



Intake of iodine-containing multivitamin preparations by pregnant women from the Krakow region of Poland

Stosowanie w Krakowie preparatów witaminowych zawierających jod przez kobiety w ciąży

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Abstract

Background: The aim of this study was to evaluate the number of women who take multivitamin formulations containing iodine.

Material and methods: A 34-question questionnaire was given to 500 women during their puerperal stay in two obstetrics/gynaecology wards in Krakow.

Results: 295 pregnant women (59%) took iodine-containing formulations. 205 pregnant women (41%) took multivitamin preparations without iodine. 49.7% of the women (91 out of 183) who inhabited rural areas and small towns were not supplemented with iodine during pregnancy. Women in Krakow took iodine-containing multivitamin formulations in 61.2% of cases. Women with primary and secondary education did not use iodine supplementation in 48.3% and 50.3% of cases respectively. Women with a university education did not use supplementation in 38.6% of cases. The prevalence of women using iodine-containing multivitamin preparation was similar in each age group.

Conclusions: The promotion of iodine supplementation to pregnant women should be augmented at each level of contact with medical staff. Medical staff should be reminded about such promotion at each level of medical care and training (general practitioner, obstetrics/gynaecology specialist, endocrinologist, postgraduate training). (*Pol J Endocrinol* 2011; 62 (4): 309–315)

Key words: iodine, pregnancy, multivitamin preparations

Streszczenie

Wstęp: Celem pracy była ocena liczby kobiet w ciąży stosujących preparaty witaminowe zawierające jod.

Materiał i metody: Badanie ankietowe przeprowadzono u kolejnych 500 kobiet, które urodziły dzieci w latach 2007–2008 na dwóch oddziałach położniczych w Krakowie Nowej Hucie. Ankietę składającą się z 34 pytań przeprowadzono w czasie pobytu pacjentek na oddziałach położniczych pomiędzy 2. a 4. dniem porodu.

Wyniki: Spośród badanych 295 pacjentek (59%) przyjmowało w ciąży preparaty witaminowe zawierające rekomendowaną dawkę jodu, natomiast 205 ciężarnych (41%) stosowało preparaty witaminowe pozbawione jodu. W przypadku ciężarnych zamieszkujących tereny wiejskie i małe miasta (n = 183) 91 kobiet (49,7%) nie stosowało w ciąży suplementacji jodu. Odsetek ten ulegał korzystnemu odwróceniu w przypadku mieszkanek Krakowa (n = 317), gdzie 38,8% ciężarnych nie przyjmowało preparatów zawierających rekomendowaną dawkę jodu. Podobnie wysoki odsetek pacjentek, które przyjmowały preparaty bez jodu dotyczył kobiet z wykształceniem zawodowym (48,4%) i średnim (50,3%). Kobiety z wykształceniem wyższym w 38,6% przypadków nie stosowały preparatów zawierających jod. W każdym z przedziałów wiekowych przeważały pacjentki przyjmujące preparaty z rekomendowaną dawką jodu.

Wnioski: Istnieje konieczność zwiększenia edukacji kobiet w ciąży dotyczącej konieczności dodatkowej suplementacji jodem na wszystkich poziomach opieki zdrowotnej: lekarza pierwszego kontaktu, położnika i ginekologa, endokrynologa oraz w szkoleniu podyplomowym. (*Endokrynol Pol* 2011; 62 (4): 309–315)

Słowa kluczowe: jod, ciąża, preparaty wielowitaminowe

Introduction

Iodine has been identified by the World Health Organisation as one of the factors influencing health status. Iodine, which is a trace element and does not accumulate in the body, has to be supplemented. Excessive iodine is excreted

in the urine [1]. Seafish and seafood generally, spring water, and air with droplets of sea water are extremely rich sources of iodine. Iodised salt is the primary food source of iodine at a population level [2]. The implementation of a population strategy for preventing iodine deficiency by introducing iodised salt and an extra iodine supplementation in selected



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groups resulted, over the course of 14 years, in a decrease in the number of countries with iodine deficiency as a national public health problem, from 110 in 1993 to 47 in 2007 [3]. Delange in 2002 reported that 32 European countries were affected by iodine deficiency in the early 1990s [4]. The same article says that access to iodised salt at the household level in European countries increased from 5% in 1990 to 28% in 1999 [4].

During pregnancy and lactation, the daily requirement for iodine increases nearly twofold due to enhanced renal clearance of iodine, iodine trapping by the placental-fetal unit, and increased release of hepatic thyroid binding globulin. Insufficient iodine intake can result in decreased production of thyroid hormones and hypothyroidism. Maternal hypothyroidism frequently leads to foetal brain damage [5]. In 2006, the American Thyroid Association recommended that all women should receive 150 μg iodine in addition to their regular dietary intake during pregnancy and lactation [5].

In the Polish strategy of iodine prophylaxis, an additional daily intake of 150–200 μg iodine as medication is strongly recommended during pregnancy and lactation after evaluating the dietary habits of pregnant and breastfeeding women [6]. In 2003, Poland was rated by WHO and ICCIDD as belonging to the group of countries (roughly one third of Europe's population) where iodine intake is sufficient at a population level [7–9]. Because household salt is the main carrier of iodine in the Polish model of iodine prophylaxis, and because mean individual salt consumption in Poland is at least double the recommended WHO level, current efforts aimed at preventing iodine deficiency aim to increase consumption of non-salt iodine-rich products (e.g. milk and mineral water). Once they achieve an iodine concentration of 0.1–0.2 mg, these products can easily supplement any decrease in physiological iodine levels resulting from reduced salt consumption [10].

However, the seasonal variation in iodine concentration in these products should be taken into consideration. Brzóška et al. studied iodine concentration in Polish consumer milk. Iodine concentration for provincial cities ranged from 63.8 to 173.7 mg/L. Compared to the winter, milk iodine concentration in the summer was lower by an average of 25.2%, with standard deviations of between 4.3% (Kielce) and 52.2% (Wrocław) [11]. Wide-ranging educational campaigns, to be coordinated by the newly designated WHO Collaborating Centre for Nutrition at the Chair of Endocrinology at Jagiellonian University, are also required [10].

At the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) Conference held in Istanbul in 2004, it was revealed that in pregnant women iodine intake frequently falls below the recommended level of 200 μg . This is the result of non-compliance with the regimen

of additional iodine intake during pregnancy and lactation. In Europe, the additional daily dose of iodine is 100–150 μg taken as a supplement to the regular diet of pregnant and breastfeeding women. The World Health Organisation (WHO) recently increased its recommended iodine intake during pregnancy from 200 to 250 $\mu\text{g}/\text{day}$ [12].

The aim of this study was to verify (via a questionnaire survey) the number of pregnant patients who took iodine-containing multivitamin preparations amounting to not less than 150 μg of iodine daily.

Material and methods

An anonymous questionnaire survey was given to 500 consecutive women who gave birth in 2007 and 2008 in two obstetric wards in Krakow Nowa Huta. The questionnaire included 34 questions and was given to postpartum mothers during their stay in the obstetric wards, on the second, third or fourth day after delivery. The mothers were asked which brand of multivitamin preparation was taken by them during pregnancy. Those who took preparations with at least 150 μg of iodine daily (in one tablet or as a simultaneous intake of vitamin preparations with at least a 150 μg iodine tablet) were considered as sufficiently supplemented. The staff who distributed the questionnaires were allowed to explain a question if necessary, but those actually conducting the analysis did not come into contact with the patients.

All questionnaires were analysed and then divided according to where the patient lived, their education, age, and number of pregnancies. The questionnaire can be found in Appendix 1.

Statistical analysis

Due to the characteristics of the gathered data, proportion test was employed to determine the differences between specific groups. In Tables I to IX, a p-value is given for the weakest difference only, i.e. the greatest p-value obtained from all pairs possible.

Results

The majority (57.4%) of women were aged 21 to 30 years, and the smallest group was of those aged over 40 (3%, $p < 0.01$) (Table I). Most of the respondents lived in a voivodeship capital (64.4%) and only 8% (the smallest group) in a county capital ($p < 0.001$) (Table II). Most were university graduates (51.4%, $p < 0.001$), and most had just given birth to their first child (55.4%, $p < 0.001$) (Tables III and IV).

The results of the questionnaire survey carried out in 500 consecutive women who gave birth in 2007 and

Table I. The division of patients included in the study according to age group

Tabela I. Liczba pacjentek biorących udział w badaniu w poszczególnych przedziałach wiekowych

Age group	≤ 20 yrs	21–30 yrs	31–39 yrs	Above 40 yrs	p
Number of patients	33	287	165	15	< 0.01
Ratio	6.6%	57.4%	33%	3%	

Table II. The division of patients included in the study according to dwelling place

Tabela II. Miejsce zamieszkania pacjentek biorących udział w badaniu

Dwelling place	Countryside	Small town	County town	Voivodship city	p
Number of patients	95	43	40	322	< 0.001
Ratio	19%	8.6%	8%	64.4%	B/C NS

Table III. The division of patients included in the study according to their education

Tabela III. Wykształcenie pacjentek biorących udział w badaniu

Education	Primary	Secondary	Higher	p
Number of patients	73	170	257	< 0.001
Ratio	14.6%	34%	51.4%	

Table IV. The division of patients included in the study according to number of past pregnancies

Tabela IV. Podział pacjentek ze względu na liczbę przeżytych ciąż

Number of past pregnancies	Primigravida	Multipara	p
Number of patients	277	223	< 0.001
Ratio	55.4%	44.6%	

Table V. The number of patients who took multivitamin preparations containing at least 150 µg of iodine

Tabela V. Liczba pacjentek zażywających w ciąży preparaty bez jodu i preparaty z jodem w dawce nie mniejszej niż 150 µg

Type of preparation	Without iodine	With iodine	p
Number of patients	205	295	< 0.001
Ratio	41%	59%	

Table VI. The number of patients who took multivitamin preparations containing at least 150 µg of iodine in particular age groups

Tabela VI. Liczba pacjentek zażywających preparaty bez jodu i preparaty z jodem w dawce nie mniejszej niż 150 µg, w poszczególnych przedziałach wiekowych

Age group	≤ 20 yrs	21–30 yrs	31–39 yrs	Above 40 yrs	p
Type of preparation					
Without iodine	16 (7.8%)	117 (57.1%)	64 (31.2%)	8 (3.9%)	< 0.001; B/C NS
With iodine	17 (5.8%)	170 (57.6%)	101 (34.2%)	7 (2.4%)	< 0.05
p	NS	NS	NS	NS	

Table VII. The division of patients who took multivitamin preparations containing at least 150 µg of iodine according to their dwelling place**Tabela VII.** Liczba pacjentek zażywających preparaty bez jodu i preparaty z jodem w dawce nie mniejszej niż 150 µg w zależności od miejsca zamieszkania

Dwelling place	Countryside	Small town	County town	Voivodship city	p
Type of preparation					
Without iodine	47 (22.9%)	19 (9.3%)	17 (8.3%)	122 (59.5%)	< 0.001; B/C NS
With iodine	48 (16.3%)	24 (8.1%)	23 (7.8%)	200 (67.8)	< 0.005; B/C NS
p	NS	NS	NS	NS	

Table VIII. The division of patients who took multivitamin preparations containing at least 150 µg of iodine according to their education**Tabela VIII.** Liczba pacjentek zażywających preparaty bez jodu i preparaty z jodem w dawce nie mniejszej niż 150 µg w zależności od stopnia wykształcenia badanych

Education	Primary	Secondary	Higher	p
Type of preparation				
Without iodine	31 (15.1%)	67 (32.7%)	107 (52.2%)	< 0.001
With iodine	42 (14.2%)	103 (34.9%)	150 (50.9)	< 0.001
p	NS	NS	NS	

Table IX. The division of patients who took multivitamin preparations containing at least 150 µg of iodine according to the number of past pregnancies**Tabela IX.** Liczba pacjentek zażywających preparaty bez jodu i preparaty z jodem w dawce nie mniejszej niż 150 µg w zależności od liczby ciąż

Number of past pregnancies	Primigravida	Multipara	p
Type of preparation			
Without iodine	114	91	< 0.05
With iodine	163	132	< 0.01
p	NS	NS	

2008 in two obstetric wards in Krakow-Nowa Huta showed that more than a third of these women (41%) during pregnancy did not reach the recommended dose of iodine, although most (59%; $p < 0.001$) had done so (Table V). Iodine-containing multivitamin preparations were most frequently used in the group of women aged 21–30 (Table VI). Pregnant women aged under 20 and over 40, in 48.5% and 53.3% of cases, respectively, did not supplement their diet with iodine. Urban dwellers were more likely to take vitamin preparations. The inhabitants of rural areas in 49.5% of cases took multivitamin preparations which did not contain the recommended amount of iodine (Table VII). Women who were university graduates most commonly were able to adequately supplement their diet with iodine (Table VIII). Women who had just had their first child

more frequently supplemented their diet with iodine than did those women who had given birth previously (Table IX).

Discussion

Despite strong recommendations from both domestic and international authorities that the diet of pregnant and lactating women should be supplemented with 150 µg, or even 250 µg, daily doses of iodine, 41% of the inhabitants of Krakow and its vicinity did not take the proper amount of iodine. A study carried out in Sydney showed moderate to severe iodine deficiency in pregnant and lactating women in recent years [13]. The authors suggested that it was necessary to promote iodine supplementation in pregnant women

in this population [13]. In another Australian survey, the results of which were published at the beginning of 2010 and which was carried out in a group of 139 pregnant women, it was shown that only 35% of them took iodine-containing multivitamin preparations, 11% changed their diet intentionally to increase their iodine intake, and only just over half of the women (51–58%) knew which foods were rich in iodine [14].

A Spanish study carried out in Valencia in a group of 232 pregnant women demonstrated that 60.8% of them used iodised salt and 51.3% of them used iodine-containing multivitamin preparations [15]. A Norwegian survey of 40,108 pregnant women revealed that 31% of them supplemented their diet with vitamins, although the dietary intake of iodine did not reach the Nordic Recommendations for pregnant women. [16]. Another Spanish report, this time from Barcelona, should however be mentioned: in a group of 1,844 pregnant women from an iodine-sufficient population, supplementation with an iodine-containing multivitamin preparation resulted in lowering the blood level of free thyroxine in the second trimester of pregnancy [17]. A very recent Spanish study of 1,522 women showed that 48.9% of Valencian women consumed iodine supplements, 93.3% in Gipuzkoa, and 11.0% in Sabadell. The prevalence of iodised salt consumption was 50.5% in the whole sample. The urinary iodine concentration reached the WHO reference levels only in Gipuzkoa, where iodine supplements were widely consumed [18].

Hashemipour et al. in a cross-sectional study compared urinary iodine concentrations (UIC) in newborns with congenital hypothyroidism, as well as UIC and the milk iodine concentrations (MIC) of their mothers to a control group [19]. They found that iodine excess could be a possible risk factor for congenital hypothyroidism, but there were findings, such as a lack of correlation between maternal MIC and UIC, and the median neonatal UIC, which was similar in the two groups [19]. Keshteli et al. excluded the role of zinc status in the high prevalence of goitre in the Isfahan region [20].

Ołtarzewski and Szymborski carried out their research in the 1990s, in a Polish population, on a much larger group than ours. They showed a similar percentage (47.7%) of pregnant women who did not supplement their iodine intake properly [7]. Studies on the Krakow population carried out in the 1980s and 1990s revealed that 80% of pregnant women had goitre and

abnormal ioduria if they did not supplement their iodine intake properly [21].

Conclusions

The promotion of iodine supplementation should be augmented at each level of contact medical staff have with pregnant women. Medical staff must be reminded about such promotion at each level of medical care and training (general practitioner, obstetrics/gynaecology specialist, endocrinologist, postgraduate training).

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Appendix: questionnaire

1. Age:
2. Dwelling place
 - voivodeship capital
 - powiat capital
 - gmina capital
 - rural area
3. Education:
 - primary school
 - basic vocational school
 - secondary school (general)
 - secondary school (technical)
 - college
 - university (B.A.)
 - university (M.A.)
4. Profile of education:
 - secondary school, biomedical profile (e.g. nursery school, medical laboratory technician school, emergency medical technician school, dental technician school, general secondary school with biological-chemical profile)
 - secondary school, mathematical profile (e.g. school of commerce, school of economics, general secondary school with mathematical-physical profile)
 - secondary school, another profile
 - university, biomedical profile (e.g. medicine, nursery, veterinary, medical emergency, medical laboratory analytics, pharmacy, biology, biotechnology, Agricultural University of Krakow)
 - university, mathematical profile (e.g. economics, technical, mathematics, physics, Krakow University of Economics, AGH University of Science and Technology, Krakow University of Technology, Faculties of Mathematics, Physics etc. of the Jagiellonian University)
 - university, humanistic profile (e.g. philosophy, sociology, psychology, pedagogy, philologies)
 - university, other profile
5. Have you been diagnosed with a chronic disease?
 - diabetes mellitus
 - hypertension
 - hypothyroidism
 - other thyroid diseases (please specify)
 - other chronic diseases (please specify)
6. Was the last pregnancy:
 - your first (then skip to question 10)
 - subsequent (which one)
7. How did the past pregnancies finish?
 - miscarriage (which pregnancy and which week)
 - preterm delivery (which pregnancy and which week)
 - delivery at term (37–40 week) (which pregnancy and which week)
 - post-term delivery (which pregnancy and how many days after the term)
8. Past normal pregnancies finished with:
 - vaginal delivery (e.g. 1st pregnancy, vaginal delivery)
 - caesarean section (e.g. 2nd pregnancy, caesarean section)
9. Children born previously are:
 - healthy (which pregnancy)
 - congenitally defected (which pregnancy)
 - affected with cerebral palsy resulting from perineal complications (which pregnancy)
 - others
10. Did the last pregnancy develop normally?
 - Yes
 - No
11. If no, did any of the following symptoms occur? (please select all that apply and give the number of weeks they occurred for the first time and when they disappeared)
 - vaginal bleeding
 - premature cramps of uterus
 - premature rupture of the membranes
 - oedema
 - hypertension
 - proteinuria
 - vomiting
 - anaemia
 - others — please specify
12. How much weight did you gain during pregnancy?
 - less than 10 kg
 - 10–15 kg
 - 15 kg or more
13. In which week of pregnancy was your child born?
14. The last pregnancy finished with:
 - vaginal delivery
 - caesarean section
15. The last child was born as:
 - healthy
 - congenitally defected (please specify)
 - affected with cerebral palsy
 - others

16. How many points did the neonate score in the Apgar scale? Please give the length and weight of the child.
Apgar score
Birth weight
Birth length
17. Did you take any multivitamin preparations during the last pregnancy?
 Yes
 No
18. Did you take any prenatal multivitamin preparations during the last pregnancy?
 Yes
 No
19. From which week of pregnancy did you start taking multivitamin preparations?
From week of the pregnancy
20. Who recommended that you take multivitamin preparations in pregnancy?
 husband
 mother
 mother in law
 sister
 friend
 your doctor
 another patient
21. Did you take any vitamin preparations shortly before the pregnancy?
 Yes
 No
22. Did you take vitamin preparations and folic acid simultaneously in pregnancy?
 Yes
 No
23. Did you take vitamin preparations and folic acid simultaneously before your pregnancy?
 Yes
 No
24. Did you take **singular folic acid supplements** during the whole period of pregnancy?
 Yes
 No
25. Did you take **singular folic acid supplements** before your pregnancy?
 Yes
 No
26. After the third month of pregnancy, were you advised to stop taking folic acid and start multivitamin preparations?
 Yes
 No
27. After the third month of pregnancy, who recommended that you stop taking folic acid and start multivitamin preparations?
 husband
 mother
 mother in law
 sister
 friend
 your doctor
 another patient
28. Which multivitamin preparations did you take in pregnancy?
 Feminatal
 Feminatal N
 Prenatal classic
 Prenatal complex
 Materna
 Centrum Materna
 Vitrum Prenatal
 Elevit
 Falvit
 Falvit M
 Folik
 Jodid
 Jodex
 other (please specify)
.
.
.
29. Did you replace the multivitamin preparation with another one during the last pregnancy?
 Yes
 No
30. What was the reason for changing one preparation to another in the last pregnancy?
 recommendation of relatives
 recommendation of a friend
 recommendation of the doctor
 recommendation of other patients
 side effects
31. After the previous pregnancy, did you take any multivitamin preparations during lactation?
 Yes
 No