



## Selected Aspects of Nutritional Habits of Polish Women in the Preconception Period and During Pregnancy

Submitted: 27 September 2023; Accepted: 03 April 2024;

Published: 19 April 2024

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## Abstract

**Background:** *The diet of women in the preconception period and during pregnancy has a crucial impact on the development of the fetus and the health and metabolism of the baby. The energy requirements of a pregnant woman are higher, in addition, she should ensure an appropriate intake of particular nutrients and fluids. Folic acid supplementation is the most effective intervention in reducing congenital neural coil defects, as is stopping the consumption of alcohol and minimizing the intake of caffeinated beverages.*

**Objectives:** *The aim of the study was to assess the dietary habits, including caffeine and alcohol consumption, of women who are pregnant or preparing to conceive a child.*

**Material and methods:** *The study population comprised (n=539) Polish women. An original questionnaire was used, including a metric and questions about preparation for pregnancy and dietary habits. Responses were collected via the Internet in forums for pregnant women.*

**Results:** *Of the total of the women surveyed, 73% said they were preparing for pregnancy. 64% of the respondents began taking folic acid supplements and 49% had started vitamin and mineral supplementation. Only 21% of women said they had changed their diet in preparation for conceiving offspring. As many as 34% of women said they themselves had adequate knowledge about nutrition during pregnancy, while 43% searched for information on this topic on the Internet. The factor that differentiated the practiced eating habits to the greatest extent was the level of education.*

**Conclusions:** *Despite numerous recommendations, there are still many women who do not prepare for pregnancy and do not follow preconception recommendations. A large number of Polish women with lower education still do not take folic acid. It is necessary to educate the society also about harmful effects of alcohol on the developing fetus. Knowledge should be spread with the use of*

*social media, because women often look for information about nutritional rules on the Internet.*

**Key words:** *diet, pregnancy, nutrition, supplementation, vitamins*

## **Introduction**

The diet of women during the preconception period and during pregnancy has a key impact on the development of the fetus, the child's health and metabolism, and on the woman's health after childbirth. A pregnant woman's energy demand is higher, and she must also ensure adequate intake of individual nutrients and fluids. All these changes result from the energy used for the growth of the fetus and placenta, higher resting energy expenditure, and more intense work of the lungs and heart of a pregnant woman. Expert opinions recommend increasing the daily energy content of the diet by 360 kcal from the second trimester of pregnancy, and by 475 kcal in the third trimester [1]. Changes in the diet of pregnant women are not limited only to providing the right amount of energy, current research emphasizes how important it is to consume proteins, fats, and sugars from appropriate sources [1, 2]. It is recommended to consume a higher supply of omega-3 fatty acids and to provide the body with as little saturated fatty acids and trans fatty acids as possible. When choosing carbohydrates, it is important to pay attention to the appropriate amount of dietary fiber, the recommended intake of which is 25 g/day [1, 3]. In addition to the macronutrients described, a balanced pregnant diet must include key vitamins and micronutrients for the health and development of the fetus, with particular emphasis on supplementation with folic acid, vitamin D3, iron, iodine, and magnesium. Research shows that 2–3 months before and after fertilization is a critical period for optimizing gamete functions and early placental development [4]. Therefore, folic acid supplementation is recommended, as it can reduce the risk of neural tube defects by as much as 70% [4]. Contrary to popular belief, pregnant women do not have to follow a diet that is easily digestible or devoid of spicy products (unless there are medical recommendations for it), but they should avoid

eating raw meat, fish, seafood, eggs or wild mushrooms due to the risk of infection with bacteria such as *Listeria* and *Salmonella* or the *Toxoplasma* parasite. In addition to proper nutrition, hydration is a very important element of the diet; it is recommended that pregnant women drink more than 2 liters of water a day. When considering recommendations regarding the diet and lifestyle of pregnant women, we cannot ignore the guidelines regarding the use of stimulants, primarily alcohol, tobacco, and psychoactive substances. In addition to the harmful substances mentioned, the consumption of caffeine, which is one of the most frequently consumed pharmacologically active substances delivered in the form of liquid, should also be taken into account. Caffeine is most often found in tea and coffee, which are part of the diet of women during the preconception period and during pregnancy. It is recommended to limit caffeine consumption in pregnant women due to its significantly slower metabolism and easy passage from the placenta to the fetus [5]. The negative effects of high caffeine consumption include primarily an increased risk of miscarriage, premature birth, and reduced birth weight of the newborn. The maximum amount of daily caffeine consumption during pregnancy is considered to be 200 mg per day [6]. The exposure of women of reproductive age to harmful factors undeniably poses a risk to reproductive health, proper pregnancy, and child development. Despite numerous health campaigns and scientific publications on the negative impact of alcohol on the fetus, alcohol consumption by pregnant women is still a serious problem [7, 8]. Its symptoms are incurable and can significantly worsen the child's quality of life. Currently, there is no specific amount of alcohol safe to consume during pregnancy, so any is considered dangerous. It is worth emphasizing that there is no protective period during pregnancy during which alcohol is not harmful. The aim of the study was to assess the dietary habits, including caffeine and alcohol consumption, of women who are pregnant or preparing to conceive a child. An attempt was made to check whether and how future mothers change their lifestyle, including what changes they introduce in their diet and where they get information about what they should eat during pregnancy. The obtained qualitative variables were compared with sociodemographic variables.

## Materials and methods

539 Polish women aged 30.25 were examined ( $SD=5.22$ ;  $min=17$ ,  $max=47$ ). Among the respondents, the largest group were women with higher education – 365 (67%), followed by secondary education – 152 (28%), and primary and vocational education – 24 (5%). 411 women (76%) lived in cities, the remaining 130 (26%) lived in the country. Another aspect taken into account in the description of the study group was the number of pregnancies. 205 women (38%) declared being in their first pregnancy, 99 women (18%) in their second pregnancy, and 44 (8%) in their third and subsequent pregnancy. The remaining 193 women (36%) were in the postpartum period up to 6 months after pregnancy at the time of the study. An original survey questionnaire was used, containing questions about the sociodemographic characteristics of the respondents and questions about preparations for pregnancy and eating habits. The answers were collected online in online forums bringing together pregnant women on social networking sites who declared they would be pregnant in Purposeful random and snowball sampling methods were used to select the study group. The inclusion criteria for the study were the following: being pregnant at the time of the study or being in the period after the birth of a child (in a period not longer than 6 months due to the possibility of remembering lifestyle activities during pregnancy). In order to develop the collected results, descriptive statistics for quantitative variables and percentage distribution of variables were used. To check the statistical significance, the following tests were performed: Pearson's chi square, Cramer's V coefficient, and Mann-Whitney U coefficient. Excel and Statistica were used. The research was voluntary and anonymous. Consent was obtained from the Bioethics Committee operating at the Faculty of Medicine of the University of Opole, number: No. dz. EZD/ 213292 /2023.

## Results

First of all, pregnant women were asked whether getting pregnant had been preceded by any preparations. Among the respondents, 394 women (73%)

declared that they were preparing for pregnancy. Then, the surveyed women were asked about the form of preparation. 344 (64%) respondents started taking folic acid preparations, 298 (55%) had check-ups with a gynecologist, 268 (49%) started vitamin and mineral supplementation, 63 (11%) stopped smoking, and 120 (22%) limited alcohol consumption (importantly – the question was about limiting, not stopping drinking). Only 115 (21%) women declared that they had changed their diet while preparing to conceive. Responses regarding lifestyle changes and preparations for pregnancy were compared with the level of education of the respondents. The level of education was important when starting folic acid supplementation before pregnancy: it was used by 68% of women with higher education, 58% with secondary education, and 33% with vocational and primary education ( $\chi^2=14.60$ ;  $df=2$ ;  $p=0.001$ ; Cramer's  $V=0.164$ ). Moreover, the level of education was important for quitting smoking: 8% of women with higher education, 8% of women with vocational and primary education, and 21% of women with secondary education did so ( $\chi^2=18.18$ ;  $df=2$ ;  $p=0.001$ ; Cramer's  $V=0.183$ ). Every fifth woman with higher education (24%) and every fourth woman (22%) with secondary education limited alcohol consumption when preparing to become pregnant. This type of change was not made by any of the women with primary and vocational education ( $\chi^2=7.43$ ;  $df=2$ ;  $p=0.1$ ; Cramer's  $V=0.117$ ). In the case of the remaining answers about preparation for pregnancy, no statistical differences were observed related to the respondents' education, and the same was true in the case of place of residence. The relation between the number of pregnancies and child planning was also analyzed. Only the number of pregnancies was important for the intake of folic acid – 63% of women in their first pregnancy supplemented this vitamin before conception, compared to 60% of women in their second, and 50% in their third and subsequent pregnancies ( $\chi^2=11.75$ ;  $df=5$ ;  $p=0.01$ ; Cramer's  $V=0.147$ ). In other activities related to preparation for pregnancy, no changes were observed in terms of the number of pregnancies. The Mann-Whitney U test also checked whether age had an impact on the type of preparations undertaken for pregnancy. Only in the case of stopping smoking, a statistically significant difference was obtained ( $p=0.01$ ): younger women declared this change. Taking into account

the changes in eating habits made by pregnant women, it was noticed that (the respondents could choose more than one answer):

- 284 (52%) – women said they ate more fruit and vegetables;
- 149 (28%) – ate everything they wanted;
- 162 (30%) – ate as they did before pregnancy;
- 208 (38%) – ate better quality food.

Among the surveyed women, 162 (30%) declared that they ate what they always did and did not change their eating practices. In relation to the above changes in diet, statistical differences were observed between women with different levels of education in the case of consuming more fruit and vegetables. ( $\chi^2=6.63$ ;  $df=2$ ;  $p=0.01$ ; Cramer's  $V=0.110$ ): women with higher (52%) and secondary education (57%) declared that they consumed fruit and vegetables twice as often as women with vocational and primary education (29%). In other dietary habits, the level of education did not have a role. Interestingly, the only difference observed in relation to the influence of place of residence was the issue of eating more food during pregnancy than before – it was twice as often declared by women living in the city (13%) compared to those living in the countryside (6%) –  $\chi^2=4.48$ ;  $df=1$ ;  $p=0.01$ ;  $F_i=0.009$ ). The age of the respondents also did not influence the change in eating habits. Only the answer “I ate what I wanted” was statistically more often given by younger women ( $p=0.001$ ). With regard to other aspects of diet during pregnancy, age did not matter. An important aspect, apart from qualitative changes in nutrition, were quantitative indicators (amount of food consumed). Only 26 women (5%) said they had limited the amount of food they consumed, while 61 (11%) said they ate more than before pregnancy. The remaining respondents (16%) ate the same amount of food as before pregnancy. The surveyed women were asked whether becoming pregnant had changed their coffee drinking habits. It was shown that 232 (43%) women reduced the amount of coffee consumed during pregnancy, 113 (21%) drank the same amount of coffee as before pregnancy, 94 (17%) did not drink coffee at all every day, while 100 (19%) decided to stop drinking coffee after becoming pregnant. Pregnant women were also asked about the source of information on the principles of proper nutrition during pregnancy. As many as 185 (34%) women believe that they

have adequate knowledge of what and how much to eat during pregnancy. The remaining women – 231 (43%) – looked for nutritional advice on the Internet. Among the respondents, 13 (3%) used nutritional counseling from family and friends. Every fifth woman (20%) used professional nutritional advice – 92 women (18%) followed the gynecologist's advice, while 13 women (2%) consulted a dietitian during pregnancy to optimize their diet. Also in this matter, the strongest differentiating factor turned out to be the level of education of the respondents ( $\chi^2=54.96$ ;  $df=2$ ;  $p=0.001$ ; Cramer's  $V=0.225$ ). 18% of women with higher and secondary education and 8% of women with vocational and primary education obtained knowledge about dietary conditions during pregnancy from a gynecologist. Women with higher education (46%) and secondary education (38%) were also twice as likely to use online nutritional advice as women with vocational and primary education (20%). However, the answer "I know what to eat" was most often given by women with the lowest level of education (50%), compared to women with secondary (38%) and higher education (32%).

## Discussion

Both in the preconception period and during pregnancy, a key role in eating habits is performed by vitamin and mineral supplementation, eating good quality products and diversifying the diet. Folic acid supplementation is the most important and effective intervention in reducing congenital neural tube defects [9]. It is recommended to take a folic acid supplement at a dose of 0.4 mg daily in the month before conception or at least during the first trimester of pregnancy. In the case of a history of congenital defects, the dose is increased to 4 mg daily [10]. Two-thirds of the women in our study were preparing for pregnancy. Compared to the study of Dutch women, this is not a satisfactory indicator, because in the Netherlands 85.5% of women prepared for pregnancy. However, 69.5% of Dutch women used folic acid supplements, but as many as 50.5% of women consumed alcohol at any time during pregnancy [11]. As our study shows, 64% of Polish women supplemented folic acid. Preparations for pregnancy depend on many factors, including the



economic situation in a given country. In Malawi (Africa), the majority of mothers (63.9%) did not take any steps to prepare for pregnancy. Women who made preparations (36.1%) started eating healthier (71.9%) and saving money (42.8%), and these two forms were the most common forms of preparation [12]. However, Polish women have a much better economic situation. Research suggests that taking vitamin and mineral supplements before and during the preconceptional period is associated with a reduced risk of having low birth weight and/or small for gestational age (SGA) offspring and preterm births (PTD). Some studies have reported that maternal pre-pregnancy size indicators, short stature, underweight, and overweight are associated with an increased risk of PTD and SGA [13]. In our study, half of the women started supplementing vitamins and minerals before pregnancy, but only one in five declared that they had changed their diet while preparing to conceive. Women during their reproductive years should increase the nutritional content of their diet, with particular emphasis on iron, calcium, magnesium, zinc, folic acid, and vitamin B6 [14]. Importantly, higher fruit consumption, minimal consumption of fast food and sugar-sweetened beverages, and a diet with a lower glycemic index may shorten the time to conception [15]. The demand for energy, protein, vitamins and minerals may increase during pregnancy, but there is no single preparation available on the market that contains all the necessary microelements, and they perform a key role in embryogenesis, fetal development, and maternal health [9]. Doctors should encourage pregnant women to maintain a balanced diet and take supplements in the case of deficiencies. In an Iranian study, scientists indicated that the main source of information commonly used by patients was a gynecologist [16]. It has been shown that providing appropriate health education among pregnant women is an important aspect of prenatal care [17]. This approach is associated with many benefits for the child, including an increased rate of initiation and continuation of breastfeeding [17]. Severe micronutrient deficiency or excess during pregnancy may have negative effects on fetal growth (intrauterine growth retardation, low birth weight, or congenital defects) and pregnancy development (preeclampsia or gestational diabetes) [9]. Taking into account substances that are clearly harmful to the health of the fetus, our

study showed that every 10<sup>th</sup> woman surveyed stopped smoking cigarettes while preparing for pregnancy. Fetal exposure to tobacco smoke may be associated with many complications, such as premature birth and the risk of low birth weight [18]. Therefore, it is particularly important to avoid both active and passive smoking by women planning to be and being pregnant, as both forms of smoking are equally dangerous for the proper development of the fetus. Our study also asked whether women limited or gave up drinking alcohol while preparing for pregnancy. Only 22% of surveyed women decided to reduce the consumption of alcohol-containing drinks. Importantly, none of the women with primary or vocational education changed their alcohol drinking habits while preparing for pregnancy. In Poland, according to the reports of the State Agency for Solving Alcohol-related Problems—PARPA, the number of addicted women is over 1.5 million, which constitutes a serious social problem. Therefore, there is also a high risk of alcohol consumption by these women during pregnancy, which is associated with a number of negative effects on the developing fetus, including the occurrence of fetal alcohol syndrome (FAS) [19]. Women who plan to have children should stop drinking alcohol a few months before the planned pregnancy in order to avoid negative health effects in the offspring [20]. Caffeine, which stimulates the central nervous system, is one of the most popular psychoactive substances in the world. Coffee, tea, carbonated drinks, and energy drinks are among the most popular drinks in the world because their consumption is associated with improving mood, increasing concentration, and minimizing the feeling of drowsiness. For these reasons, pregnant women also willingly consume them, often not realizing that consuming energy drinks containing caffeine may negatively affect the course of pregnancy [21, 22]. According to the recommendations of the American College of Obstetricians and Gynecologists (ACOG), the permissible daily dose of caffeine that is safe for a pregnant woman and her child is  $\leq 200$  mg [6]. However, Surma & Witek point out in their research that many women do not give up coffee during pregnancy, and a significant number of women exceed the permissible daily dose of caffeine ( $\leq 200$  mg) [23]. In our study, less than a half of the surveyed women limited the amount of coffee they consumed during pregnancy. During

pregnancy, the metabolism of caffeine significantly slows down, which results in a prolonged effect of this compound and increased penetration of caffeine into the body of the developing fetus [5]. It is currently believed that excessive coffee consumption during pregnancy may be associated with low birth weight and an increased risk of miscarriage. Caffeine may negatively affect fetal stress hormones, which may be associated with a greater risk of rapid weight gain after birth and obesity, as well as a greater likelihood of developing heart disease and diabetes later in life [5, 24, 25]. Caffeine consumption increases the risk of bleeding among pregnant women in the early stages of pregnancy [26]. Whereas, high caffeine consumption during pregnancy is associated with an increase in the level of catecholamines in the fetus, which may increase the fetal heart rate and the force of placental vasoconstriction, and consequently lead to impaired fetal oxygenation [27, 28]. The question was also asked where pregnant women get information about the principles of proper nutrition. Currently, in the era of the Internet, access to information is common; according to data from the Central Statistical Office in Poland, in 2022 93.3% of households had access to the Internet. Most, almost half of the surveyed women, looked for information on how to eat on the Internet, and 34% of women believed that they had adequate knowledge about how to eat. Significantly fewer pregnant women used the advice of a dietitian or gynecologist. Primary and vocational education predominated among women who did not seek information on the principles of proper nutrition during pregnancy. This indicates the need for education on this topic [27]. Many pregnant women look for information online to supplement the information provided by health care providers. However, sometimes this has negative consequences and is associated with greater anxiety about one's pregnancy and more frequent visits to the doctor [29]. It is also necessary to emphasize the potential positive impact of information contained on the Internet on the well-being of the mother and child and to promote information based on evidence-based medicine. An important aspect is also the education of medical staff and the promotion of information among healthcare workers about appropriate nutrition among pregnant women and women planning to have children [30].

## Conclusions

1. Only every fifth woman declared a change in eating habits while preparing for pregnancy, while every third woman followed the same diet during pregnancy as before it.
2. The most frequently used element of dietary preparation for pregnancy is folic acid supplementation and eating more fruit and vegetables.
3. Among the sociodemographic factors, the level of education is the most important for practicing the principles of a healthy lifestyle and proper nutrition. Education should especially cover women with primary and vocational education.
4. Caffeine consumption during pregnancy should be limited to 200 mg per day due to its negative effects on the pregnant woman and the fetus. It is the responsibility of medical staff to inform patients about this.
5. Despite numerous recommendations, a significant percentage of women still do not prepare for pregnancy and do not follow preconception recommendations regarding lifestyle, including nutrition. Still a large number of Polish women with lower education do not take folic acid (prevention of neural tube defects).
6. It is necessary to educate society, and not only future parents, about the negative effects of alcohol consumption and to raise awareness of the harmful effects of alcohol on the developing fetus. The results of our study may encourage medical staff to promote knowledge about preparing for pregnancy during routine visits to preconception women. Knowledge about optimal nutrition during pregnancy should also be disseminated using social media, social networking sites, and online magazines, because the Internet is the basic source of information for pregnant women.

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