

# Quality of pregnant women's diet in Poland – macro-elements

Iwona Bojar<sup>1</sup>, Alfred Owoc<sup>2</sup>, Ewa Humeniuk<sup>3</sup>, Adam Fronczak<sup>2</sup>, Irena Walecka<sup>2</sup>

<sup>1</sup>Institute of Rural Health, Lublin, Poland

<sup>2</sup>Lubuski College of Public Health, Zielona Gora, Poland

<sup>3</sup>Department of Pathology and Rehabilitation of Speech, Medical University, Lublin, Poland

**Submitted:** 28 March 2011

**Accepted:** 6 December 2011

Arch Med Sci 2014; 10, 2: 361–365

DOI: 10.5114/aoms.2013.35001

Copyright © 2014 Termedia & Banach

**Corresponding author:**

Iwona Bojar PhD  
Institute of Rural Health  
2 Jaczewskiego St  
20-090 Lublin, Poland  
Phone: +48 783 960 257  
E-mail:  
iwonabojar75@gmail.com

## Abstract

**Introduction:** The objective was to assess the quality of pregnant women's diet in Poland concerning macro-elements and to analyze reasons for low or high quality diets.

**Material and methods:** Five hundred and twelve pregnant women in their 20<sup>th</sup> to 30<sup>th</sup> week of pregnancy took part in the research conducted by means of a 7-day observation of diet. Consumed products were analyzed by means of DIETETYK software developed by the Polish National Food and Nutrition Institute. Obtained macro values were averaged. The results were compared with the recommendations from the World Health Organization, European Union and Polish National Food and Nutrition Institute and analyzed statistically ( $\chi^2$  test).

**Results:** The pregnant women consumed an average of 1898  $\pm$  380 kcal daily. Average value of macro components supplied with the diet did not deviate from EU and NFNI nutrition recommendations: protein – 72.1 g/person daily, fats overall – 72.8 g, polyunsaturated fatty acids – 10.93 g, cholesterol – 283 mg, carbohydrates – 257 g. The study proved a significant relation between a higher quality diet of pregnant women and tertiary or secondary education ( $p = 0.05$ ) as well as urban residence ( $p = 0.01$ ).

**Conclusions:** Pregnant women's diet in Poland is not significantly different from diet quality of pregnant women from other countries. A lower quality diet was observed among women who smoked during pregnancy and lived in rural areas.

**Key words:** macro elements, quality of diet, pregnant, recommendations.

## Introduction

The health behavior of pregnant women, including proper provision of all necessary nutrition elements, affects the frequency of pregnancy complications, fetal development and occurrence of diseases among children in later age [1]. The World Health Organization (WHO) recommends pregnant women's diet to be rational, provide an adequate amount of energy and include necessary nutrition elements (proteins, carbohydrates, fats, mineral elements and vitamins) in proper amounts and proportions [2]. According to the Polish National Food and Nutrition Institute (NFNI), pregnancy increases the norm of protein consumption to 95 g a day [3]. An estimated 60% of overall daily requirements for proteins concern animal proteins that are derived mainly from milk and its products, animal meat, poultry and fishes. The remaining 40% should originate from vegetables, e.g. leguminous plants.

Fat should make up 30% of the energy value of a daily diet (including consumption of not more than 10% saturated fatty acids and not more than 300 g of cholesterol a day). There are alterations in a diet during pregnancy which are related to the sorts of fats consumed. During this period women have an increased requirement for some of the unsaturated fatty acids – linoleic acid and  $\alpha$ -linoleic acid. It is recommended that pregnant women consume natural fats [2].

The objective of the work was to assess the quality of pregnant women's diet in Poland concerning macro-elements (proteins, carbohydrates, fats) and to analyze reasons for low or high quality diets.

## Material and methods

Five hundred and twelve women in their 20<sup>th</sup> to 30<sup>th</sup> week of pregnancy took part in the research. The tests took place in 2008 in ten randomly chosen obstetric-gynecological outpatient clinics within the whole territory of Poland. The research was conducted on the basis of a 7-day observation of diet. The women described quality and quantity of produce and meals consumed on each week day. The 7-day data were summed, averaged and compared with recommendations from the World

Table I. Protein requirements

Nutrition recommendations	Proteins [g/day]	
	Non-pregnant women	Pregnant women
WHO	45	51
Europe	47	48–60
USA	46	60
Former Soviet Union	75	105

Table II. Average daily consumption of produce

Group of products	Average values [g]	% below WHO recommendation
<b>Meat, fish, eggs, seeds (<math>\Sigma</math>)</b>	<b>224</b>	3.12% ( $< 130$ g/daily)
Unprocessed red meat	37	
Processed red meat	72	
Poultry	40	
Fish	31	
Eggs	22	
Seeds/nuts	6.5	
<b>Milk products (<math>\Sigma</math>)</b>	<b>384</b>	46.87% (milk and its products $< 400$ g/daily, yellow cheese $< 45$ g/daily)
Fat milk	227	
Fat-free milk	0	
Yoghurt	65.8	
Yellow cheese	32	

May 2008, Poland,  $n = 512$

Health Organization (WHO). The second phase of the analysis of consumed produce included the use of DIETETYK software developed by the Polish National Food and Nutrition Institute (NFNI). The values of macro-elements obtained during the observation were averaged and the results compared with the recommendations from the WHO, European Union and NFNI.

## Statistical analysis

The results were statistically analyzed. We conducted statistical significance tests of relations between variables using the  $\chi^2$  Pearson test, which tests the independence of qualitative features expressed in nominal scales. The verification of the test included calculating the value of the  $\chi^2$  function and comparing it with numerical values of that function predicted by the null hypothesis. The presupposed probability of an error was set at  $p = 0.05$ ,  $p = 0.02$ ,  $p = 0.01$ ,  $p = 0.001$ .

## Results

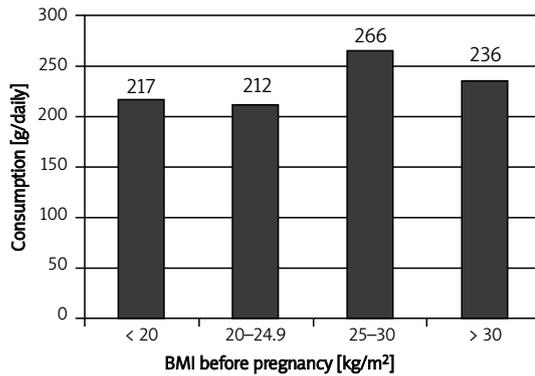
Pregnant women aged 20–35 years accounted for 82.81% of the sample. 12.5% of women were above 35 years and 4.69% were below 20 years. 70.3% lived in cities and 29.7% in rural areas. 37.5% of women had a body mass index (BMI) below 20 kg/m<sup>2</sup>, 42.2% from 20 to 24.9 kg/m<sup>2</sup>, 15.6% from 25 to 29.9 kg/m<sup>2</sup>, and 4.7% above 30 kg/m<sup>2</sup>. Almost half of them (48.43%) had an academic education, 35.94% a secondary education, and 15.63% a primary education. 4.7% of the pregnant women smoked. Almost 79.7% of the pregnant women used vitamin-mineral supplements. 20.3% of the women were educated on nutrition issues during pregnancy.

The research proved that the pregnant women consumed an average of 1898  $\pm$ 380 kcal daily. The minimum average value recorded was 1300 kcal and the maximum was 3063 kcal. The first phase of the research included an analysis of consumption of produce from specific groups and comparing it with WHO recommendations. The average daily consumption of respective produce (in grams), excluding cereal produce, is shown in Tables I and II.

According to WHO recommendations the total value of produce from the "meat, fish, eggs, seeds" group should not be less than 130 g a day. Among the surveyed women 3.12% consumed less than that.

Consumption of dairy products, according to the WHO, should include not less than 400 g of milk, yoghurt and derivatives daily and not less than 45 g of yellow cheese daily. Among women under observation 46.87% consumed less in their diet.

The average daily consumption of group I produce (meat, fish, eggs) is significantly related to the BMI before pregnancy. The largest average con-



**Figure 1.** Average daily consumption of group I produce in relation to BMI before pregnancy

**Table III.** Average values of macro-elements in the diet of pregnant women under observation

Macro-elements	Average values [g/person/daily]
Proteins	72.1
Overall fats	72.8
Polyunsaturated fatty acids	10.93
Cholesterol	283
Carbohydrates	257

May 2008, Poland, n = 512

**Table IV.** Overall consumption of fats among the pregnant women in relation to education, place of residence and the NFNI norm

Fats overall	Below norm [%]	Norm [%]	Above norm [%]	Value of p
Education:				
Tertiary	36.00	60.00	4.00	< 0.05
Bachelor	16.67	16.67	66.67	
Secondary	13.04	56.52	30.43	
Vocational	12.50	62.50	25.00	
Elementary	0.00	50.00	50.00	
Place of residence:				
Urban	24.44	64.44	11.11	< 0.001
Rural	15.79	31.58	52.63	

May 2008, Poland, n = 512

sumption of produce from that group (266 g/daily) was among the women whose BMI before pregnancy was 25–30 kg/m<sup>2</sup>. Smoking, place of residence, education on nutrition or level of education did not affect consumption of group I produce significantly (Figure 1).

The amount of dairy products consumed by the pregnant women is not significantly related to BMI before pregnancy, place of residence, education or smoking ( $p > 0.05$ ).

The DIETETYK software developed by NFNI was used in the second phase of the produce consumption analysis. The values of macro-elements obtained during the analysis were averaged.

The conducted analysis proved that despite too low consumption of milk products among the surveyed women, the average value of macro-elements in the diet complies with nutrition recommendations of the WHO, EU and NFNI (Table III).

There was a significant relation between a higher quality diet during pregnancy and a secondary or tertiary education, education on nutrition during pregnancy and place of residence. Age, marital status, and number of past pregnancies were not related to diet quality.

There was a significant relation between the overall amount of fats in the diet and the surveyed women's level of education. The pregnant women with tertiary or secondary education more often consumed the recommended amount of fats than other women.

Urban residence and educating pregnant women on nutrition issues were among other factors contributing to the higher quality diet in terms of fat consumption (Tables IV, V).

The pregnant women from urban areas consumed produce that contained more adequate amounts of proteins than women from rural areas (Table VI).

**Table V.** Cholesterol consumption among the surveyed women in relation to their education during pregnancy on nutrition and the NFNI norm

Cholesterol	< 300 mg/daily	> 300 mg/daily	Value of p
Education on nutrition during pregnancy			
No	56.86%	43.14%	< 0.001
Yes	92.31%	7.69%	

May 2008, Poland, n = 512

**Table VI.** Protein consumption among the surveyed women in relation to their place of residence and the NFNI norm

Proteins	Below norm [%]	Norm [%]	Above norm [%]	Value of <i>p</i>
<b>Place of residence</b>				
Urban	48.89	48.89	2.22	< 0.05
Rural	31.58	36.84	31.58	

May 2008, Poland, *n* = 512

## Discussion

The average daily consumption of group I produce (meat, fish, eggs in grams) among the surveyed women complies with the recommendations of the World Health Organization. The highest average consumption of this produce concerned the pregnant women whose BMI prior to pregnancy was within the 25–30 kg/m<sup>2</sup> range. The consumption of group I produce was not significantly affected by smoking or level of education. On average, the pregnant women consumed insufficient amounts of dairy products. However, the average amount of macro-elements consumed complies with the nutrition recommendations from the WHO, EU and NFNI.

The study proved a significant relation between a higher quality diet of pregnant women and tertiary or secondary education as well as urban residence. Age, civil status, number of pregnancies, and education during pregnancy did not affect diet quality.

The research conducted in Germany found that women's diet quality was significantly related to the level of education. The women with tertiary education had better quality diets than ones with lower education. It was also concluded that pregnant women more frequently consumed vitamins and micro-elements on a regular basis. Nevertheless, the research proved that pregnant women in Germany consumed substantial amounts of food considered unhealthy [4].

The 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 [5, 6].

A 7-day observation conducted in England quantified consumption of produce for women in their 28<sup>th</sup> week of pregnancy. It was concluded that smoking and education during pregnancy significantly affected the quality of their diet. Smoking and lower education were the main reasons for a low-quality diet [7].

Women in Finland consume more food (30-40%) than is 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 [8].

In the United States pregnant women with tertiary education had a significantly higher quality diet. There was a higher percentage of women con-

suming vegetables in line with WHO recommendations in the better educated group [9]. The authors of another study in the United States also found a relation between safe nutrition during pregnancy and a higher level of education [10].

The first research found that pregnancy positively affected overall diet quality. The eating pyramid in the sample group more likely reflected the WHO pyramid of rational nutrition, compared with the period of time prior to pregnancy. The pregnant women consumed a more proper food mix [11].

The strongest factors in other studies assessing diet of pregnant women in European countries with similar culture and climate were: education level, wealth status and age [12–18]. It has also been confirmed that there is an impact of family norms on nutrition habits of pregnant women [19]. A review of the literature concerning nutrition during pregnancy in European and non-European countries proved that cultural differences and climate do affect the diet. Nevertheless, these differences become less clear as the civilization develops. Canadian women residing in the Arctic region are a good example of that. Their diet used to be full of meat and fish in the past and thus contained large amounts of polyunsaturated fatty acids and fat-soluble vitamins. Right now ubiquitous supermarkets make processed food and “fast food” available to more and more people [23].

Changes that make processed food more readily available and changing lifestyles across the world reduce the importance of cultural and climate differences in nutrition. That makes education on proper nutrition habits even more important.

In conclusion, the research conducted among the pregnant women by means of a 7-day observation of their diet suggests that the consumption of meat products is in line with WHO recommendations. Pregnant women in Poland consume insufficient amounts of dairy products, although it does not deteriorate the quality of diet in terms of individual macro-elements. Pregnant women's diet in our country during the analyzed period of time is not significantly different from diet quality of pregnant women from other EU countries or the United States. It was also found that a higher-quality diet, i.e. more compliant with WHO, EU and NFNI recommendations, is correlated with lower body mass index of the pregnant women prior to preg-

nancy and level of education. A lower quality diet was observed among women who smoked during pregnancy and lived in rural areas.

## References

1. Huk-Wieliczuk E, Wdowiak L. State of health of adolescents in eastern regions of Poland. Podlasie region child. *Ann Agric Environ Med* 2006; 13: 39-43.
2. 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.
3. Szostak-Węgierek D, Cichońska A. Nutrition of pregnant woman [Polish]. PZWL, Warsaw 2005.
4. Thiele S, Mensink G, Beitz R. Determinants of diet quality. *Public Health Nutrition* 2004; 7: 29-37.
5. Fidanza AA, Fidanza R. A nutrition study involving a group of pregnant women in Assisi, Italy. Part 1: Anthropometry, dietary intake and nutrition knowledge, practices and attitudes. *Int J Vitam Nutr Res* 1986; 56: 373-80.
6. Fidanza AA, Simonetti MS, Cucchia LM. A nutrition study involving a group of pregnant women in Assisi, Italy. Part 2: Determination of vitamin nutriture. *Int J Vitam Nutr Res* 1986; 56: 381-6.
7. Haste FM, Brooke OG, Anderson HR, Bland JM, Peacock JL. Social determinants of nutrient intake in smokers and non-smokers during pregnancy. *J Epidemiol Community Health* 1990; 44: 205-9.
8. Erkkola M, Karppinen M, Javanainen J, Rasanen L, Knip M, Virtanen SM. Validity and reproducibility of food frequency questionnaire for pregnant Finnish women. *Am J Epidemiol* 2001; 154: 466-76.
9. 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: 801-9.
10. Fowles ER, Gabrielson M. First trimester predictors of diet and birth outcomes in low-income pregnant women. *J Community Health Nurs* 2005; 22: 117-30.
11. 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 socio-demographic conditions. *Ann Agric Environ Med* 2006; 13: 281-7.
12. Cuco G, Fernandez-Ballart J, Sala J, et al. Dietary patterns and associated lifestyles in preconception, pregnancy and postpartum. *Eur J Clin Nutr* 2006; 60: 364-71.
13. Schulze MB, Hoffmann K, Kroke A, Boeing H. Dietary patterns and their associations with food and nutrient intake in the European Prospective Investigation into Cancer and Nutrition (EPIC) – Potsdam study. *Br J Nutr* 2001; 85: 363-73.
14. Williams DEM, Prevost AT, Whichelow MJ, Cox BD, Day NE, Wareham NJ. A cross-sectional study of dietary patterns with glucose intolerance and other features of the metabolic syndrome. *Br J Nutr* 2000; 83: 257-66.
15. Mishra G, Ball K, Arbuckle J, Crawford D. Dietary patterns of Australian adults and their associations with socio-economic status: results from the 1995 National Nutrition Survey. *Eur J Clin Nutr* 2002; 56: 687-93.
16. Costacou T, Bamia C, Ferrari P, Riboli E, Trichopoulos D, Trichopoulou A. Tracing the Mediterranean diet through principal components and cluster analyses in the Greek population. *Eur J Clin Nutr* 2003; 57: 1378-85.
17. Sanchez-Villegas A, Delgado-Rodriguez M, Martinez-Gonzalez MA, de Irala-Estevez J. Gender, age, socio-demographic and lifestyle factors associated with major dietary patterns in the Spanish Project SUN (Seguimiento Universidad de Navarra). *Eur J Clin Nutr* 2003; 57: 285-92.
18. Robinson SM, Crozier SR, Borland SE, Hammond J, Barker DJP, Inskip HM. Impact of educational attainment on the quality of young women's diets. *Eur J Clin Nutr* 2004; 58: 1174-80.
19. Mikkila V, Rasanen L, Raitakari OT, Pietinen P, Viikari J. Consistent dietary patterns identified from childhood to adulthood: the Cardiovascular Risk in Young Finns Study. *Br J Nutr* 2005; 93: 923-31.
20. Cuco G, Fernandez-Ballart BJ, Sala J, et al. Dietary patterns and associated lifestyles in preconception, pregnancy and postpartum. *Eur J Clin Nutr* 2006; 60: 364-71.
21. De Irala-Estevez J, Groth M, Johansson L, Oltersdorf U, Prattala R, Martinez-Gonzalez M. A systematic review of socioeconomic differences in food habits in Europe: consumption of fruit and vegetables. *Eur J Clin Nutr* 2000; 54: 706-14.
22. Golding J, Pembrey M, Jones R, ALSPAC Study Team. ALSPAC – The Avon Longitudinal Study of Parents and Children. I. Study methodology. *Paediatr Perinat Epidemiol* 2001; 15: 74-87.
23. Berti PR, Soueida R, Kuhnlein HV. Dietary assessment of indigenous Canadian Arctic women with a focus on pregnancy and lactation. *Int J Circumpolar Health* 2008; 67: 349-62.