

# Nutritional behavior in pregnancy

Natalia Misan<sup>1</sup>, Katarzyna Paczkowska<sup>2</sup>, Magdalena Szmyt<sup>2</sup>, Katarzyna Kapska<sup>1</sup>,  
Lidia Tomczak<sup>1</sup>, Grzegorz H. Breborowicz<sup>1</sup>, Mariola Ropacka-Lesiak<sup>1</sup>

<sup>1</sup>Department of Perinatology and Gynecology, Poznan University of Medical Sciences, Poland

<sup>2</sup>Students' Scientific Association by the Department of Perinatology and Gynecology,  
Poznan University of Medical Sciences, Poland

## ABSTRACT

**Objectives:** The aim of the study was to characterize nutritional behavior in pregnancy.

**Material and methods:** The survey study included 250 pregnant women. The survey concerned dietary behavior referred to the type of diet, the number of meals per day, snacking between meals, consumption of meat, fish, dairy products, bread, fruits and vegetables.

**Results:** 88.8% of the respondents were not on a special diet. The most of the women ate more than three times a day. The women usually ate fruits and vegetables, yogurt and sweets as snacks between meals. The majority of respondents consumed meat and sliced meats twice or once a day with the preference of poultry. Only 17.6% of them ate fish with the recommended frequency and as much as 21.2% chose not-recommended species. Almost 29.6% of patients consumed 3 to 4 servings of milk or milk products a day and 16.8% of them excluded milk. Half of the respondents declared eating wheat bread and 24% of them chose wheat roll during pregnancy. Despite the large number of women who consumed wheat baking, a considerable amount of women chose wholemeal bread and wholemeal rolls. Nutritional behaviors were correlated with on education level and weight gain during pregnancy.

**Conclusions:** The frequency of meals was adequate for the most of pregnant women as well as recommended consumption of meat with poultry preference. However, the inappropriate nutrition was also observed in a low consumption of fish and dairy products, a high consumption of wheat breadstuff and sweets, as well as in a small intake of milk. Education level and weight gain during pregnancy were associated with nutritional behaviors.

**Key words:** nutritional behavior; proper diet; eating habits; healthy lifestyle; body mass index; weight gain

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## INTRODUCTION

Proper nutrition in pregnancy is one of the public health concerning problem. The malnutrition affects more than a half of women in many low- and middle-income countries with the highest risk among the poorest [1].

Both among underweight as well as overweight women, the risk of small for gestational age fetuses (SGA) and prematurity is increased [2]. Moreover, maternal obesity can lead to many consequences such as pregnancy induced hypertension, preeclampsia, gestational diabetes, increased rate of cesarean sections and delivering large for gestational age infants (LGA) [3].

Leonard SA. et al. reported that high maternal body weight in the reproductive period increases the risk of childhood obesity. Furthermore, the high pre-pregnancy

BMI influences more on the postpartum weight retention than weight gain during pregnancy [4].

According to the Academy of Nutrition and Dietetics statement, reproductive-aged women should implement a healthy lifestyle, which reduces the risk of fetal defects, inappropriate fetal development and chronic diseases of both mother and newborn. The factors affecting the perinatal outcomes include correct pre-pregnancy weight, appropriate weight gain and physical activity during gestation, consumption of a wide variety of food, vitamins and minerals supplementation, elimination of alcohol and smoking [5].

## Objectives

The aim of the study was to characterize nutritional behavior in pregnant women in Poland.

Corresponding author:

Natalia Misan

Department of Perinatology and Gynecology, Poznan University of Medical Sciences, Poland  
e-mail: [natalia.podkova@wp.pl](mailto:natalia.podkova@wp.pl)

## MATERIAL AND METHODS

The survey study included 250 women who gave birth in the Obstetric-Gynecological Hospital, University of Medical Sciences in Poznan. All patients signed informed consent and fulfilled a questionnaire prepared by authors (Supp. file 1). Then the women were divided into two groups- those with lower and higher education level and the nutritional behaviors were analyzed. Independently, they were divided for three groups according to pre-pregnancy BMI and gestational weight gain recommended by the Institute of Health [6]. The first group was composed of women with lower weight gain than recommended, the second group consisted of females with proper weight gain and the third group included respondents who put on weight more than recommended.

The questions referred to general information, such as age, pregestational and actual weight, place of residence, education, marital status, employment before and during pregnancy, the period of working during pregnancy and the type of pregnancy (singleton or multiple). Moreover, the questions also concerned diseases and complications during pregnancy. The part of dietary behaviours referred to the type of diet and the number of meals per day. It also concerned snacking between meals, consumption of meat, fish, dairy products, bread, fruits and vegetables.

The general characteristics of the study group is presented in the Table 1. The coexisting diseases and pregnancy complications are shown in the Table 2. The data are expressed as a percentage or as mean (M) and standard deviation (SD).

The calculations were performed using Microsoft Excel 2010 and Statistica StatSoft 13.1. The data in interval scale were assessed using nonparametric Mann-Whitney test and the data in nominal scale were analyzed using the Fisher's exact test. The significance level was assumed as p-value below 0.05. The data do not add up because of multiple choice questions.

## RESULTS

88.8% of the respondents were not on any special diet. Only 7.2% of women were on diabetic diet and 0.8% on gluten-free diet. The same number of women were on low-salt diet and 0.4% on low-fat diet. Only 1.2% of pregnant women were vegetarians or vegans. High protein food responded 0.8% women. When assessing the frequency of meals, it was noticed that only 33.6% of women ate 5 times a day or more often. Pregnant women consumed meals 4 (36.0%) or 3 (26.0%) times a day, and up to 4.4% ate less than 3 times a day. Especially often they ate fruits and vegetables (84.8%) and yoghurt (68.8%). Almost half of them ate sweets (46.8%) between meals. According to fruits and vegetables, the most often chosen were apples, bananas, oranges, and among vegetables tomatoes, carrots, cucumber and potatoes.

**Table 1.** The general characteristics of survey respondents

Characteristics	Pregnant women
<b>Age</b> [years] (Mean $\pm$ SD)	30 $\pm$ 5
<b>BMI</b> [kg/m <sup>2</sup> ] (Mean $\pm$ SD)	22.8 $\pm$ 4.4
<b>Place of residence</b> [%]	
rural areas	33.2
urban areas	66.8
<b>Education</b> [%]	
lower	29.2
higher	70.8
<b>Marital status</b> [%]	
unmarried	16.0
married	81.2
divorced	2.8
<b>Work activity</b> [%]	
before pregnancy	86.4
during pregnancy	59.6
<b>Term of gestational work activity discontinuation</b> [weeks] (Mean $\pm$ SD)	20 $\pm$ 10
<b>Type of pregnancy</b> [%]	
singleton	91.2
multiple	8.8

**Table 2.** The diseases and pregnancy complications of survey respondents

Diseases and pregnancy complications	Number of pregnant women [%]
Chronic arterial hypertension	4.4
Pregnancy induced arterial hypertension	4.4
Gestational diabetes mellitus	9.6
Anaemia	7.6
Hypothyroidism	8.4
Hyperthyroidism	1.2
Polyhydramnion	2.0
Oligohydramnion	2.0
Premature membrane rupture	4.0
Intrauterine growth restriction	3.6
Fetal defect	2.0
Cervical insufficiency	4.8
Threatening preterm delivery	18.8
Vaginal bleeding in pregnancy	8.8
Spine pain	30.4

The majority of respondents consumed meat and sliced meats twice (38.8%) or once (34.8%) a day. As for meat, most of them consumed poultry (73.2%). Much less women consumed beef (13.2%) and pork (8.8%). Even less pregnant women ate veal (3.2%) and rabbit meat (0.4%) that are considered very healthy. Only 17.6% of women ate fish with the recommended frequency. 75.6% of them chose fish

called „fish of best choices" (salmon, cod, zander, herring, pollock, hake, blue hake, trout, sole) and even 21.2% chose not-recommended species such as mackerel, panga, and tuna. The majority of women (65.6%) consumed fish only once a week, and 12.4% did not eat fish at all. Almost 29.6% of patients consumed three to four servings of milk or milk products a day. However, 16.8% of patients excluded milk completely. Half of the respondents declared eating wheat bread and 24% of them chose wheat roll during pregnancy. Despite the large number of women who consumed wheat baking, a considerable amount of women chose wholemeal bread (49.2%) and wholemeal rolls (35.6%).

The high-educated women ate significantly more often five (34% vs 12%,  $p = 0.0002$ ) or more than five (8% vs 0%,  $p = 0.0068$ ) meals a day in comparison to women with lower education level. Additionally, women with lower education consumed two dishes a day statistically more often (7% vs 2%,  $p = 0.0491$ ). The high-educated respondents declared eating vegetables (92% vs 74%,  $p = 0.0002$ ), yoghurt (75% vs 55%,  $p = 0.0020$ ), beef (18% vs 3%,  $p = 0.006$ ) and „fish of best choices" (80% vs 64%,  $p = 0.0096$ ) significantly more often than the rest of respondents. Taking into account the frequency of meat consumption, high-educated respondents declared eating meat and sliced meats once a day (39% vs 25%,  $p = 0.0206$ ) significantly more often. Statistically the greater group of women with lower education consumed dairy products four or more times a day (15% vs 5%,  $p = 0.0107$ ) but they also declared significantly more often eating dairy products occasionally (10% vs 2%,  $p = 0.0078$ ) or not eating at all (4% vs 0%,  $p = 0.0242$ ). The wholemeal bread (59% vs 25%,  $p < 0.0001$ ) and wholemeal rolls (40% vs 26%,  $p = 0.0285$ ) were eaten significantly more often by high-educated women in comparison to those with lower education, who preferred wheat bread (66% vs 44%,  $p = 0.0010$ ). Considering fruits and vegetables, the respondents with higher education chose apples (78% vs 63%,  $p = 0.0123$ ), raspberries (21% vs 8%,  $p = 0.0077$ ), grapefruits (18% vs 5%,  $p = 0.0077$ ), asparagus (14 vs 1%,  $p = 0.0013$ ), tomatoes (76 vs 53%,  $p = 0.0004$ ), onions (14 vs 5%,  $p = 0.0469$ ) significantly more often but they also ate potatoes (35 vs 58%,  $p = 0.0009$ ) and broccoli (28% vs 42%,  $p = 0.0175$ ) statistically less often than those with lower education.

According to pre-pregnancy BMI and gestational weight gain the women with lower weight gain than recommended declared consumption of wheat bread (62.8% vs 45.7%,  $p = 0.0329$ ), watermelon (15.3% vs 4.3%,  $p = 0.0250$ ) and beef (17% vs 6.6%,  $p = 0.0410$ ) significantly more often than women with proper weight gain. Moreover, the females, who put on weight too low than recommended declared significantly more often consumption of watermelon (15.3% vs 2.7%,  $p = 0.0448$ ) and statistically less often eating between meals

(1.2% vs 8.1%,  $p = 0.0462$ ), consumption of cod (23.9% vs 43.6%,  $p = 0.0250$ ) and herring (14.8% vs 33.3%,  $p = 0.0167$ ) than females with higher weight gain than recommended. Furthermore, women with higher weight gain ate herring (33.3% vs 10.5%,  $p = 0.0027$ ) and avoided eating meat (10% vs 0%,  $p = 0.0044$ ) significantly more often than those with proper weight gain.

## DISCUSSION

Proper nutritional behavior in pregnancy is important for the wellbeing of both mother and fetus, because well-balanced diet supports maternal health during gestation, delivery and breastfeeding [7–11]. Most of our respondents were not on a diet similar to the results observed by Mielnik [12]. A special type of diet was implemented mostly as a consequence of pregnancy complications, forcing them to change the diet.

The Institute of Medicine recommends eating of three meals and two or more snacks a day [13]. Siega-Riz et al. [14] observed that women, who consumed main meals and snacks less often, had a higher risk of preterm delivery. In our study, only 26% of females followed the recommendations and consumed three main meals a day. Moreover, the most of our respondents declared eating four (36%) or five (28%) meals a day. The similar results were obtained by Mielnik [12]. Furthermore, Pieszko et al. [15] observed the increasing frequency of consumed meals in comparison to the pre-pregnancy period.

In the study of Kobiolka et al. the most often eaten snacks between meals were fruits (80%). Consecutively, pregnant women as snacks chose yogurt (61%), sweets (54%) and vegetables (19%) [16], what was compatible with the results of our study.

During pregnancy, the main recommended source of animal protein should be lean meat and its products, skimmed milk and its products, as well as fish and eggs. The consumption of pork due to the high content of saturated fats should be limited [17]. The consumption of meat and its products allows to cover the increasing iron demand for the prevention of anaemia and preterm delivery [18, 19]. According to Szostak-Węgierek and Cichocka [20] study, the pregnant women should consume one portion (about 150 grams) of poultry a day in the first trimester and one and a half servings of poultry a day in the second and third trimester, interchangeably with fish two to three times a week. In our study, most women followed the recommendations and consumed meat and sliced meats twice (38.8%) or once (34.8%) a day, which was comparable with results of Mielnik. Moreover, she presented a similar number of non-eating meats women as it was found in our study (3.4%). Similarly to Mielnik's research, pregnant women preferred poultry [12].

During gestational period pregnant women should also eat fish meals. It is recommended to eat one portion of fish (about 150 grams) in the first trimester and one and a half portion of fish during the second and third trimester with the frequency of two to three times a week [20]. In accordance with the Food and Drug Administration recommendations [21], the pregnant women should consume two to three servings of fish of best choices a week or one serving of fish of good choices a week. Only about one fifth (17.6%) of our patients ate fish with the recommended frequency. Moreover, even 21.2% of the respondents chose not-recommended species of fish. Kobiółka et al. [16] noticed that the majority of pregnant women consumed fish once or twice a week (74%), three to four times a week (18%) and 8% of them declared not eating fish at all.

Furthermore, it is recommended to consume three servings of milk or milk products a day in the first trimester and four servings a day in the second and third trimester of pregnancy. One glass of milk, yogurt, kefir, 100 grams of curd cheese or 2 slices of cheese is considered as one serving [20]. Our study revealed that only less than one third of patients followed these recommendations (29.6%). This means that pregnant women eat dairy products in an insufficient amount, which may have an undesirable adverse effect on the course of pregnancy. Similar eating habits in relation to dairy products were presented by Kobiółka et al. [16]. Moreover, only about one fifth of pregnant patients consumed milk every day (23.2%). Furthermore, 16.8% of our patients did not drink milk. Similarly, in the Mielnik's study [12] as much as 33% of women did not drink milk during gestation. Contrary, Kobiółka et al. [16] revealed that only 1% of pregnant respondents declared drinking of milk.

The basic products recommended in the daily diet of pregnant women are cereal products, being the main source of carbohydrates and minerals [22, 23]. Wholemeal bread, rich in fiber, regulates the motility of the digestive tract, gives a sense of satiety, which prevent snacking between meals, and thus creates a greater opportunity to maintain proper weight. Half of our respondents declared eating wheat bread and 24% of them chose wheat roll during pregnancy. Despite the large number of women who consumed wheat baking, a considerable amount of females chose wholemeal bread (49.2%) and wholemeal rolls (35.6%). Slightly worse nutritional habits were observed by Mielnik. The most of survey respondents chose wheat bread (48.9%) and wheat roll (46.6%). The rest of pregnant respondents ate wholemeal bread (29.5%), wholemeal roll (20.5%), wheat-rye bread (19.3%), rye bread (14.8%) and toasted bread (3.4%) [12].

The positive association between consumption of fruit and vegetables and a birthweight was observed in previous studies [24–26]. Our respondents ate the most often apples, bananas and oranges, and the most often chosen vegetables

were tomatoes, carrots and potatoes. The similar preferences were observed by Mielnik [12].

A lot of dietary behaviors were associated with education level. That's why education of pregnant patients regarding healthy nutrition is so important. Interestingly, only a few dietary preferences differed between patients after taking into account BMI and gestational weight gain. We assumed that differences between groups may not be statistically significant because all groups were composed of patients whose pre-pregnancy BMI was too low, normal or too high, therefore the differences of nutritional behaviors may be unnoticeable. In addition, the questionnaire referred to the consumption of food in pregnancy without specifying the consumed quantity. Dietary intake is difficult to measure but the meals quantity is one of the most important factors of the appropriate weight gain during pregnancy. The larger meal portions contribute to higher weight gain in pregnant women. The method of measurement of the food consumption should be easy and clear for all pregnant women. According to Nöthlings study [27], measuring food intake by cups, servings and grams is effective and adequate for most analyzes. Taking into account cups and servings may be much easier for most surveyed patients. In our study we decided that it would be difficult to determine because of probable differences between gestational trimesters, even within the same trimester and seasonal changes in meals composition. Anyway, the calculation of food intake should be consider in further studies.

Analyzing the dietary preferences data in pregnancy, it should be stated that many pregnant women do not follow the food recommendations. It has to be underline that there is a lot to do in this area. The principles of healthy eating based on the pyramid of healthy nutrition should be promoted among reproductive-aged women. Doctors and health professionals should be obliged to implement proper dietary behavior and inform about harmful effects of both malnutrition as well as overeating in pregnancy.

## CONCLUSIONS

The study revealed that the most pregnant women consumed meals with adequate frequency. Moreover, we noticed the recommended consumption of meat with poultry preference. However, the dietary habits revealed nutritional mistakes such as low consumption of fish and dairy products, consumption of wheat breadstuff and sweets, as well as small intake of milk. The high education level was related with greater consumption of vegetables, yoghurt, beef, „fish of best choices“, wholemeal bread and eating five meals a day. The weight gain during pregnancy was associated with consumption of wholemeal bread, beef, herring, watermelon, eating between meals and eating meat in general. Therefore, there is still a considerable need to expand nutritional education and to develop mother awareness in the perinatal care programs.

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## Supplemental file 1. The questionnaire

## Part I — demographic data (please highlight the correct answers)

Age .....

Body weight before pregnancy .....

Current body weight .....

Height .....

Place of residence

rural area less than 5000 people

small city less than 20,000 people

city more than 20,000 people

Monthly household income without taxes

less than 1,000 PLN

1,100–3,000 PLN

3,100–6,000 PLN

6,100–10,000 PLN

more than 10,000 PLN

Education

primary

vocational

high school

higher

Marital status

unmarried

married

divorced

other .....

Did you work professionally? .....

before pregnancy

yes

no

during current pregnancy

yes

no

If yes, until which week of pregnancy did you work? .....

Type of professional work (describe)

physical work .....

mental work .....

housewife .....

other .....

In which area are you employed?	
agriculture	food industry
textile industry	construction
hotel and gastronomy	transport
finance and banking	media, publishing
advertising	
information technology, telecommunications	
public administration	education
health service	social assistance
culture, entertainment	recreation
other .....	
Type of the work (you can choose more than one answer)	
sitting, about 4 hours per day	
sitting, about 8 hours or more per day	
physical, less than 4 hours per day	
physical, about 8 hours or more per day	
work mostly related with driving	
student	
unemployed	
What is the main source of the stress for you in your work ? (choose maximum 3 answers)	
conflicts between employees	
conflicts with management	
problems with defining the responsibilities	
sense of control	
workload	
possibility of self-realization and the use of own potential	
conflict of values	
health	
physical working conditions	
What is the main source of the stress for you in your family life? (choose maximum 3 answers)	
conflicts with your spouse/partner	
conflicts with other family members	
health of family members	
financial problems	
work	
division of duties (cleaning, babysitting)	
conflict of values	
political views	
other .....	
<b>Part II — questions about general health and obstetric history (please write or highlight the correct answer)</b>	
Obstetric history	
labors	
period between current and last pregnancy (years)	
miscarriages	
Week of gestation .....	

Type of pregnancy
single
multiple
Did you suffer from (you can choose more than one option)
chronic arterial hypertension
pregnancy induced arterial hypertension
coronary heart disease
pregestational diabetes mellitus
gestational diabetes mellitus
asthma
anaemia
hyperthyroidism
hypothyroidism
viral hepatitis (typ B or C)
renal failure
liver diseases (which) .....
other .....
Did you suffer from any other pregnancy complication: (several answers are possible)
polyhydramnion
oligohydramnion
premature rupture of membranes) (which week of pregnancy? .....
intrauterine growth restriction
complications of multiple pregnancy (twin-to-twin transfusion syndrome, selective intrauterine growth restriction)
fetal defect .....
genetic fetal defect .....
cervical insufficiency, did you have cervical suture? If yes, in which week of pregnancy? .....
threatening preterm delivery
threatened miscarriage
intrauterine infection
bleeding
abdominal pain
abnormality of placenta or umbilical cord: placenta increta, vasa previa, umbilical cord collison
other .....
Did you have the back pain during pregnancy?
yes
no
When did the back pain occur first time? (week of gestation) .....
In which part of spine did a pain occur? (multiple choice)
cervical
thoracic
lumbar
pelvic
all

Did a pain awake you?	
yes	
no	
Did you have hands oedema?	
yes, in which week of pregnancy? .....	
no	
Did you have legs oedema?	
yes, in which week of pregnancy? .....	
no	
Was there a time during the day when the back pain was stronger? (Multiple choice)	
morning, just after awake	morning
early afternoon	afternoon
evening	whole day
at night	
<b>Part III — nutritional behaviors during pregnancy (please highlight the correct answer)</b>	
Were you on any special diet?	
no	
vegetarian	
vegan	
other, what? .....	
How many meals did you have every day (without sweets)	
one	two
three	four
five	more than five
What did you eat between main meals?	
fruits, vegetables	
yoghurt	
sweets	
sandwiches	
sweet buns	
other, what? .....	
I don't eat between meals	
What kind of bread did you eat the most often (choose maximum 2 answers)	
wheat bread	
wholemeal bread	
rye bread	
wheat rolls	
wholemeal rolls	
crispy bread	
I don't eat bread	
What fruits were you most likely to eat (choose maximum 3 options)	
apples	strawberries
grapes	plums
raspberries	cherries
bananas	oranges

peaches or apricots	watermelons
lemons	grapefruits
What vegetables were you most likely to eat (choose maximum 3 options)	
potatoes	carrots
parsley	broccoli
cauliflower	asparagus
celery	tomatoes
cucumbers	onions
What kind of meat did you eat most often during pregnancy?	
poultry	
beef	
veal	
other, what? .....	
I didn't eat meat during pregnancy	
What kind of fish did you eat most often during pregnancy?	
salmon	
carp	
cod	
zander	
mackerel	
herring	
pollock	
panga	
hake	
other, what? .....	
I didn't eat fish during pregnancy	
How often per week did you eat fish as main meal?	
once a week	
twice a week	
3 times a week	
4 times a week	
five or more than 5 times a week	
I didn't eat fish at all	
How often did you eat meat and sliced meats?	
once a day	
twice a day	
3 times a day	
4 or more than 4 times a day	
I didn't eat meat and sliced meats at all	
occasionally	
How often did you eat dairy products?	
once a day	
twice a day	
3 times a day	
4 or more than 4 times a day	
I didn't eat dairy products	
occasionally	