hormone synthesis and daily iodine intake increase by approximately 50% in the first few weeks of pregnancy [9].

Therefore, guidelines recommend an almost twofold increase in dietary iodine intake during pregnancy to maintain optimal thyroid hormone synthesis in the mother and the foetus [10–12]. In accordance with the recommendations adopted in Poland, pregnant and lactating women should receive iodine supplementation at a dose of 150–200 μg of iodine/day [12]. Due to the fact that the significantly increased demand for iodine occurs in the first trimester of pregnancy, it is postulated that iodine supplementation should begin several months before conception [12]. It was calculated by Zimmermann [13] that the total iodine amount of 220–250 μg/day consumed by pregnant women corresponds to a urine iodine concentration of 135–150 μg/L. Nevertheless, the total iodine supply during pregnancy should be at least 250 μg daily [10–12].

Although severe iodine deficiency in pregnancy is well known to result in adverse childhood outcomes, such as cretinism and mental retardation [13], less is known about the effects of mild-to-moderate deficiency [14].

For example, Bath et al. [15] assessed the association between maternal iodine status and child IQ at age 8 years and reading ability at age 9 years. Children of mothers with ioduria below 150 μg/g (iodine to creatinine ratio) were more likely to be in the smallest quartile for verbal IQ, reading accuracy, and reading comprehension than were those of mothers with a ratio of 150 μg/g or more. These results were even worse when the ioduria was below 50 μg/g [15]. In a recently performed study in the Netherlands, classified as an iodine-sufficient area, an association between low maternal urinary iodine and impaired executive function in offspring has been revealed [16]. In contrast, Ghassabian et al. [17] found no relation between maternal urine iodine concentration (UIC) in early pregnancy and children's language comprehension at 6 years.

Despite the methodological difficulties of capturing the relationship between the iodine supplementation and cognitive function in children, the obtained data show the importance of optimal iodine intake during early gestation and emphasise the risk that mild iodine deficiency can pose to the developing infant, even in areas classified as iodine sufficient.

The current model of iodine prophylaxis in Poland was developed by the Polish Council for Control of Iodine Deficiency Disorders (PCCIDD) [18] and contains obligatory iodisation of household salt (20–40 mg KI/1 kg), neonates' formula (10 μg/100 mL of milk), and additional supplementation for pregnant and breastfeeding women with 150–200 μg of iodine [18].

As in other countries, as well as in Poland, both iodine compounds, i.e. KI and KIO_3, are used [19], although ongoing experiments have created certain controversies in terms of the safety of the latter iodine carrier [20, 21].

The effectiveness of iodine prophylaxis in Poland conducted since 1997 has been confirmed in a number of studies [22–25]. The results were quite satisfactory, especially when the incidence of goitre in children (37.5% *vs.* 1.4%) or median value of ioduria (45.2 *vs.* 101.1 μg/L) observed before and after the introduction of prophylaxis were compared [26].

However, there was some concern over the fact that the above ioduria levels, although remaining in reference ranges, oscillated around the borderline values [26], which in the case of dietary salt restriction may again lead to too little iodine intake.

The World Health Organisation (WHO) has issued a recommendation that increased salt consumption, as a risk factor for hypertension, atherosclerosis, myocardial infarction, and stroke, should be restricted [27, 28].

Reducing the amount of sodium in a diet (below 5 g/day) is one of the main recommendations for lifestyle modification in patients with hypertension [29], but the European Society of Hypertension and the European Society of Cardiology recommend salt intake of 5–6 g/day even in the general population [30]. The arguments for limiting salt intake in the diet are so numerous and consistent that in the coming years we should expect a significant (reaching as high as 70%) decrease in salt intake in the Polish population [31].

The aim of the study was to examine the effectiveness of iodine prophylaxis in pregnant women by evaluating the supply of iodine and ioduria.

Material and methods

The study included 115 women, patients of the Outpatient Gynaecological Department of the Polish Mother's Memorial Hospital — Research Institute in Lodz. Women came to the outpatient department in order to receive maternity care in mid-2010. None of the subjects had been ever been treated for thyroid disease and had never remained under the care of an endocrinologist. The examined women had only stayed under gynaecological care.

During the study, the patients were asked about medications, including preparations containing iodine, and their eating habits. A spot urine sample was secured for determination of iodide concentration. Samples were stored at –70° C until assay. In order to determine iodide concentration, the modified catalytic method by Sandell and Kolthoff was used [32]. A blood sample was drawn from each patient to measure the free thyroxine (fT4), TSH, and thyroid antibodies (antiTPO, antiTg, antiTSHR). Quantitative analyses of hormones and antibodies were performed by chemiluminescent immunoassays using a Roche Diagnostics automatic analyser — Cobas. Normal ranges for the analysed data were: TSH 0.27–4.2 mIU/L, fT4 0.93–1.7 ng/dL, antiTPO < 34.0 IU/mL; antiTg < 115 IU/mL and antiTSHR < 1.8 IU/L.

Thyroid palpation was performed, followed by ultrasound examination of the thyroid gland with a Toshiba Aplio XG (Toshiba Medical Systems Corporation, Japan) with a 12 MHz linear transducer (model PLT-1204BT, Toshiba Medical Systems Corporation, Japan). Measurements were performed while the subjects were lying on a medical coach. The sum of lateral thyroid lobe volumes constituted the actual volume of the thyroid gland; the volume of the isthmus was skipped. The volume of thyroid lobe was calculated according to the following formula, proposed by Brunn et al. [33]:

$V\ [mL] = 0.479 \times W \times D \times L$

where: W — width [cm]; D — depth [cm]; L — length [cm].

Neonates' TSH was examined as part of the neonatal screening protocol. The procedure was based on determination of TSH in dried blood spots obtained by heel puncture three days after birth. Values above 15 mIU/L were indicative of hypothyroidism.

Patients have given their consent to the study, voluntarily signing the appropriate statement. The Ethical Committee approved the protocol ("Thyro-Mobil Project"). The study was part of a program on iodine deficiency in pregnant women. The basic characteristics of the studied population are shown in Table I.

Table I. *The number and age of the women examined in different trimesters*

Tabela I. *Liczba i wiek przebadanych kobiet w poszczególnych trymestrach ciąży*

	n	Age		
		Mean ± SD	Min.	Max.
I trimester	7	28.6 ± 5.3	22	39
II trimester	61	28.6 ± 4.7	18	37
III trimester	47	29.4 ± 4.9	18	39
Total	115	29.2 ± 4.6	18	39

The data were statistically analysed using non-parametric test for independent groups (Mann-Whitney Rank Sum test), Kruskal-Wallis One Way Analysis of Variance on Ranks, followed by Dunn test and Chi-Square analysis. In all analyses, statistical significance was accepted at the level of $p < 0.05$. Data processing, statistical analyses, and figures were performed by using SigmaPlot 12.3 (Systat Software, Inc., San Jose, CA, USA) and Excel (Microsoft Corp., Redmond, WA, USA).

Results

Median ioduria among the surveyed women, independently of the time point of measurement, was 79.6 μg/L, which corresponds to iodine deficiency. In the different trimesters of pregnancy, these values were similar and equalled in the first trimester — 80.1 μg/L, in the second trimester — 81.3 μg/L, and in the third trimester — 78.4 μg/L. The UIC values in different trimesters of pregnancy are presented in Figure 1.

Only 45.2% of women were taking iodine supplementation at any time during pregnancy. Iodine prophylaxis was based on multivitamin supplements containing iodine prepared for pregnant women. None of the women received pure KI. The number of subjects taking iodine supplementation varied in particular trimesters: in the first trimester — none of the subjects; in the second trimester — 15 subjects from the group of 61 patients (24.6%); in the third trimester — 37 subjects from the group of 47 patients (78.7%). Figure 2 shows the percentage distribution of women taking iodine supplementation.

Iodine supplementation given to 52 women from the group of 115 women (45.2%) contributed to an increase of ioduria in comparison to the group of women not taking iodine supplementation (median 129.4 μg/L *vs.* 73.0 μg/L; $p < 0.001$); however, the median value of ioduria

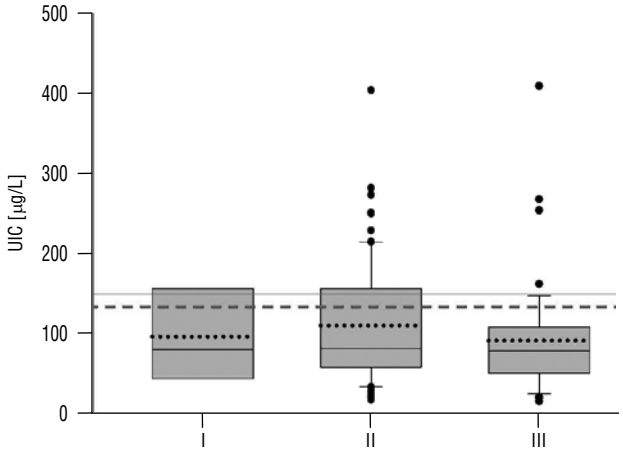

Figure 1. *Urinary iodine concentration (UIC) in the examined pregnant women in different trimesters. Upper and lower limits of boxes are 75 and 25 percentiles, respectively. Horizontal solid line and dotted line in the boxes are median and mean, respectively. Whiskers mean standard deviation (SD). Points are scatter of UIC. Horizontal long solid line and dashed line indicate lowest normal values of UIC for pregnant women, which are 150 µg/L and 135 µg/L, respectively*

Rycina 1. *Stężenie jodu w moczu (UIC) u badanych kobiet w poszczególnych trymestrach. Górne i dolne krawędzie prostokątów odpowiadają wartościom odpowiednio 75 i 25 percentyla. Poprzeczne linie ciągłe oraz kropkowane wewnątrz prostokątów oznaczają odpowiednio wartości mediany i średniej. Wąsy odpowiadają odchyleniom standardowym. Punkty stanowią rozrzut stężeń jodu w moczu. Poprzeczna długa linia ciągła i przerywana wskazują na graniczne wartości prawidłowe stężenia jodu w moczu u kobiet w ciąży, odpowiednio 150 µg/l i 135 µg/l*

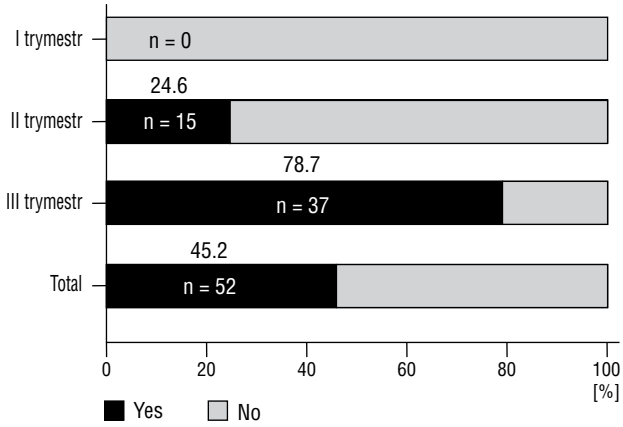

Figure 2. *The frequency of women taking iodine supplementation anytime during pregnancy*

Rycina 2. *Odsetek kobiet przyjmujących suplementację jodu w czasie badania*

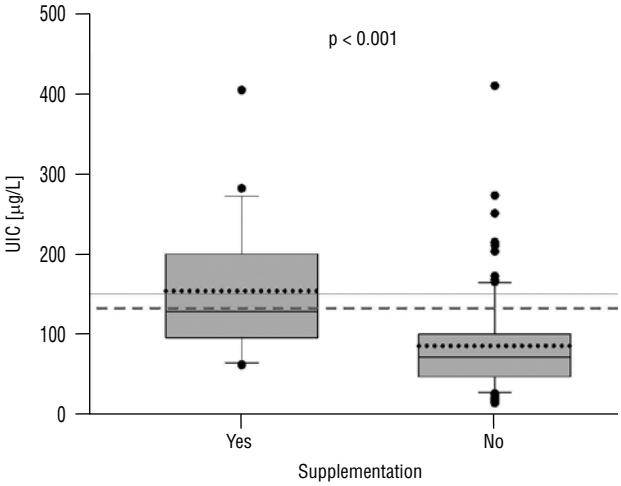

Figure 3. *The dependence of urinary iodine concentration (UIC) in pregnant women on iodine supplementation. Upper and lower limits of boxes are 75 and 25 percentiles, respectively. Horizontal solid line and dotted line in the boxes are median and mean, respectively. Whiskers mean standard deviation (SD). Points are scatter of UIC. Horizontal long solid line and dashed line indicate lowest normal values of UIC for pregnant women, which are 150 µg/L and 135 µg/L, respectively*

Rycina 3. *Stężenie jodu w moczu (UIC) u kobiet w ciąży w zależności od przyjmowania suplementacji jodu. Górne i dolne krawędzie prostokątów odpowiadają wartościom odpowiednio 75 i 25 percentyla. Poprzeczne linie ciągłe oraz kropkowane wewnątrz prostokątów oznaczają odpowiednio wartości mediany i średniej. Wąsy odpowiadają odchyleniom standardowym. Punkty stanowią rozrzut stężeń jodu w moczu. Poprzeczna długa linia ciągła i przerywana wskazują na dolne wartości prawidłowe stężenia jodu w moczu u kobiet w ciąży, odpowiednio 150 µg/l i 135 µg/l*

still did not reach the recommended level. Figure 3 shows the ioduria in women taking iodine supplementation and in those with no iodine supplementation.

Among women taking iodine supplementation, only in the second trimester, the median ioduria was higher than 135–150 µg/L and equalled 167.8 µg/L. Figure 4 depicts the values of ioduria in the group receiving iodine supplementation and in the group without iodine supplementation in different trimesters of pregnancy.

Table II presents the values of UIC, TSH, fT4, antithyroid antibodies concentrations, and thyroid volume. The values of TSH, fT4, anti-Tg, anti-TPO, and anti-TSHR concentrations did not differ between groups. TSH and fT4 values remained in normal ranges in all subjects. Anti-Tg antibodies were increased in two women in the first trimester. Anti-Tg and anti-TPO antibodies were increased in one and two subjects, respectively, in the second trimester; and in one and five subjects, respectively, in the third trimester of pregnancy. None of them had increased concentration of anti-TSHR. The thyroid volumes did not differ between groups. Seven subjects were diagnosed by ultrasonography as having a goitre (three women in II trimester and four women in III trimester).

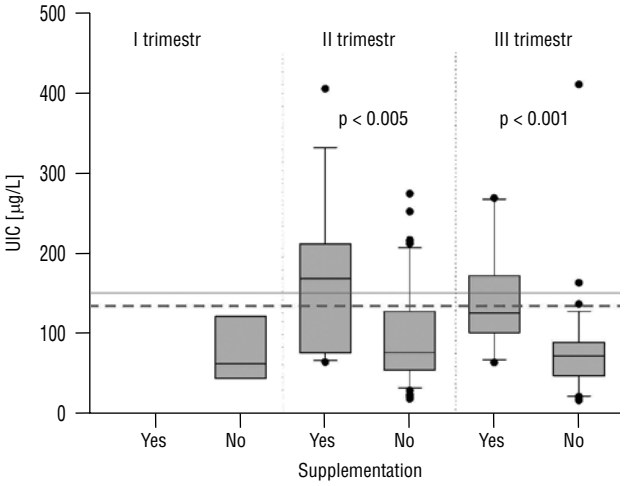

Figure 4. *The dependence of urinary iodine concentration (UIC) in pregnant women in different trimesters on iodine supplementation. Upper and lower limits of boxes are 75 and 25 percentiles, respectively. Horizontal solid line and dotted line in the boxes are median and mean, respectively. Whiskers mean standard deviation (SD). Points are scatter of UIC. Horizontal long solid line and dashed line indicate lowest normal values of UIC for pregnant women, which are 150 µg/L and 135 µg/L, respectively*

Rycina 4. *Stężenie jodu w moczu (UIC) u kobiet w ciąży w poszczególnych trymestrach ciąży w zależności od suplementacji jodu. Górne i dolne krawędzie prostokątów odpowiadają wartościom odpowiednio 75 i 25 percentyla. Poprzeczne linie ciągłe oraz kropkowane wewnątrz prostokątów oznaczają odpowiednio wartości mediany i średniej. Wąsy odpowiadają odchyleniom standardowym. Punkty stanowią rozrzut stężeń jodu w moczu. Poprzeczna długa linia ciągła i przerywana wskazują na graniczne wartości prawidłowe stężenia jodu w moczu u kobiet w ciąży tj. odpowiednio 150 µg/l i 135 µg/l*

The results of neonates' TSH were obtained in 92 cases. All the results were within normal limits. The median of neonates' TSH was 1.36 mIU/L and the mean ± SD was 1.55 ± 1.19. Only in two subjects, the TSH value was above 5 mIU/L (5.69; 7.79).

Discussion

The introduction of the current model of iodine prophylaxis has been proven to be very successful. The supply of iodine in the Polish population has significantly increased and has reached normal values. However, the amount of iodine added to kitchen salt (30 mg of KI or 39 mg of KIO_3/kg NaCl [19]) does not provide optimal iodine intake during pregnancy and in breast-feeding women, in whom the need for iodine is greater than in the general population. Thus, iodine prophylaxis in these individuals, carried out only on the basis of mandatory consumption of iodised kitchen salt, is insufficient, and they should receive an additional amount

Table II. *Urinary iodine concentrations (UICs) and TSH, fT4, antiTPO, antiTg and antiTSHR concentrations in women examined in different trimesters, subgrouped according to iodine supplementation*

Tabela II. *Stężenia jodu w moczu, stężenia TSH, fT4, antyTPO, antyTg oraz antyTSHR oraz objętość tarczycy oceniona ultrasonograficznie u przebadanych kobiet w poszczególnych trymestrach ciąży z uwzględnieniem suplementacji jodu*

Trimester	Iodine supplementation	%	UIC [µg/L]		TSH [mIU/L]	FT4 [ng/dL]	antiTg [IU/mL]	antiTPO [IU/mL]	antiTSHR [IU/L]	Thyroid volume [mL]
			Mean ± SD	Median						
I (n = 7)	Yes (n = 0)	–	–	–	–	–	–	–	–	–
	No (n = 7)	100	81.9 ± 49.8	61.2	2.07 ± 1.34	1.26 ± 0.1	171.3 ± 303.1	44.0 ± 64.8	0.43 ± 0.23	9.0 ± 5.4
II (n = 61)	Yes (n = 15)	24.6	161.1 ± 95.0	167.8**	1.81 ± 1.05	1.05 ± 0.18	16.8 ± 13.1	12.8 ± 5.4	0.55 ± 0.2	11.3 ± 4.2
	No (n = 46)	75.4	93.7 ± 62.4	75.7	1.65 ± 1.14	1.05 ± 0.15	22.2 ± 26.2	19.1 ± 28.4	0.64 ± 0.31	11.9 ± 3.3
III (n = 47)	Yes (n = 37)	78.7	141.9 ± 66.6	125.2*	1.68 ± 0.62	0.92 ± 0.11	24.7 ± 17.2	13.4 ± 2.6	0.59 ± 0.3	12.6 ± 10.7
	No (n = 10)	21.3	77.7 ± 65.3	71.2	1.82 ± 1.56	0.97 ± 0.09	38.5 ± 65.1	42.8 ± 111.2	0.67 ± 0.27	13.0 ± 4.2
Total (n = 115)	Yes (n = 52)	45.2	154.9 ± 82.1	129.4*	1.76 ± 0.86	1.01 ± 0.87	20.4 ± 15.1	27.9 ± 81.8	0.56 ± 0.24	12.2 ± 9.2
	No (n = 63)	54.8	86.8 ± 62.5	73.0	1.76 ± 1.33	1.03 ± 0.15	40.2 ± 98.2	30.6 ± 75.9	0.64 ± 0.29	11.8 ± 4.56

*p < 0.001, **p < 0.005. UICs — urinary iodine concentrations

Table III. *Characteristics of studies on the use of iodine prophylaxis in pregnant women in Poland*
Tabela III. *Charakterystyka prac na temat stosowania profilaktyki jodowej u kobiet w ciąży w Polsce*

City/Region of Poland	Number of subjects (n)	Median of UIC [μg/L]	Percentage of women taking iodine supplementation (%)	Type of analysis
Warsaw [36]	62	I — 98 II — 122 III — 129	100%	Prospective study
Krakow Region [35]	500	n/d	59%	Questionnaire analysis
Warsaw (Central Poland) [34]	100	112.6	35%	Cross-sectional study
Lodz (Central Poland)	115	I — 80.1 II — 81.3 III — 78.4	I — 0% II — 24.6% III — 78.7%	Cross-sectional study

UIC — urinary iodine concentration

of iodine (150–200 μg/day) in the form of multivitamin tablets containing iodine or in the form of pure KI [12] .

Unfortunately, our data indicate that less than half of the women (45.2%) followed those recommendations and received an additional amount of iodine. Similar data were obtained by Gietka-Czernel et al. and by Milewicz et al., who performed studies in women living around Warsaw and Krakow, respectively [34, 35]. It should, however, be emphasised that the recommendations are directed at physicians, not at patients. Thus, the relatively small percentage of women who take the iodine supplementation is mainly due to doctors' orders that deviate significantly from the recommendations. It should be noted that the proportion of women receiving iodine supplementation increases with advancement of pregnancy, and in the third trimester it reaches 78.7%. It can therefore be concluded that the majority of physicians supplement optimal iodine intake in pregnant women, but only in the third trimester of pregnancy. In the first and second trimesters, the proportion of women taking iodine supplementation is very low (0% and 24.6%, respectively). Such observations are obviously unsatisfactory, since it is the early period of pregnancy when the foetus is particularly sensitive to iodine deficiency, due to the developing nervous system. Taking into account the increased demand for iodine in pregnant women, the above observations as well as our findings additionally confirm the notion that iodine supplementation should start in the preconception period.

It is worth noting that the median ioduria in women taking iodine supplementation has not reached the recommended values (median 129.4 μg/L *vs.* at least 135–150 μg/L), which means that, despite the conducted prevention, iodine supply was insufficient. These values are similar to the data observed by other authors. For example, among pregnant women in whom the iodine supplementation was conducted, a median ioduria was found at the level of 96 μg/L (I trimester), 122 μg/L (II trimester), and 129 μg/L (III trimester) [36]. The question therefore arises whether the recommended additional dose of iodine (150–200 μg/L) is not too low. It is very difficult to answer this question, but in the deliberations on this issue it should be taken into account that a lot of preparations containing iodine are not registered as drugs but as dietary supplements, which may translate into differences between the claimed concentrations of iodine in the medicament dose and the measured ones. Restani et al. [37] investigated 43 preparations containing iodine, and in most cases the actual amount of iodine was different from the declared amount. It should also be noted that some multivitamins do not contain iodine, and because of the similarity of names they may be mistakenly taken [this applies to "over-the-counter" (OTC) medications]. Also another issue should be taken into account. Namely, during pregnancy, as a result of physiological changes that occur in a woman's body, the amount of excreted urine increases, and therefore it would be more reasonable to compare ioduria in pregnant women in relation to creatinine excretion. Interesting observations were made by Gowachirapant et al. [38], who measured ioduria in school-aged children and their mothers being pregnant at the time of the study; these families lived together and had a similar diet. They noted that ioduria in children was correct; while in pregnant women it indicated a deficiency of iodine in the diet.

Taking into account the obtained values of ioduria, further diversification of iodine supply should also be considered, especially in the context of actions taken to reduce the consumption of salt. Various kinds of mineral water and milk, enriched in iodine during the production process, should be remembered here. Recommendations on drinking water and milk containing

iodine in the concentration of 150–200 μg/L could even better protect the foetus and the mother from iodine deficiency and from the risk of overdose [39].

Our work was not a prospective study, and hence the number of subjects in each group is not comparable. This difference is due to the fact that the centre in which the research was conducted is a centre with a higher degree of referentiality. However, we believe that such a method of analysis allowed us to capture the actual state of iodine intake and, to a certain extent, the quality of iodine prophylaxis. Whereas prospective studies are usually treated as more informative, the performed cross-sectional analysis in the present study does constitute the only objective method to evaluate the real effectiveness of iodine prophylaxis in pregnant women in Poland.

Table III presents the basic data of studies on the use of iodine prophylaxis in Poland.

Conclusions

Based on the obtained results it can be concluded that:

1. A significant percentage of pregnant women in Poland do not fulfil the criteria of iodine sufficiency.
2. Not all pregnant women, especially at the beginning of pregnancy, take the recommended iodine supplementation, which suggests that more effective actions should be undertaken to promote iodine supplementation pre-conception and during pregnancy.
3. Iodine deficiency is seen even in a certain percentage of pregnant women who declare that they take iodine supplements, which suggests that the quality of the supplementation should be also verified.

Thus, the general conclusion is that the effectiveness of iodine prophylaxis in pregnant women in Poland, evaluated on the basis of the analysis of a randomly chosen sample, is not satisfactory in terms of compliance with the recommendations and, possibly, the quality of the supplementation.

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