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ORIGINAL PAPER

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Nutritional behavior of pregnant women from the Podkarpacie province

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ABSTRACT

Introduction. Healthy nutrition is very important during pregnancy for both a baby and a mother. Modification of metabolic and hormonal processes i.e. metabolic programming occurs already at the prenatal stage. This process significantly affects the baby's health and eating habits at a later age. The diet of a pregnant woman should supplement the demand for energy, nutrients, vitamins and minerals. An expecting woman needs to also avoid products that are contraindicated during this period, such as raw milk, eggs or meat.

Aim. Assessment of nutritional behavior of pregnant women from the Podkarpacie province.

Materials and method. 228 women living in the Podkarpackie province were enrolled in the study. Surveys were collected via the Internet. An anonymous questionnaire developed by the authors was used.

Results. Women's eating habits are primarily influenced by education. Most women had knowledge about proper nutrition and awareness of its impact on the health of the baby. A worrying fact was a very low intake of dairy products. 44% of women consumed dairy products only once a day. Fruit and vegetables consumption was also low (40% of the respondents ate only from 100 to 200 g during the day).

Conclusions. Although part of the eating habits of pregnant women is correct, nutritional education should be introduced in this group, especially related to the adequate supply of dairy products, fruit and vegetables to supplement the necessary vitamins, minerals and protein.

Keywords. pregnancy, diet, eating habits

Introduction

During pregnancy, it is important to provide the body of a pregnant woman with all the necessary nutrients, minerals and vitamins. The energy value of the diet should also be properly planned. Deficiency or excess of nutrients can lead to permanent modifications of the body's hormonal and metabolic processes. Deficiencies, combined with a variety of gene expression during prenatal period change metabolism and the development of physiological processes. The processes that occur at the time of intrauterine development have an impact on the formation of diet-related dis-

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eases (obesity, cardiovascular disease, metabolic syndrome) in adulthood.[1-3]

The energy requirement in the first trimester is identical to that before pregnancy. In the second trimester, the demand increases by 360 kcal per day, in the third trimester by 475 kcal compared to the pre-pregnancy requirement.[4] The amount of protein increases by 0.3 g/kg of body weight (bw) per day; the highest need occurs in the second half of pregnancy.[5,6] According to Polish nutrition standards, pregnant women should have 1.2 g / kg bw protein intake throughout the day.[6] Recommended products are mainly lean meats, dairy products, and fish. During pregnancy, the amount of carbohydrates should be 55-60% of the daily energy requirement, while the amount of sugars added not more than 10%. Whole-grain products need to be included in the menu. Fats in the diet of a pregnant woman should be provided in an amount of 20-35% of the daily energy requirement. During pregnancy, the need for EFA (essential fatty acids) increases: omega 3, α-linolenic acid (ALA) in an amount of 0.5% of the daily energy requirement, docosahexaenoic acid (DHA) in an amount of 200 to 300 mg and acid eicosapentaenoic acid (EPA) 250 mg / day.[6-11] The daily requirement for water is about 300 ml higher than before pregnancy, and the daily fluid intake should be around 2300 ml.[6,12-15]

Supplementation during pregnancy

It is important to plan the supplementation in the right amount and proportion in relation to the demand for given ingredients.[5-14,16-18] Insufficient supply as well as too high doses of supplements may cause fetal defects.[16,19-21]

Folic acid derived from food is absorbed in the gastrointestinal tract from 50 to 90%.[16,22] Supplementation of this ingredient should be included at least 3 months before the planned pregnancy and continued in the first trimester in the amount of 0.4 mg per day. Insufficient amount of folic acid may cause fetal neural tube defects.[23,24] The next essential ingredient is iron. The amount of iron provided daily should be 18 mg before pregnancy, from 26 to 27 mg during pregnancy, and in the case of confirmed microcytic anemia from 60 to 120 mg.[25] During the pregnancy, the need for iodine also increases. WHO (World Health Organization) recommendations are 250 μg / day for pregnant women and breastfeeding mothers. Not only iodine deficiency, but also excess, above 500 μg / day, leads to impaired thyroid function in a newborn.[26] An essential component is also cholecalciferol (vitamin D3). Demand for vitamin D3 is primarily covered by skin biosynthesis. To a small extent, the ingredient is supplied with food. The dose of vitamin D3 in pregnant women with inadequate supply along with diet and low skin synthesis should range from 800 to 1000 μg per day.[7,27]

Food to avoid during pregnancy

During pregnancy, some food products are counter indicated because they can be a source of bacteria that easily penetrate through the placenta. Examples of such products are mainly: soft cheeses, e.g. oscypek, camembert cheese, blue cheese. Such food can cause premature delivery or miscarriage. Listeriosis in a baby causes ophthalmic diseases, CNS (Central Nervous System) and hearing diseases.[4,28,29]

Aim

The aim of this study was to assess the nutritional behavior of pregnant women
from the Podkarpackie province. The influence of the physiological condition (trimester of pregnancy, puerperium) and education on eating habits was also assessed.

Material and method

The survey was conducted in the Podkarpackie province in 2017 using the anonymous survey developed by the authors. The survey consisted of 39 questions on basic data. The demographics included questions about age, place of residence, education and physiological status (trimester of pregnancy, puerperium). The remaining questions referred to the conditions occurring during pregnancy, the knowledge of the respondents on the topic of nutrition in pregnancy and supplementation and their current dietary habits.

The inclusion criteria were: a woman of procreative age, informed consent to complete an anonymous questionnaire, confirmed pregnancy or puerperium (up to 6 weeks after childbirth), living in the Podkarpackie

Table 1. Characteristics of the study group

Parameter	Percentage			
Place of residence	**countryside**	**town**	**city**	
	36%	8%	56%	
education	**vocational**		**secondary**	**higher**
	5%		29%	66%
Physiological status	**I trimester**	**II trimester**	**III trimester**	**puerperium**
	11%	17%	20%	52%
Type of pregnancy	**Single**		**Multiple**	
	99%		1%	

Province. The exclusion criteria were the lack of the patient's consent, lack of pregnancy, delivery earlier than 6 weeks, living outside the Podkarpackie Province.

Finally, the study involved 228 women with an average age of 28.03 ± 3.88 years. Among the respondents, 52% were women in puerperium (up to 6 weeks after birth), 20% of women in the third trimester of pregnancy, 17% - in the second, while 11% in the first. Single pregnancies accounted for 99%, while multiple pregnancies were less than 1%. Fifty six percent of women lived in the city, 36% in the countryside, and the remaining 8% in the towns. The largest number of respondents (66%) had higher education and 22% had secondary education. The lowest number were pregnant women with vocational education (5%) (Table 1).

The Pearson Chi-square test was used for statistical analysis. The statistical analysis was performed with EXCEL and Statistica 13 softwares. P <0.05 was assumed as the significance level. Values below the level of significance were considered as values reflecting the correlations between data.

Results

Sixty five percent of the 228 women surveyed did not suffer from any diseases that may appear during pregnancy. The most common condition indicated by the respondents was anemia (14%) followed by the response "others", in which the respondents answered: hypothyroidism, fetal hypotrophy, constipation, fibroids, incompetent cervix, proteinuria, oedema, placenta previa, venous thrombosis, recurrent urinary tract inflammation. Women with gestational diabetes accounted for 6% of the respondents and 3% had hypertension (Tab 2). It was observed that 57% of the respondents complained of digestive problems, such as nausea or vomiting. However, there was no statistically significant relationship between the occurrence of nausea and the amount of meals consumed during the day (p = 0.082) (Figure 1).

Among the respondents, 79% paid attention to their nutrition during pregnancy and tried to eat healthy, while 21% of the respondents did not change their diet and did not pay attention to it (Table 3). During pregnancy, some products should be strictly excluded as they may pose a risk to the fetus and 85% of the respondents avoided such products, 13% did not know what products are risky, 2% consumed such products despite their known danger. A statistically significant relationship (p <0.001) between education and avoidance of products counter-indicated during pregnancy was found (Table 4). Seventy five percent of the respondents declared increased appetite for some products. Most often they were sweets and fruits. A smaller percentage were

Table 2. Conditions accompanying pregnancy

Condition	n	%
Gestational diabetes	14	6
Anaemia	32	14
Hypertension	8	3
None	152	65
Others	27	12
Nausea	130	57

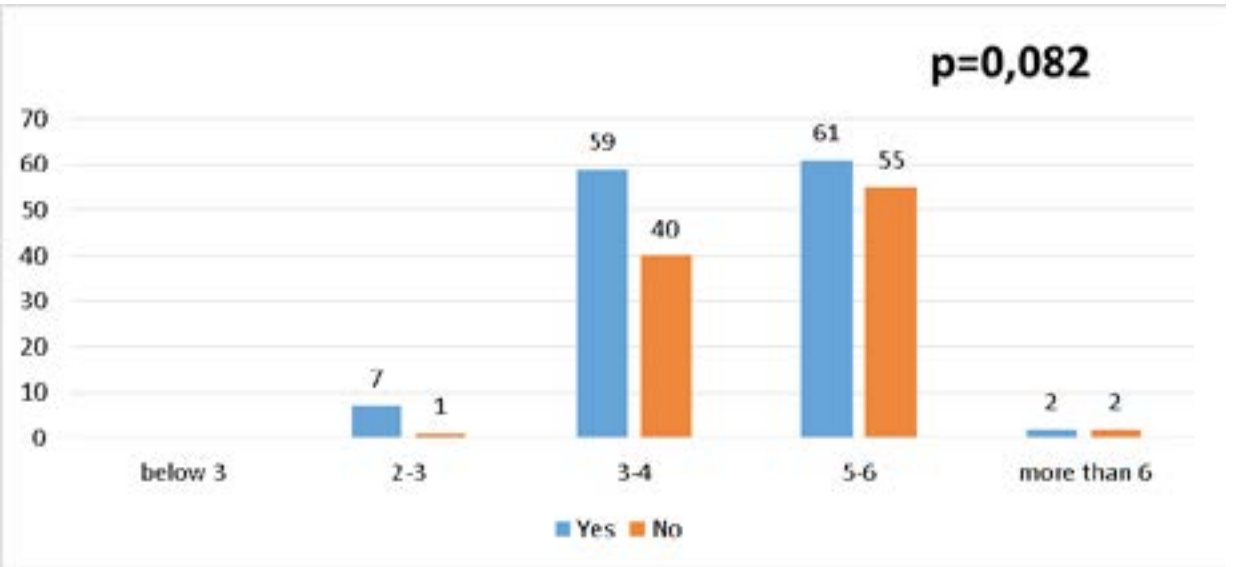

Figure 1. Incidence of vomiting and / or nausea and the amount of meals consumed

fast food and salty snacks. Among pregnant women and women who recently gave birth, 43% of the respondents declared consuming dairy products once a day and 41% 2-3 times a day. Only 7% of dairy consumption was at the level of 3 to 4 servings a day. Analyzing the quality of consumed products, it appears that only 14% of the respondents consumed whole grain products. In the case of meat, lean meat was selected in 92% of cases. However, 4% of the respondents did not eat it at all. In order to provide the right amount of omega 3 in the diet, 78% of the subjects consumed fish at least once a week. Among 40% of the respondents, the intake of vegetables and fruit during the day was between 100 and 200 g and in the amount of 200 - 300 g in the case of 30% of the respondents. The intake of both vegetables (p = 0.307) and fruit (p = 0.092) during the day by the examined women did not differ significantly in terms of physiological status. The analysis of collected data showed that water is the most frequently chosen fluid (71% of the respondents). Liquids were usually drunk in quantities of 1.5 to 2 liters. (Table 3)

Among pregnant women or those who have recently given birth, 35% sweetens drinks with 1-2 teaspoons of sugar, while 34% do not sweeten at all. A statistically significant relation was demonstrated between the level of education and sweetening drinks (p <0.001) (Figure 2).

Pregnant women and those during puerperium from the Podkarpackie province are mostly aware of the fact that nutrition in their state affects the fetus, over 60% of the respondents indicated such an answer. Some

Table 3. Selected nutritional behaviors of the respondents

Type nutritional behavior [%]					
The impact of pregnancy on changing eating habits	Yes			No	
	79			21	
Avoiding products not indicated during pregnancy	yes		no	I do not know what are these products	
	84.6		2.6	12.7	
Number of meals consumed a day	Less than 3	2-3	3-4	5-6	More than 6
	0	4	43	51	2
Eating between meals	yes			no	
	81			19	
Types of food eaten between meals	sweets	"fast food"	Salty snacks	fruit	other
	28	1	12	54	6
The type of carbohydrates consumed	Of white flour		Of wholemeal flour		different
	36		14		50
Type of meat consumed	lean meat (e.g. turkey, chicken, rabbit, pork)		fat meat (pork, bacon, goose, duck)		I don't eat meat
	92		4		4
Frequency of consuming fish	Once a week	Twice a week	Several times a week	I don't eat fish	
	69	9	1	21	
Frequency of consuming eggs	Once a week	Several times a week	Several times a month	I don't eat eggs	
	35	39	14	12	
Frequency of consuming legumes	Once a week	Several times a week	Several times a month	I don't eat legumes	
	32	11	38	20	
Frequency of consuming dairy products	Once a day	2-3 times a day	3-4 times a day	More than 4 times a day	I don't eat dairy products
	43	41	7	1	7
Amount of vegetables consumed a day	Less than 100 g	100 – 200 g	200 – 300 g	300 – 400 g	More than 400 g
	13	40	30	10	7
Amount of fruit consumed a day	Less than 100 g	100 – 200 g	200 – 300 g	300 – 400 g	More than 400 g
	7	31	31	17	14
Amount of water consumed per day	Less than 0, 5 l	0.5 – 1.l	1.5 – 2.l	2 – 3.l	More than 3 l
	1.80	27.60	46.90	21.50	2.20

Table 4. Impact of the respondents' education on selected nutritional behaviors

		Education			
		Vocational [%]	Secondary [%]	Higher [%]	p
Avoiding counter indicated products	Yes	2.7	21.0	66.6	p <0.001
	No	0.4	0.9	1.3	
	I don't know	1.3	7.0	4.4	
Types of food eaten between meals	Sweets	4.9	16.8	0.9	p =0.127
	Fast food	0.4	0.0	0.0	
	Salty snacks	3.1	5.3	1.3	
	Friut	15.9	25.2	2.0	
	Other	4.9	19.0	0.0	
Number of meals consumed a day	Less than 3	0.0	0.4	0.0	p = 0.005
	2-3	0.9	2.2	0.4	
	3-4	3.1	15.4	25.0	
	5-6	1.3	10.5	39.0	
	More than 6	0.0	0.4	1.3	

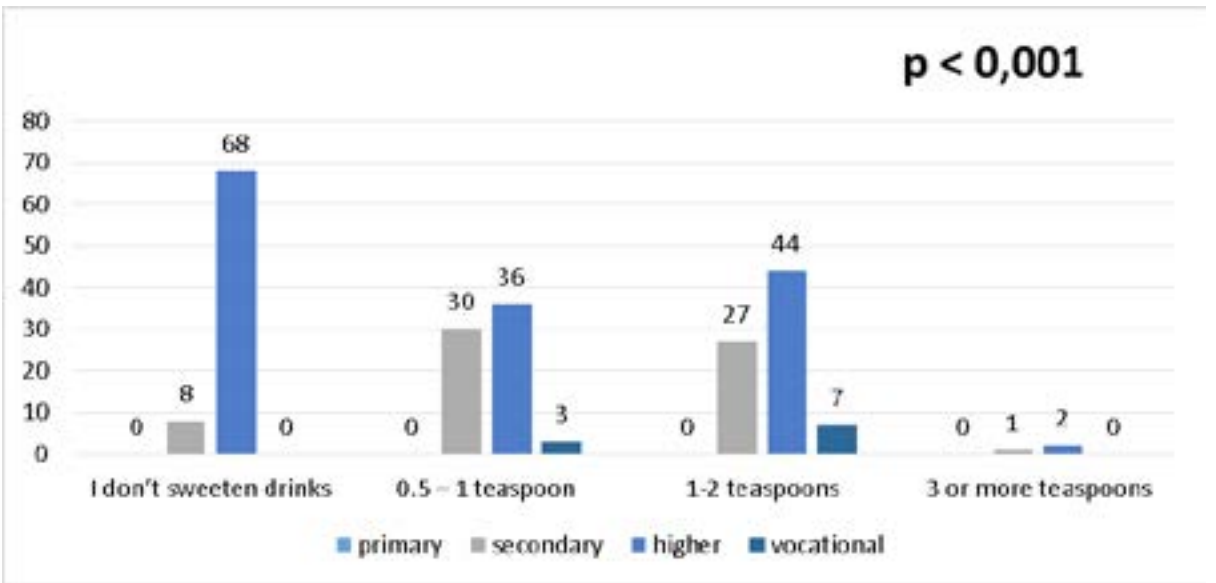

Figure 2. The amount of sugar added to drinks and the level of education

Table 5. Influence od diet during pregnancy on baby's health status and supplementation in pregnancy

Variable	Yes [%]	No [%]	I don't know [%]
Diet during pregnancy and the impact on the baby's health status	63	9	28
Supplementation used	73	29	–
Supplementation with omega 3	63	38	–

of the respondents (28%) do not have knowledge on this subject. However, 9% of them think that nutrition during pregnancy has no impact on their baby (Table 5). The analysis of selected answers shows that 73% of the women used supplementation during pregnancy, 27% of the respondents answered negatively. The use of supplementation among the studied women did not differ significantly in terms of their education (p = 0.086). The supplementation with omega acids was used by 62% of the women, while 38% did not use it at all.

Discussion

The health status of a pregnant woman affects normal development of the fetus. However, various conditions may occur during pregnancy. Among women from the Podkarpackie province, the most common ailments were anemia, hypertension, and gestational diabetes.

In Poland, the incidence of anemia during pregnancy is as much as 18.6-41.4%. The most common cause is iron deficiency, less frequently folic acid or vitamin B12 deficiency. In a study by Grochal et al. of 1653 pregnant

women hospitalized at the SPZOZ hospital in Rawa Mazowiecka, as much as 14.82% had anemia.[30] In a study by Wójciak et al. among women aged 19-44, who undertook any slimming activities during pregnancy, an increased incidence of anemia was found.[31]

In Cífková et al., hypertension occurred in 5-10% of the pregnant women. Arterial hypertension can lead to complications such as: placental abruption, organ failure, prematurity, intrauterine growth restriction and even death.[32,33]

Maciąg et al. examined the knowledge about nutrition in hypertension among the pregnant women from the Independent Public Complex of Health Care Institutions in Sandomierz at the department of gynecology and obstetrics. The study included 60 women, only 22% of whom had correct knowledge that consumption of caffeine, alcohol, the use of excessive amounts of salt, low intake of calcium-rich products or smoking affects blood pressure.[34]

Gestational diabetes is (GDM) one of the more common conditions occurring during pregnancy. The consequences of this disease are very dangerous, because they threaten the health of the future mother and her baby. Pregnancy complications associated with this condition include intrauterine deaths, premature birth, high birth weight of the baby, fetal hypoxia or malformations. In pregnant women with GDM, the risk of developing type 2 diabetes is much higher, over 50% compared to healthy people. The study conducted in about 6,000 pregnant women in various parts of Poland demonstrated that the problem of GDM affects approximately 3.4% of the pregnant women, however, it varies in individual e.g.: 2% -Toruń or 3.9% - Kartuzy.[35]

Nausea and vomiting are typical, however, unpleasant ailments during pregnancy. In the studies of Gadsby R. et al. and Lacroix S. et al. vomiting occurred in 50% in early pregnancy ceasing in the second and third trimester of pregnancy, while nausea occurred in 25%.[36] This condition referred to as hyperemesis gravidarum affects 0.3-1.5% of pregnant women.[37] It is associated with strong, persistent vomiting, body weight loss below 5%, electrolyte disturbances, ketonuria and dehydration.[36] Among the respondents from the Podkarpackie province, 57% suffered from nausea and vomiting, especially at the beginning of pregnancy. This is probably related to high levels of chorionic gonadotropin. The biggest problem during these ailments was the smaller amount of meals consumed, particularly meat.

During pregnancy, products that can be a source of bacteria are inadvisable. They penetrate easily through the placenta and in addition, women expecting a baby have 20 times less resistance compared to other adults. Pregnant women from the Podkarpackie province in the majority (85%) were aware that the intake of certain products during pregnancy is inadvisable. Myszkowska-Ryciak et al. studied 50 women aged 21-36 and found that their knowledge about nutrition during pregnancy and the intake of macro and micro-components is fragmentary.[12] Ziema et al. studied the level of knowledge about toxoplasmosis among pregnant, midwives, medical students and obstetricians. The study covered 310 people, including 109 pregnant women. The lowest knowledge among the respondents was among pregnant women.[29] In the Dubiel study on nutritional knowledge among 102 women, 93% declared they knew the forbidden products during pregnancy. They mentioned mainly: raw eggs, raw meat, fish and blue cheese.[38]

Pregnant women from the Podkarpackie province chose white cereal products interchangeably with whole meal ones (50%). Thirty eight percent consumed only whole meal products, while 15% consumed only white cereal products. In Hyżyk's study 42% of the respondents chose whole meal wheat bread.[39] According to Myszkowska-Ryciak et al., the respondents believed that sweets are a good source of complex carbohydrates, which was consistent with a small knowledge on nutrition.[12]

Women living in the region of Podkarpacie mostly chose lean meat (92%) such as turkey, chicken, and rabbit. According to Godal et al. the respondents consumed a large amount of red meat (up to 40%). Fish consumption is important during pregnancy, because they are a source of well-absorbed protein and the main source of very important n-3 fatty acids. Nowadays it is very hard to buy fish uncontaminated with heavy metals, dioxins or polychlorinated biphenyls. Those from a safe source usually involve a high price, which unfortunately makes them less available to the majority of consumers. The pregnant women who do not eat fish should use DHA supplements. Ensuring their correct amount in the diet affects the reduction of the probability of premature birth, the higher weight of the fetus, its normal psychological development and vision, and also reduces the number of postpartum depression episodes. Pregnant women should supplement 500 mg of DHA daily with the first month of pregnancy in case of low consumption of fish and other sources of DHA. Pregnant women with a high risk of premature labor should supplement 1000 mg DHA / day. A suitable source of DHA is that which is obtained by a special biotechnology method from algae of the Schizochytrium genus, which do not allow the pollution of seawater to break into their structure. The women from Podkarpacie, despite rare fish consumption - once a week (70%), declared DHA supplementation (60%).

The respondents showed a low intake of dairy products. Forty four percent ate dairy products once a day, 40%: 2-3 times a day. Less than 2% above 4 times a day. In the study by Hyżyk et al. the woman questioned

also had very low intake of dairy products, only 16% of them consumed dairy products more than once a day.[39] Myszkowska-Ryciak showed that pregnant woman consumed too little calcium. Moreover, up to 40% thought that during pregnancy one should not drink milk. Only 46% of women suggested that dairy products are a good source of protein.[12] In the study of Godala et al. 25% declared dairy consumption a few times during a day.[38] The respondents living in the Podkarpackie region were characterized by low intake of vegetables and fruit. The most frequently marked quantity of vegetables consumed was 100-200 g (40%). Fruit consumption was at 100-200 g by 30% and 200-300 g also by 30% during the day. Godal et al. determined that 51% of the pregnant women declared fruit consumption several times a day whereas 30% - vegetable intake. Fruits and vegetables were consumed mostly in raw form (50%).[38] Hyżyk et al. examined fruit and vegetable consumption among respondents in the winter, the results indicated too little consumption of these products.[39] Szczepaniak et al. concluded that pregnant women consumed too small portions of fruit during a day - usually from 1-2 servings.[38]

In the study, 50% of the respondents suggested that they consumed the right amount of water from 1.5 to 2 liters during the day. About 30% drank 0.5-1 liters daily. The most frequently chosen liquids were mineral water (71%), then fruit tea, herbal tea (14%), coffee and black tea (12%). Godal et al. found that 67% of the women also choose to drink water the most, 45% of women declared to consume black tea daily. During the pregnancy, about 15% gave up coffee during pregnancy, while every fourth examined drank one cup a day.[38]

63% of the respondents from Podkarpacie considered that nutrition has an impact on the health and eating habits of their baby. However, 28% of the women did not have knowledge on this subject. Nutritional education is important at the time of the preconception. It is important to pay attention to nutrition during planning and pregnancy. In the Kozłowska-Wojciechowska et al. study, the knowledge of pregnant women about the nutrition at this time and its impact on the baby was estimated as an average.[40] The study also shows that 85% believe that the future mother's diet affects baby's birth weight. According to Myszkowska-Ryciak et al. two thirds declared that they had sufficient knowledge about nutrition in pregnancy.[12,40] Every pregnant woman should think about supplementation preferably after consulting the gynecologist. The diet should be the basic source of vitamins and minerals. Ingredients that are often found in supplements for pregnant women are: folic acid, vitamin D3, iodine, omega-3 acids and iron due to their high demand and too little of it in the diet. Most future mothers (78%) from the Podkarpackie region used supplementation with vitamin and mineral preparations for pregnant women. The deficiency of certain vitamins or minerals may have serious consequences for the fetus or mother. The respondents examined by Kozłowska-Wojciechowska et al. considered deficiency of iron (87%), calcium (78%) and folic acid (75%) as the most dangerous.[40] In the Myszkowska-Ryciak study the greatest deficits were iron and calcium.[12] In 1998 in order to prevent the neural tube defects in the fetus, a 0.4 mg folic acid dose was established for women in the preconception period and up to the 12th week of pregnancy. In Poland in 2007, folic acid was only taken by 35% of women before pregnancy, 84% of pregnant women and 12% of unplanned pregnancies. The introduction of iodine-enriched salt reduced the number of abortions, premature births and hypothyroidism in newborn babies. Pregnant women who do not eat healthy should take vitamins and minerals with appropriate supplements.[41] It should be remembered, however, that the excess of some vitamins can also be dangerous for a baby.

Conclusions

1. The respondents avoided products that were not recommended during pregnancy.
2. The respondents chose the right kind of meat.
3. Despite the low consumption of fish, the surveyed supplemented omega-3 fatty acids.
4. The examined pregnant women consumed a very small amount of dairy products during the day. The consumption of more than 4 portions of dairy products was declared by less than 2% of women. The most frequent amount consumed (44% of women) was one portion of dairy products a day.
5. Prior to pregnancy and during pregnancy, supplementation intended for pregnant women should be used. Most women from the Podkarpacie region were aware of this. Taking appropriate supplements was declared by 74% of women.

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