



NUTRIENTS' DEFICIENCY RISKS IN PREGNANT WOMEN DUE TO THEIR EATING HABITS

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ABSTRACT:

Aim: To research the dietary habits of pregnant women living in Bulgaria and to assess the possible health effects for the offspring.

Methods: An online anonymous survey of the dietary habits of pregnant women living in Bulgaria was conducted. A questionnaire was developed in Google Forms, collecting information about the demographic profile, diet, frequency of consumption of certain food and drink groups, use of alternative dietary patterns, etc. The questionnaire was spread through social media using the snowball technique. The assessment of the respondents' dietary habits was based on the national dietary recommendations during pregnancy. Descriptive analysis of the results was done using Jamovi software statistical package ver. 2.3.0.

Results: 117 pregnant women aged between 21 and 54 years (median - 30 years) were interviewed. Daily consumption of milk and dairy products was found in 41% and 47% of respondents, respectively. Among the women surveyed, all were reported to consume dairy products, except 5.1% who did not consume milk. The relative share of women who rarely or never consumed fish was 58.1% and 12%, respectively, and one woman did not consume both fish and meat. Vegetarians accounted for 6% of the women surveyed, and 6% were on a low carbohydrate diet.

Conclusion: Although the majority of pregnant women surveyed followed the recommendations for healthy eating, some rarely or never consumed some of the healthy foods, which put them at risk of deficiency or insufficiency of certain nutrients.

Keywords: nutrition in pregnancy, nutrients, metabolic disorders, neurodevelopment, frequency of food intake,

INTRODUCTION:

The eating habits and nutritional status of the pregnant woman influence metabolic and physiological responses in the offspring that could manifest in both childhood and adulthood. Macro- or micronutrient deficiencies can adversely affect physical and neuropsychological development and significantly increase the risk of offspring developing metabolic and neurological diseases.

Aim:

To conduct a thorough study of pregnant women's dietary habits in Bulgaria and assess possible health effects on the offspring.

METHODS:

An anonymous online survey of the eating habits of pregnant women was conducted. For this purpose, a questionnaire was developed in Google Forms, collecting information on demographic profile, diet, frequency of consumption of certain food and beverage groups, implementation of alternative dietary patterns, etc. The questionnaire was spread through social media using the snowball technique. The assessment of the respondents' dietary habits was based on the national dietary recommendations during pregnancy. A descriptive analysis of the results was done using a statistical software package Jamovi ver. 2.3.0. A graphical representation of some of the results obtained is presented.

RESULTS:

117 pregnant women aged 21 to 54 years (median - 30 years) were surveyed. The mean duration of pregnancy was 6.62 (± 1.98) months. The majority of the women surveyed had a university degree (91.5%; n=107), of them, 66.7% (n=78) had a master's degree. The predominant part among the respondents were women for whom the current pregnancy was the first one - 78.6% (n=92). With the onset of pregnancy, 72.6% (n=85) had changed their eating habits. The relative proportion of

women who ate more than three times a day was 93.2% (n=109). Three main meals and two or one intermediate snacks were found in 37.6% (n=44) and 4.3% (n=5), respectively. The relative proportion of women who did not

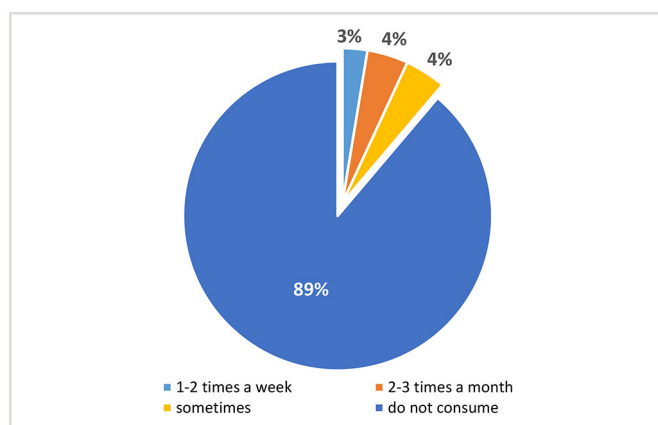
eat breakfast in the morning was 5.1% (n=6), and 18.8% (n=22) ate erratically. The frequency of consumption of the different food groups among the female respondents is presented in Table 1.

Table 1. Distribution of respondents according to the frequency of consumption of different food groups.

	Milk (n/%)	Dairy products (n/%)	Meat (n/%)	Fish (n/%)	Fruit (n/%)	Vegetables (n/%)	Grains (n/%)	Sweets (n/%)
Every day	48/41	55/47	19/16,2	0	89/76,1	65/55,6	56/47,9	43/36,8
1-2 times a week	22/18,8	12/10,3	18/15,4	35/29,9	4/3,4	11/9,4	12/10,3	18/15,4
3-4 times a week	27/23,1	43/36,8	60/51,3	0	20/17,1	31/26,5	37/31,6	39/33,3
2-3 times a month	2/1,7	3/2,6	8/6,8	18/15,4	1/0,9	3/2,6	3/2,6	3/2,6
Sometimes	12/10,3	4/3,4	6/5,1	50/42,7	3/2,6	7/6	8/6,8	10/8,5
never	6/5,1	0	6/5,1	14/12	0	0	1/0,9	4/3,4

Analysis of the results showed the highest prevalence of women not consuming alcohol during pregnancy – 88.9%; (n=104) (Fig. 1).

Fig. 1. Frequency of alcohol consumption (%)



We recorded the highest relative share of respondent women who do not consume coffee during pregnancy – 44,4% (n=52), followed by those who drink coffee 1-2 times a day – 35,9% (n=42). The rest of the women reported less frequent consumption of the drink (1 - 2 times a week).

The majority of respondents (88%; n=103) did not follow alternative dietary patterns - vegetarianism, veganism, low carbohydrate diet, raw foodism, Dukan, 90-day diet. The results analysis showed that seven women (6%) were vegetarians, and the same number followed a low carbohydrate diet.

DISCUSSION:

To ensure good intrauterine development of the fetus, a pregnant woman should stick to a healthy lifestyle,

an element of which is a healthy diet. With the onset of pregnancy, about 73% of the women in the study changed their eating habits. Of those who followed the recommendations for recommendations for 3-5 meals a day during pregnancy [1], only 41.9% had three main meals and one or two snacks. It was also found that some (5.2%) of the pregnant women skipped breakfast, and 18.8% ate erratically—without any set regimen. A dietary regimen with an even distribution of food intake throughout the day favours metabolism and satisfaction of increased [2] energy requirements.

Milk, dairy products, meat, and fish are nutritional sources of complete protein necessary for growth and development. Adequate intake of complete protein during pregnancy is crucial to satisfy the synthesis processes in both the mother and the fetus. Excessively low protein intake is associated with potential negative effects in terms of the baby's birth weight and length, and excessively high intakes may affect fetal development [3].

Milk and dairy products are a nutritional source of easily absorbed calcium. Low calcium intake by a pregnant woman increases the risk of hypertensive disorders of pregnancy [4], osteopenia, paresthesias, muscle cramps and tremors, as well as delayed growth, low birth weight and poor fetal bone mineralisation [5]. A daily intake of milk and/or dairy products is required to meet macronutrient requirements during pregnancy [1]. Less than 50% of the women surveyed adhered to this recommendation. Some respondents reported that they rarely consumed this food group, and six respondents did not consume milk but did consume dairy products. These results give reason to suspect calcium deficiency among some of the respondents.

Meat and fish are nutritional sources of easily absorbed iron, which is an important micronutrient in pregnancy. Iron deficiency in the pregnant woman increases the

risk of preterm birth, low birth weight, reduced protection against infection, abnormal psychomotor development and impaired cognitive function of the offspring in infancy [6], as well as cardiovascular risk for the offspring in adulthood. Recommendations for fish consumption 1-2 times per week were met in 29.9% (n=35) of pregnant women surveyed and for meat consumption 3-4 times per week in 51.3%. One of the surveyed women was at risk of iron deficiency due to a lack of meat and fish consumption. Fish is a source of the essential omega-3 polyunsaturated fatty acids – the eicosapentaenoic and docosahexaenoic, which are essential for brain and visual analyser development in the offspring. It is also the most significant nutritional source of vitamin D, especially during the winter months. Maternal vitamin D deficiency has been associated with the risk of neonatal rickets as well as multiple adverse pregnancy outcomes such as gestational diabetes mellitus, preeclampsia [7], preterm birth [8], and infants small for their gestational age [9]. More than half of the women surveyed reported low fish consumption, increasing their risk of omega-3 fatty acid and vitamin D deficiency.

Animal food products are also sources of retinoids, which are precursors of vitamin A. Its physiological functions include vision, growth, bone metabolism, immune function and gene transcription.

Plant foods - fruits, vegetables, nuts, legumes and grains - also play an important role in a pregnant woman's healthy diet. According to national recommendations, fruits, vegetables, and grains should be present in a healthy person's daily menu. The majority of the women surveyed were found to be following this recommendation. However, there were also respondents reporting a very low frequency of consumption of fruits, vegetables and cereals, 3.5%, 8.6% and 29.7%, respectively. Among the survey respondents, all reported consuming fruits and/or vegetables. One pregnant woman (0.9%) reported not consuming grains.

Plant food products are sources of water-soluble B vitamins and vitamin C, complex carbohydrates (energy source), fiber, vegetable protein. Carbohydrates are the main substrate for fetal growth. B vitamins are water-soluble vitamins required for the production and release of energy in cells and for the metabolism of proteins, fats and carbohydrates [10]. A deficiency of these vitamins can affect cell growth as well as the development of neural tissue. Folate (vitamin B9) plays a crucial role in the prevention of neural tube defects and in neurogenesis, apoptosis and normal development of the nervous system. Low maternal folate concentrations during pregnancy are associated with behavioral problems in childhood, increased risk of attention deficit reduced problem-solving ability [11], and lower cognitive ability [12].

The main energy source for the body is carbohydrates. The diet requirements of carbohydrates during pregnancy remain the same as in the pre-pregnancy period. During pregnancy, it is advisable to consume sources of complex carbohydrates (whole grain cereals, legumes), while added sugars should not exceed 5 E%. According to the study results, the respondents who consumed sugar or confectionery on a daily basis have the highest relative share. A high intake of added sugars during pregnancy increases the risk of atopy and atopic asthma and reduces cognitive abilities in children [13]. Confectionery can also be a source of trans-fatty acids. They have been shown to adversely affect the cardiovascular system and increase serum cholesterol levels. According to some authors, during the intrauterine period, they can affect neurodevelopment [14].

Regarding the consumption of alcohol and coffee by the female respondents, the relative share of those not consuming these drinks was found to be the highest. There were no respondents who consumed alcohol on a daily basis. Alcohol abuse or heavy consumption during pregnancy is known to be associated with fetal alcohol syndrome. The risks of miscarriage, preterm birth, and newborns small for their gestational age are also increased in women with high or regular alcohol intake [15]. The consequences of occasional or low to moderate alcohol consumption for maternal and infant health are less clear. Currently, no safe level of alcohol consumption during pregnancy is known.

Caffeine is a trimethylxanthine alkaloid and the most commonly used psychoactive substance worldwide. The results of studies on the effects of caffeine during pregnancy are controversial. Several meta-analyses have reported that increased caffeine intake is associated with an increased risk of low birth weight and an increased risk of miscarriage, where the effects are dose-dependent [16, 17].

Trends in the adoption of alternative dietary patterns among pregnant women have also been studied. Despite some health benefits, these dietary patterns do not fit into the concept of healthy eating because of the health risks they pose. In the study, 12% of the women followed an alternative eating pattern—1/2 were vegetarians, and the rest followed a low-carbohydrate diet. The risk of nutritional deficiencies and metabolic disorders in these women could have adverse effects on their health and that of their offspring.

CONCLUSION:

The majority of the respondents changed their eating habits after registering their pregnancy. In terms of the frequency of consumption of milk and dairy products, grains, fruit and vegetables, coffee and alcohol, the highest relative share of respondents adhered to national recommendations for healthy eating, but it was below 50% in terms of con-

sumption of milk and/or dairy products and grains. Low consumption of fish and high frequency of consumption of sugar and confectionery were found among female respondents. There were also respondents who rarely or never consumed some of the healthy foods, which put them at risk of deficiency or insufficiency of certain nutrients.

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