

Inappropriate consumption of vitamins and minerals by pregnant women in Poland

Iwona Bojar¹, Alfred Owoc², Ewa Humeniuk³, Waldemar Wierzba², Adam Fronczak⁴

¹ Department for Health Problems of Ageing, Institute of Rural Health, Lublin, Poland

² Lubuski Collage of Public Health, Zielona Góra, Poland

³ Department of Pathology and Rehabilitation of Spaech, Medical University, Lublin, Poland

⁴ Medical University, Łódź, Poland

Bojar I, Owoc A, Humeniuk E, Wierzba W, Fronczak A. Inappropriate consumption of vitamins and minerals by pregnant women in Poland. *Ann Agric Environ Med.* 2012; 19(2): 263-266.

Abstract

Introduction: Women's daily nutrition should include proper amounts of vitamins, ingredients and fluids. The shortage or surplus of any ingredient can negatively affect the health condition of a mother or her baby

Objective: The objective of the study was to assess the quality of the diet of pregnant women in Poland against the World Health Organization (WHO) and European Union (EU) recommendations concerning requirements for vitamins and minerals.

Methodology: 512 pregnant women in their 20th-30th week of pregnancy took part in the research conducted by the means of observation of a 7-day diet. Consumed products were analyzed by the means of DIETETYK software developed by the Polish National Food and Nutrition Institute (NFNI). Obtained micro- values were averaged. The results were compared with the recommendations of the WHO UE and NFNI and analyzed statistically (test Chi²).

Results: A lower consumption than 400g/day of fruit and vegetables in the diets was found in 4.68% of pregnant women. Mean values for vitamins: D – 2.64 µg/person, B6 – 1.76 mg/person and folic acid – 1603 µg/person, as well as average values for mineral components: calcium 689 mg/person, magnesium 255 mg/person, iron – 10.1 mg/person, zinc – 9.2 mg/person were also lower than daily recommended values. Daily level for sodium, phosphorus and vitamin A were exceeded.

Conclusion: Results indicate insufficient knowledge of pregnant women about proper nutrition during pregnancy. Supplementing most vitamins and mineral components, beginning with a first pregnancy trimester, is necessary. Women at childbearing age must be educated about the necessity for proper nutrition during and before a pregnancy.

Key words

vitamins and minerals, quality of diet, pregnant, recommendations

INTRODUCTION

Women's daily nutrition should include proper amounts of vitamins, ingredients and fluids. A shortage or surplus of any ingredient can negatively affect the health condition of a mother and/or her baby. [1] According to recommendations by the WHO and EU, a daily requirement for vitamins and minerals is satisfied by 400g of fruits and vegetables. [2, 3]. A study by the European micronutritional Recommendations Aligned (EURRECA) study published in 2010 in the *European Journal of Clinical Nutrition* defined 10 ten most important microelements for human development and health: vitamins D, B12, C, folic acid, iron, calcium, selenium, iodine and copper [4]. A pregnant woman's body needs increased amounts of almost all fat-soluble (A, D, E) and water-soluble (C, group B vitamins and folic acid) vitamins. A need for many other micro-elements is also increased.

Incorrect amounts of microelements in the diets of pregnant women were found in developing countries, such as Thailand [5], Bangladesh [6], China [7], Sudan [8], Nigeria [9], and developed ones such as the USA [10]. Earlier studies

from Poland also suggest that diet did not cover the needs for some vitamins and minerals.

WHO and EU recommendations [2, 3] concern supplementation of vitamins and microelements such as: folic acid, calcium, magnesium, iron, zinc and iodine. Recommended norms for daily consumption of these elements are shown in Table 1.

Table 1. Requirement for micro-elements during pregnancy according to the WHO, EU, USA and NFNI

Micro-elements	Recommendations			
	WHO	UE	USA	NFNI (Poland)
A vitamin (µg/day)	1,000	950	950	1,000
B6 vitamin (mg/day)	3	X	x	3
D vitamin (µg/day)	15	X	x	15
folic acid (µg/day)	370-470	400	400	450
calcium (mg/day)	1,000-1,200	700	1,200	1,100
iron (mg/day)	12,5	17-21	30	24
iodium (µg/day)	200	130	175	X
zinc (µg/day)	7.3-13.3	7.1	15	14
magnesium (mg/day)	350	350	350	330
phosphorus (mg/day)	900	900	800	900
sodium (mg/day)	570	500	550	575

Address for correspondence: Iwona Bojar Department for Health Problems of Ageing, Institute of Rural Health, Jaczewskiego 2, 20-090 Lublin, Poland.
E-mail: iwona bojar75@gmail.com

Received: 10 January 2012; accepted: 26 April 2012

According to the Polish NFNI, a pregnant woman should consume about 1,100 milligrams of calcium daily in her diet. The main sources of this element are milk and dairy products. Lesser amounts of calcium can also be found in vegetable products [11].

Magnesium is another very important element of a diet. It supports the functions of over 300 enzymes in the human body and a daily amount of magnesium for pregnant women is recommended at 350 milligrams. Absorbing magnesium is facilitated by taking B6 vitamin at the same time. Children whose mothers lack magnesium are often born early, have weaker appetite, are nervous and overexcitable [11].

About 30% of women suffer from anaemia caused by iron deficiency – the recommended daily requirement for iron during pregnancy is set at 24 milligrams.

A shortage of iodine in pregnant women's diet increases the risk of miscarriage, disorders in children's development, and can even lead to foetal death. According to the WHO, pregnant women should receive 160-180 micrograms of iodine a day [2, 3].

During the 10-year period 1995-2005, Poland's National Health Protection Programme, worked out by a team of experts, recommends that 0.4-1 mg of folic acid should be consumed daily by all women of reproductive age in order to prevent dysfunctions associated with the cardiovascular system. This is particularly important during the 3 months prior to a planned conception. Poland is a country with one of the highest rates of deaths related to cleft spine and hydrocephalus. It has been confirmed that apart from genetic conditionings, it is also caused by environmental factors, including folic acid deficiency in a diet [2, 3, 12].

It has also been observed that dysfunctions in foils absorption by the intestine are related to zinc deficiency. Polish National Food and Nutrition Institute in Warsaw, as well as the American Science Academy, recommend a prophylactic amount of 14 mg of zinc to be consumed daily during pregnancy.

Objective. The objective of the presented study was to assess the quality of the diet of pregnant women's in Poland compared with the WHO and EU recommendations concerning requirements for vitamins and minerals.

MATERIAL AND METHOD

A total of 512 pregnant women in their 20th - 30th week of pregnancy took part in the research. The tests took place in 2009 in 10 randomly-chosen obstetric-gynecological outpatients clinics on the whole territory of Poland. The research was conducted by means of observation of a 7-day diet. The women gave qualitative and quantitative descriptions of products and meals consumed on each day of the week. The 7-day results were added, averaged, and compared with the WHO recommendations. The second phase included an analysis of consumed products using the DIETETYK software developed by NFNI. The amounts of vitamins and other micro-elements obtained during observation were averaged. The obtained results were compared with the WHO, EU, NFNI recommendations for pregnant women, and statistically analyzed. The diets were analyzed according to age, education, place of residence, BMI before pregnancy, smoking, vitamins supplementation during

pregnancy, and nutrition education during pregnancy. The results were statistically analyzed with the χ^2 Pearson test that examined the independence of qualitative features expressed on the nominal scale. The verification of the test included calculating the value of the χ^2 function and comparing it with numeric values of that function postulated by the zero hypothesis. The presupposed probability of an error was set at $p=0.05$, $p=0.02$, $p=0.01$, $p=0.001$. To research was approved by the Bioethics Committee of the Institute of Rural Health in Lublin.

RESULTS

Pregnant women aged 20-35 accounted for 82.81% of the sample, of whom 12.5% were aged above 35 and 4.69% were aged below 20. 70.3% lived in cities and 29.7% in rural areas. 37.5% of the women had BMI below 20, 42.2% from 20-24.9, 15.6% from 25-29.9 and 4.7% had a BMI above 30. Almost half of them had academic education (48.43%), secondary education (35.94%) and primary (15.63%); 4.7% of the pregnant women smoked almost 79.7% of the pregnant women used vitamin-mineral supplements; and 20.3% of the women were educated on nutrition issues during pregnancy.

The first phase of the research included analysis of the consumption of fruits and vegetables which was compared with the WHO recommendations. The average daily consumption in grams is shown in Table 2.

Table 2. Average daily consumption of fruits and vegetables (g)

Group of produce	Average value in g	% below WHO recommendation
Fruits and vegetables (Σ)	731.72	
fruits	269	4.68%
fruit juices	108	< 400g/daily fruits and vegetables
vegetables	355	

N=512

According to the WHO recommendation, the overall amount of fruits and vegetables should not be less than 400 grams daily; however, 4.68% of the surveyed women consumed less than the recommended amount in their daily diet. The overall consumption of fruit varied according to BMI before pregnancy, as did smoking and level of education.

The pregnant women whose BMI before pregnancy was within 25-30 consumed the largest amounts of fruit (425 g/daily on average). Slightly less amounts of fruit were consumed by the women with BMI before pregnancy within 20-24.9 (393 g/daily, on average), and BMI below 20 (346 g/daily, on average). The lowest amounts of fruits were consumed by the pregnant women who were obese – BMI over 30 (304g/daily, on average).

The fruit consumption among the pregnant women was significantly related to smoking during pregnancy. The surveyed women who smoked consumed, on average, only 160 g/daily of fruit. The average for non-smoking women was 388 g/daily.

The pregnant women with a higher education level consumed, on average, the lowest amounts of fruit daily (301 g/daily). The highest consumption of fruit (404 g/daily, on average) was recorded among the women with elementary education.

Vegetable consumption among the pregnant women was related to BMI before pregnancy. The most vegetables (248 g/daily) were consumed by the women with a BMI before pregnancy below 20. The women with BMI over 30 before pregnancy consumed the lowest amounts of vegetables (194 g/daily).

The pregnant women consumed more boiled vegetables (227 g/daily, on average) than raw vegetables (130 g/daily, on average).

In the second phase, the analysis of consumption of fruit, vegetables and meals containing these ingredients was conducted by the means of DIETETYK software developed by the NFNI. The precise values of vitamins and minerals obtained during the observation were averaged.

It was noted that although only 4.68% of the surveyed women consumed smaller amounts of fruit and vegetables than recommended by the WHO, the quality of produce did not supply the recommended amounts of respective vitamins and minerals.

Table 3. Average values of vitamins and minerals in the pregnant women's diet

Vitamins	value/person/daily		Mineral	value/person/daily
vitamin D	2.64 ug/os/d	↓	calcium	689 mg/os/d ↓
vitamin B6	1.76 mg/os/d	↓	magnesium	255 mg/os/d ↓
vitamin A	1.255 ug/os/d	↑	iron	10.1 mg/os/d ↓
folic acid	160.3 ug/os/d	↓	zinc	9.2 mg/os/d ↓
			sodium	1.734 mg/os/d ↑
			phosphorus	1161 mg/os/d ↑

↓ – value lower than recommendations from the WHO, UE and NFNI.

↑ – value higher than recommendations from the WHO, UE and NFNI.

N = 512.

The only statistically significant relation concerning a higher quality diet during pregnancy in terms of vitamins and micro-elements was related to urban place of residence. Other factors – age, education, civil status, number of past pregnancies – did not affect the quality of the diet.

The pregnant women living in cities consumed more than sufficient amounts of magnesium, and less frequently exceeded consumption norms for A vitamin than the women from rural areas ($p < 0.05$).

Table 4. Consumption of vitamin A and magnesium by the pregnant women in relation to the NFNI norm

Place of residence	vitamin A			Magnesium		p
	<norm	norm	>norm	<350	>350	
Urban	53.33%	17.78%	28.89%	91.11%	8.89%	<0.05
Rural	36.84%	52.63%	10.53%	57.89%	42.11%	

N=512

DISCUSSION

The research proved that an average daily consumption of vegetables and fruit among the pregnant women complied with recommendations of the World Health Organization. The amount of consumed produce from the selected nutrition groups was significantly affected by such factors as: BMI before pregnancy, education, and smoking. Nutrition habits of the women who smoked include considerably insufficient amounts of fruit and vegetables. This also applied to obese

women with a BMI over 30 before pregnancy. The women with tertiary education consumed less fruit than all the other surveyed women.

Previous studies have shown that family income, education, and pregnancy BMI were associated with micronutrient inadequacy [13, 14].

Although only 4.68% of the surveyed women consumed less vegetables and fruit than recommended by the WHO, the quality of the consumed produce did not guarantee the recommended amounts of respective vitamins and minerals.

Research conducted in Italy found that the pregnant women consumed excessive amounts of high calorie produce and saturated fats, whereas the amount of dairy products was insufficient [15, 16].

Women in Finland consume more micro-elements (by 30-40%) than recommended by the WHO. A 10-day observation of the first and last week of 8-month pregnancies found that the pregnant women consumed excessive amounts of pork, margarine and offal. [17]. Although the diet of the average pregnant women in Finland is considered to be fairly healthy, studies have revealed inadequacies in the intake of foliate, iron and vitamin D [18, 19]. In recent years, however, studies have indicated a favourable trend concerning the diets of pregnant women in Finland, although – despite an increased intake of vitamin D since 2003 – its level in a diet is still lower than recommended. Furthermore, it was found that the consumption of vitamins A, D, E, C, folic acid and iron changes seasonally [20].

Research by Urgell et al. [21] confirm lower amounts of Fe, Zn and folic acid in the nutrition of pregnant women in Spain. American studies have shown [15] that a significant population of women at reproductive age do not satisfy requirements for micro-elements and vitamins. This concerns in particular women who are pregnant, smoked, or at a low socioeconomic level. In the United States, better educated women more often consume vegetables in accordance with the WHO recommendations [22]. It has been estimated that among pregnant women in the USA who smoke or are at a low socioeconomic level, as much as 33% consume insufficient (below 70% of the recommended value) amounts of folic acid, 40% calcium and around 50% iron and zinc [15]. Taking vitamin and micro-element supplements during pregnancy is very common among American women. However, according to one author, this is also unnecessary, with the exception of folic acid and iron, and should concern only smokers, alcoholics and multiple pregnancies [23].

The pregnant women aged above 35 more often than younger women consumed more fruits during pregnancy than during time prior to pregnancy [24].

CONCLUSION

Results of the presented research indicate insufficient knowledge of pregnant women about proper nutrition during pregnancy.

Due to significant deficiencies it is necessary to supplement the majority of vitamins and minerals from the first trimester – in particular, folic acid, iron, zinc and calcium.

Non-smoking women from urban areas with lower BMI before pregnancy had a higher quality diet in terms of vitamins and minerals, compared with other pregnant women.

The medical environment, schools and media should jointly educate women who are or plan to become pregnant about proper nutrition and vitamin-mineral supplementation.

REFERENCES

- Huk-Wieliczuk E, Wdowiak L. State of health of adolescents in eastern regions of Poland. Podlasie region child. *Ann Agric Environ Med.* 2006; 13(1): 39-43.
- Ministry of Health. Food and Nutrition Guidelines for Healthy Pregnant and Breastfeeding Women: A background paper. Wellington: Ministry of Health. 2006 (revised 2008).
- HEALTHY FOOD AND NUTRITION FOR WOMEN AND THEIR FAMILIES. Training Course for Health Professionals. WHO. Regional Office For Europe. Regional Office For Unicef. Geneva, Central and Eastern Europe and the Commonwealth of Independent States and the Baltics, 2001.
- Cavelaars AE et al. Prioritizing micronutrients for the purpose of reviewing their requirements: a protocol developed by EURRECA. *Eur J Clin Nutr.* 2010; 64(Suppl 2): 19-30.
- Sukchan P, Liabsuetrakul T, Chongsuvivatwong V, Songwathana P, Sornsrivichai V, Kuning M. Inadequacy of nutrients intake among pregnant women in the deep south of Thailand. *BMC Public Health.* 2010; 10: 572.
- Islam MZ, Akhtaruzzaman M, Lamberg-Allardt C. Nutritional status of women in Bangladesh: comparison of energy intake and nutritional status of a low income rural group with a high income urban group. *Asia Pacific J Clin Nutr.* 2004; 13: 61-68.
- Cheng Y, Dibley M, Zhang X, Zeng L, Yan H. Assessment of dietary intake among pregnant women in a rural area of western China. *BMC Public Health.* 2009; 9: 222.
- Abdelrahim II, Adam GK, Mohammed AA, Salih MM, Ali NI, Elbasher MI, Adam I. Anaemia, folate and vitamin B12 deficiency among pregnant women in an area of unstable malaria transmission in eastern Sudan. *Trans R Soc Trop Med Hyg.* 2009; 103: 493-496.
- Oguntona C, Akinyele I. Food and nutrient intakes by pregnant Nigerian adolescents during the third trimester. *Nutrition* 2002; 18: 673-679.
- Swensen AR, Harnack LJ, Ross JA. Nutritional assessment of pregnant women enrolled in the special supplemental program for women, infants, and children (WIC) *J Am Diet Assoc.* 2001; 101: 903-908.
- Szostak-Węgierek D, Cichocka A. Żywnienie kobiet w ciąży. (Nutrition of pregnancy women) PZWL, Warszawa 2005.
- NARODOWY PROGRAM ZDROWIA 1996-2005 (National Health Program) Ministerstwo Zdrowia i Opieki Społecznej – 1996 r.
- Kesa H, Oldewage-Theron W. Anthropometric indications and nutritional intake of women in the Vaal Triangle, South Africa. *Public Health.* 2005; 119: 294-300.
- Murakami K, Miyake Y, Sasaki S, Tanaka K, Ohya Y, Hirota Y. the Osaka Maternal and Child Health Study Group. Education, but not occupation or household income, is positively related to favorable dietary intake patterns in pregnant Japanese women: the Osaka Maternal and Child Health Study. *Nutr Res.* 2009; 29: 164-172.
- Scholl TO, Hediger ML, Bendich A, Schall JI, Smith WK, Krueger PM. Use of multivitamin/mineral prenatal supplements: influence on the outcome of pregnancy. *Am J Epidemiol.* 1997; 146(2): 134-41.
- Thiele S, Mensink G, Beitz R. Determinants of diet quality. *Public Health Nutrition* 2004; 7(1): 29-37.
- Erkkola M, Karppinen M, Javanainen J, Rasaneu L, Knip M, Virtanen SM. Validity and reproducibility of food frequency questionnaire for pregnant Finnish women. *Am. J Epidemiol.* 2001; 154(5): 466-76.
- Arkkola, T, Uusitalo, U, Pietikäinen, M et al. Dietary intake and use of dietary supplements in relation to demographic variables among pregnant Finnish women. *Br J Nutr.* 2006; 96: 913-920.
- Erkkola, M, Karppinen, M, Järvinen, A et al. Folate, vitamin D, and iron intakes are low among pregnant Finnish women. *Eur J Clin Nutr.* 1998; 52: 742-748.
- Prasad M, Lumia M, Erkkola M, Tapanainen H, Kronberg-Kippilä C, Tuokkola J, Uusitalo U, Simell O, Veijola R, Knip M, Ovaskainen ML, Virtanen SM. Diet composition of pregnant Finnish women: changes over time and across seasons. *Public Health Nutr.* 2010;13(6A): 939-46.
- Urgell MR, Benavides JF, Gonzalez DE, Aguero Laborda R, Gonzalez EF. Maternal nutritional factors: significance for the fetus and the neonate. *Early Hum.* 1998; 53: 61-76 .
- Bodnar LM, Siega-Riz AM. A Diet Quality Index for Pregnancy detects variation in diet and differences by sociodemographic factors. *Public Health Nutrition* 2002; 5(6): 801-809.
- Menard MK. Vitamin and mineral supplement prior to and during pregnancy. *Obstet Gynecol Clin North Am.* 1997; 24(3): 479-98.
- Bojar I, Wdowiak L, Humeniuk E, Błaziak P. Change In the quality of diet during pregnancy In comparison with WHO and EU recommendations – environmental and sociodemographic conditions. *Ann Agric Environ Med.* 2006; 13(2): 281-287.