


AN EVALUATION OF THE KNOWLEDGE ON SPECIFIC NUTRITIONAL NEEDS AND FACTORS AFFECTING PREGNANCY OUTCOME IN WOMEN OF REPRODUCTIVE AGE

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ABSTRACT

Background. Pregnancy is one of the few periods in a woman's life when extra weight is not perceived as a negative factor, but has positive connotations with healthy fetal development, which runs against the modern cult of a perfect, slim and healthy body. Most research studies focus on excessive rather than insufficient weight gain in successive trimesters of pregnancy.

Objective. The aim of this study was to evaluate women's knowledge about the influence of diet on pregnancy outcome and to assess changes in body weight and eating behaviors during pregnancy.

Materials and methods. The study consisted of an online survey. A total of 325 correctly and completely filled in questionnaires were considered. The respondents were divided into two groups: women without children (44.92%) and pregnant women and mothers (55.08%). The respondents' knowledge about eating behaviors during pregnancy was compared between the two groups. The responses given by mothers were used to evaluate weight gains during pregnancy and the nutritional status of pregnant women.

Results. Changes in body weight during pregnancy were regarded as acceptable and pregnancy weight gain was considered a normal process by 92% of the respondents. Pregnant women had greater knowledge about the need for increased caloric intake in successive trimesters ($p=0.0012$). The respondents' knowledge about maternal health and healthy fetal development was assessed with the use of 10 true or false questions. The average score was 6.3 ± 1.8 points, and no significant differences were found between mothers/pregnant women and women without children (6.6 ± 1.3 vs 6.2 ± 1.7 , $p>0.05$). In the present study, 67% of the respondents were of the opinion that they followed a healthy diet, 14% claimed that they did not eat right, but were not motivated to make any changes.

Conclusions. The respondents were aware that weight gain during pregnancy is a normal physiological process, but 1/3 of the respondents did not feel comfortable with the observed changes. The respondents did not have sufficient knowledge about the influence of maternal weight on fetal development. The use of diuretics and laxatives by pregnant women without medical consultation is a worrying phenomenon. These results indicate that women should have better access to knowledge about the impact of healthy nutrition on pregnancy outcome.

Key words: *eating disorders, pregnancy, pregorexia, malnutrition, body weight*

STRESZCZENIE

Wprowadzenie. Ciąża to jeden z nielicznych okresów w życiu kobiety, w których nadwaga nie jest postrzegana jako czynnik negatywny, ale kojarzy się pozytywnie ze zdrowym rozwojem płodu, co sprzeczne jest ze współczesnym kultem idealnego, szczupłego i zdrowego ciała. Większość badań naukowych skupia się na nadmiernym, a nie niedostatecznym przybieraniu na wadze w kolejnych trymestrach ciąży.

Cel. Celem pracy była ocena wiedzy kobiet na temat wpływu diety na przebieg ciąży oraz ocena zmian masy ciała i zachowań żywieniowych w okresie ciąży.

Materiał i metody. Badanie składało się z ankiety internetowej, uwzględniono 325 poprawnie wypełnionych ankiet. Respondenci zostali podzieleni na dwie grupy: kobiety bezdzietne (44,92%) oraz kobiety w ciąży i matki (55,08%). Porównano wiedzę respondentek na temat zachowań żywieniowych w czasie ciąży między obiema grupami. Odpowiedzi udzielone przez matki zostały wykorzystane do oceny przyrostów masy ciała w czasie ciąży oraz stanu odżywienia kobiet w ciąży.

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Wyniki: Zmiany masy ciała w czasie ciąży respondentki uznały za dopuszczalne, a przyrost masy ciała w ciąży zaakceptowało 92% badanych. Kobiety w ciąży miały większą wiedzę na temat potrzeby zwiększenia spożycia kalorii w kolejnych trymestrach ($p=0,0012$). Wiedza respondentek na temat zdrowia matki i zdrowego rozwoju płodu została oceniona za pomocą 10 pytań. Średni wynik wyniósł $6,3\pm 1,8$ punktu i nie stwierdzono istotnych różnic między matkami/kobietami w ciąży a kobietami nieposiadającymi dzieci ($6,6\pm 1,3$ vs $6,2\pm 1,7$, $p>0,05$). Wśród kobiet w ciąży aż 67% respondentek było zdania, że stosują zdrową dietę, 14% twierdziło, że nie odżywia się prawidłowo, ale nie ma motywacji do wprowadzania zmian.

Wnioski. Respondentki miały świadomość, że przyrost masy ciała w czasie ciąży jest normalnym procesem fizjologicznym, jednak 1/3 badanych nie czuła się komfortowo z obserwowanymi zmianami. Kobiety nie posiadały wystarczającej wiedzy na temat wpływu masy matki na rozwój płodu. Stosowanie leków moczopędnych i przeczyszczających przez kobiety w ciąży bez konsultacji lekarskiej jest niepokojącym zjawiskiem. Istnieje potrzeba zwiększenia dostępności szkoleń z zakresu roli i prawidłowego żywienia kobiet w ciąży.

Słowa kluczowe: zaburzenia odżywiania, ciąża, pregoreksja, niedożywienie, masa ciała

INTRODUCTION

Eating disorders are a serious and complex health and social problem that pose a particular threat for pregnant women. In the media, pregnant women are portrayed as happy and smiling, where shapely breasts and a small bump without excessive fat tissue are the only visible signs of pregnancy, which sets the bar high for expecting mothers. Many women try to rise to these unrealistic expectations by restricting their caloric intake, embarking on physical exercise programs that are not adapted to their physiological needs, or even taking diuretics and laxatives to control their body weight during pregnancy and quickly return to the pre-pregnancy weight [15, 19].

Pregnancy is one of the few periods in a woman's life when extra weight is not perceived as a negative factor, but has positive connotations with healthy fetal development, which runs against the modern cult of a perfect, slim and healthy body [13]. Most research studies, including studies of pregnant women, focus on excessive rather than insufficient weight gain in successive trimesters of pregnancy [1, 19]. The term "pregorexia" (a portmanteau of "pregnancy" and "anorexia") [16] was coined

in 2008 to emphasize that eating disorders can also affect pregnant women. Pregorexia is defined as a strong desire to control weight and maintain the perfect body image during pregnancy [26]. Pregorexia is difficult to diagnose because it not formally recognized as a disease and has not been classified in the ICD-10 or DSM-IV. As a result, pregnant women suffering from pregorexia are often diagnosed as anorectic, despite their specific physiological condition [31]. Pregorexia has identical symptoms to anorexia, and the affected women observe highly restrictive diets, become engaged in vigorous exercise programs, and take nutritional supplements and pharmaceuticals (laxatives and/or diuretics) to control their pregnancy weight [3, 10]. This disorder has been also described as an obsession with healthy eating combined with excessive focus on the ideal body size [31]. Women

suffering from pregorexia are extremely anxious about gaining weight during pregnancy and being unable to return to their pre-pregnancy weight [22, 31]. Similarly to other eating disorders, pregorexia is not easy to diagnose. Some symptoms cannot be distinguished from natural physiological processes that occur during pregnancy, such as changes in food and taste preference, nausea or individual differences in the rate of weight gain. These changes should be evaluated with caution to avoid overinterpretation, but worrying signs should be detected as early as possible because unhealthy eating behaviors and pharmaceuticals can negatively affect maternal and fetal health and lead to pregnancy complications [10].

Research objective

The aim of this study was to evaluate the knowledge about healthy pregnancy, specific nutritional needs and adherence to dietary recommendations during pregnancy in women of reproductive age, and to evaluate changes in body weight and eating habits in pregnant women and mothers.

MATERIALS AND METHODS

Study population

The study consisted of an online survey, and a link to the questionnaire was posted in social media groups for pregnant women, women who are planning to become pregnant and/or mothers. Patients of a gynecological clinic were also invited to participate in the study, and they were provided with the relevant information and a link to the online questionnaire during their appointments. Data were collected between 20 January and 20 April 2020, and between 1 November and 31 December 2020. The questionnaire was completed by a total of 342 respondents, but only 325 correctly and completely filled in questionnaires were considered in the study. The surveyed subjects were women aged 18 to 52. The inclusion criteria were female sex, motherhood or plans to have children. In the statistical analysis of the results, the respondents

were divided into two groups: women without children (44.92%) and pregnant women and mothers (55.08%). The respondents' knowledge about eating behaviors during pregnancy was compared between the two groups. The responses given by mothers were used to evaluate weight gains during pregnancy and the nutritional status of pregnant women.

Methods

The study involved a self-designed questionnaire containing single-choice, multiple-choice and open-ended questions. The research tool was an original 40-item questionnaire that was developed for the Polish population based on the questionnaire to measure the level of nutritional and weight gain knowledge in pregnant women [18]. The questionnaire was composed of three main parts. Part I consisted of questions assessing the respondents' knowledge about pregnancy, physiological changes in pregnant women, specific nutritional needs and dietary guidelines for pregnant women, the consequences of maternal undernutrition and low weight gains during pregnancy. Part II was addressed to mothers, and it included questions about their nutritional status and weight gains in successive trimesters of pregnancy, the desire to control or restrict weight gain, and body image during pregnancy. Information about the respondents' body weights was obtained from maternity records based on the medical examinations performed in the first trimester (up to the 10th week of pregnancy), the second trimester (15th to 20th week of pregnancy) and the third trimester (33rd to 37th week of pregnancy). Part III was designed to collect personal information from the respondents, including age, height, pre-pregnancy weight, education and place of residence.

The *Shapiro-Wilk* test was used to test the normality of distributions. Differences between groups were determined with the use of Pearson's chi-squared (χ^2) test. Two-tailed p-values <0.05 were considered statistically significant in all tests. Analyses were performed using Statistica software (version 13.1 PL; StatSoft Inc., Tulsa, OK, USA; StatSoft, Krakow, Poland).

RESULTS

Part I of the questionnaire

Changes in body weight during pregnancy were regarded as acceptable, and pregnancy weight gain was considered a normal process by 92% of the respondents, in the groups of both pregnant women and mothers, and women without children. According to 6% of the surveyed subjects, changes in body weight during pregnancy were undesirable, and most respondents in this group had excessive pre-pregnancy weight ($p < 0.05$). Pregnant women had greater

knowledge about the need for increased caloric intake in successive trimesters ($p = 0.0012$). The respondents were most likely to overestimate the recommended caloric intake in the first and third trimester (max. 500 kcal in the first trimester, 1000 kcal higher in the third trimester).

The distribution of answers to the question concerning the effects of low birth weight (LBW) on the child's future health was an important consideration. More than a third of the respondents who did not have children ($p = 0.002$) and nearly a half of mothers and pregnant women were of the opinion that LBW had no effect on the child's health if the infant quickly gained weight, whereas women without children were more likely to indicate that LBW increased the risk of lifestyle diseases ($p = 0.001$). The respondents' age was not a differentiating factor, but women with university education were more often of the opinion that LBW could have negative implications for the child's future health ($p = 0.002$), in particular by increasing the risk of heart disease. Only 10% of pregnant women and mothers and 14% of women without children recognized that LBW was directly associated with overweight and obesity in adulthood.

The respondents were asked to assess the influence of maternal weight during pregnancy on fetal development. In both groups, the highest number of respondents were of the opinion that pregnancy weight affects the child. The number of respondents who voiced a contrary opinion was three times higher among mothers than among women who did not have children ($p = 0.0021$). The number of respondents who disagreed that healthy maternal weight gain in successive trimesters can influence fetal weight gain ($p = 0.001$), healthy fetal development ($p = 0.002$) and increase the risk of intrauterine growth restriction (IUGR) ($p = 0.001$) and preterm birth ($p = 0.0035$) was also twice higher among mothers than among women who did not have children. Physiological changes during pregnancy increase the demand for some nutrients, which is why expecting mothers modify their diets. The majority of the respondents were of the opinion that pregnant women should modify their diets (more than 80% in each group; $p > 0.05$). However, the number of respondents who disagreed that dietary modifications are needed during pregnancy, in particular in the second and third trimester, was significantly higher among pregnant women and mothers ($p = 0.023$). Food cravings and the elimination of specific food groups were acceptable for 1/3 of the surveyed subjects, and pregnancy/motherhood was not a differentiating factor ($p > 0.05$).

The respondents were asked to indicate nutrients that are essential during pregnancy (Table 1). On average, pregnant women and mothers listed 2.31 ± 0.34 nutrients, whereas women without children listed

Table 1. Answers to the question: Which nutrients (vitamins, minerals, etc.) play the most important role during pregnancy?

Pregnant women and mothers n=146 [%]		Women without children n=179 [%]		P
Folic acid	87 [59.6]	Folic acid	107 [59.7]	ns
Iron	80 [54.8]	Calcium	103 [57.5]	0.0021
Vitamin D	65 [44.5]	Vitamin D	80 [44.7]	ns
Magnesium	48 [32.8]	Iron	73 [40.8]	0.0014
DHA	27 [18.5]	B vitamins	34 [19.0]	0.0027

2.34±0.28 nutrients, and the difference between groups was not significant ($p>0.05$). However, differences were observed in the type of nutrients and the order in which they were listed.

The respondents were asked whether they had been diagnosed with iron deficiency, low hemoglobin levels or low red blood cell counts during pregnancy, and whether they had been taking dietary supplements, including iron supplements, during pregnancy. In the group of pregnant women and mothers, 65% of the respondents had been taking iron supplements, and more than 50% had been anemic, in particular in the third trimester. Pregnancy weight was not correlated with iron deficiency anemia ($p<0.05$). Vitamin D deficiency was more frequently indicated by pregnant women ($p=0.002$) and women with university education ($p=0.04$), whereas vitamin D supplements were used by more than 40% of pregnant women and mothers. These respondents rarely used other dietary supplements to compensate for nutrient deficiency in pregnancy. Frequent leg cramps and nocturnal shin cramps associated with magnesium deficiency were significantly more often reported by pregnant women ($p=0.002$), and beginning from the second trimester, 1/3 of these respondents were taking magnesium supplements upon their physicians' advice. The respondents were asked about maternal undernutrition and its impact on pregnancy. In both groups, the majority of the surveyed subjects agreed that maternal undernutrition was a significant risk factor in pregnancy (95.21% of women without children vs 90.50% of mothers, $p=0.023$). The number of respondents who argued that maternal undernutrition was an important, but not a critical factor was more than three times higher among pregnant women and mothers ($p=0.002$). The respondents were also asked to rank the consequences of undernutrition for the mother and child. The responses differed significantly between groups ($p<0.05$). Anemia and vaginal bleeding were most frequently identified as maternal consequences of undernutrition (these answers were significantly more often given by pregnant women and mothers, $p=0.002$), followed by lactation problems ($p=0.03$) and depression ($p=0.02$). Low birth weight (this answer was significantly more often given by

pregnant women and mothers, $p=0.03$) and anemia (this answer was most prevalent among women without children, $p=0.01$) were selected as the major consequences of maternal undernutrition for the fetus.

The respondents' knowledge about maternal health and medical tests that are required to confirm healthy pregnancy and healthy fetal development was assessed with the use of 10 true or false questions. The average score was 6.3±1.8 points, and no significant differences were found between mothers/pregnant women and women without children (6.6±1.3 vs 6.2±1.7, $p>0.05$). The respondents scored the lowest number of points in questions concerning normal arterial blood pressure during pregnancy ($p=0.01$) and risk factors for pre-eclampsia ($p=0.001$), and earned the highest scores in questions concerning fasting glucose levels and diet-dependent complications in the third trimester, such as constipation ($p=0.03$), muscle cramps ($p=0.05$) and iron deficiency anemia ($p=0.067$).

Part II of the questionnaire

The second part of the questionnaire was addressed only to women in the third trimester of pregnancy and mothers with maternity records, and it was filled out by 147 respondents. In the first question, the respondents were asked whether they felt comfortable with the physiological changes during pregnancy. This question was designed to identify women who were at risk of pregorexia, where body dissatisfaction could trigger pathological behaviors. More than half of the respondents claimed that they regarded physiological changes during pregnancy as a normal phenomenon. Despite the above, every third respondent in that group did not feel comfortable with these changes, and 13% noted that weight gain during pregnancy made them feel unattractive. In the group of women who did not feel comfortable with pregnancy changes, 3/4 were of the opinion that their weight had increased excessively during pregnancy (Table 2). Pregnancy weight gain was excessive in all women who had been overweight or obese before becoming pregnant ($p=0.002$). Mean weight gain was 12.4 kg, and maximum weight gain was 24.1 kg. According to recommendations, pregnancy weight gain should not exceed 7-11.3 kg for overweight women and 5-9 kg for obese women.

Table 2. Pregnancy weight gain in successive stages of pregnancy

	1 st trimester	2 nd trimester	3 rd trimester
Average body weight	61.3 ±27.9 (min 48.7 – max 89.4 kg)	66.2 ± 31.3 (min 49.5 – max 97.1 kg)	69.3 ± 36.9 (min 53.5 – max 106.3 kg)
Underweight respondents (BMI < 19.9), n [%] Average body weight	27 [18.3] 52.4±4.9 (min 47.7-max 56.1)	24 [16.3] 53.8±6.4 (min 49.5-max 57.6)	21 [14.3] 55.5±3.9 (min 53.5-max 58.6)
Respondents with a healthy BMI (20-24.99), n [%] Average body weight	66 [44.9] 58.1±9.3 (min 52.5– max 71.1)	61 [41.5] 60.1±7.7 (min 55.7 – max 74,1)	67 [45.6] 62.7±5.3 (min 58.1 – max 75.6)
Overweight respondents (BMI>25), n [%] Average body weight	54 [36.8] 69.1±10.3 (min 59.7 – max 89.4)	62 [42.2] 73.9±9.4 (min 64.7– max 97.1)	59 [40.1] 78.3±11.8 (min 68.9–max 106.3)

Eleven underweight women (40%) had not achieved the recommended weight in the second or third trimester ($p=0.003$ vs $p=0.001$). Underweight women are advised to gain 12.5-18 kg during pregnancy, but mean weight gain was only 8.6 kg, and minimum weight gain was 5.5 kg in this group. The respondents were asked whether they had attempted to modify their weight before becoming pregnant. Three out of every five women had not made such attempts; every third responded had attempted to lose weight, whereas only 5% had attempted to gain weight before becoming pregnant.

Women with preeclampsia hope to minimize or completely avoid weight gain during pregnancy. The respondents were asked whether they had attempted to modify their weight during pregnancy (Figure 1). Three-quarters of the studied population had not made such attempts; only three women, classified as underweight (BMI < 18.5), had attempted to gain weight. The group of women who were concerned

about weight gain included respondents with a normal BMI, and these subjects accounted for 57% of the women who had attempted to control their weight gain during pregnancy. The majority of these respondents (84%) controlled their weight by avoiding unhealthy foods such as sweets, chips, chocolate, instant foods and fried foods. More than 50% of the surveyed subjects modified their food choices, 1/3 decreased food portions, 10% avoided eating late at night, and 1/4 went for walks despite not being professionally active (on medical leave). (Table 3)

Compensatory behaviors such as self-induced vomiting or the use of laxatives (in the absence of constipation) were not reported by any women. However, 15.5% of the subjects had used constipation and laxative treatments other than home remedies. The majority of these respondents were pregnant women in the third trimester ($p=0.002$), mostly overweight women ($p=0.001$) and women with a pre-pregnancy BMI < 20 ($p=0.003$). Five pregnant women in the

Changes in body weight during pregnancy

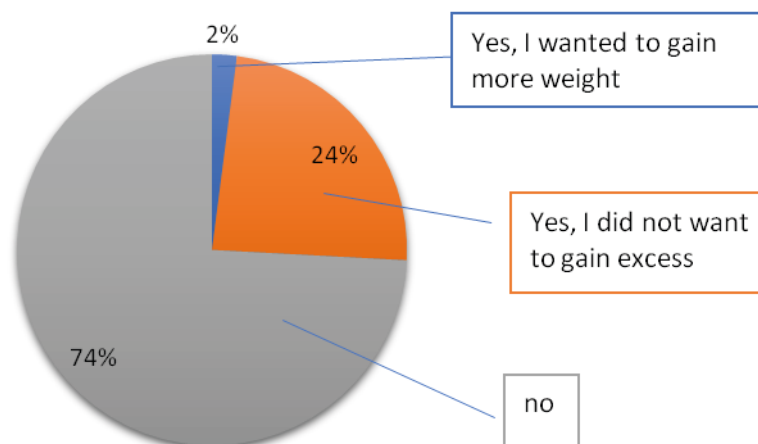


Figure 1. Response to the question: Did you attempt to change your body weight during pregnancy?

Table 3. Components of changes in eating behavior during pregnancy

	Pregnant women with BMI<18.5 before pregnancy n (%)	Pregnant women with BMI 18.5-24.99 before pregnancy n (%)	Pregnant women with BMI>25 before pregnancy n (%)	P
Increased consumption of vegetables and fruits	16 (59.3)	39 (59.1)	28 (51.8)	0.071
Increased consumption of dairy products	13 (48.1)	27 (40.1)	24 (44.4)	0.059
Increased consumption of whole grains	16 (59.3)	33 (50)	28 (51.8)	0.039
Eating breakfast regularly	14 (51.8)	47 (71.2)	31 (57.4)	0.0031
Eating 5-6 meals a day	14 (51.8)	27 (40.1)	30 (55.5)	0.023
Decreased food portion	9 (33.3%)	3 (4.5)	9 (16.6)	0.0017
Reduced intake of fast food	20 (74.1)	19 (28.8)	23 (42.6)	0.0001
Eliminating sugar or sweets	23 (85.2)	23 (34.8)	29 (53.7)	0.0026
Eliminating coffee	9 (33.3)	36 (54.5)	34 (63.0)	0.0048
Eliminating salty snacks	23 (85.2)	29 (43.9)	39 (72.2)	0.002
Used constipation and laxative treatments	7 (25.9)	2 (3.0)	11 (20.4)	0.0037
Reading food labels	20 (74.1)	36 (54.5)	24 (44.4)	0.0018

second trimester had used diuretics without medical consultation ($p=0.002$).

DISCUSSION

Maternal weight control has significant implications for pregnancy outcomes [30]. Maternal weight should be controlled every 4-6 weeks during prenatal care appointments [32]. Most of the respondents had their weight checked during regular pregnancy visits (56%), whereas more than $\frac{1}{4}$ of the surveyed subjects had not had their weight checked by a physician or a midwife during the appointment, but had monitored their weight at home and reported the results during the visit. According to 10% of the women, they had been weighed only during the first visit, and weight gain in successive stages of pregnancy was not monitored by the physician.

Pregorexia is not a formal medical term, but it is increasingly used to define eating disorders in pregnant women [6,17]. Weight gain during pregnancy is a major concern for women with pregorexia. Many women are faced with the dilemma of choosing between a positive body image and healthy fetal development [4]. For some women with an eating disorder, pregnancy is the only time when weight gain is acceptable [20]. According to *Możdżonek* and *Antosik* [21], the detection rate for pregorexia is low, mostly because women suffering from this disorder feel ashamed and hide the problem in fear of being judged. In the present study, the respondents were very reluctant to admit that they had an eating disorder. None of the

women who reported prolonged vomiting (11 subjects) admitted that it was self-induced. All women who had experienced prolonged vomiting reported low maternal weight gain in the first trimester, which could be attributed to problems with holding down food. However, half of the respondents who had suffered from prolonged vomiting were underweight before pregnancy (BMI<18.5 kg/m²). None of the pregnant women reported symptoms of pregorexia, even if symptoms of an eating disorder were present. Every fourth respondent had attempted to modify or control her weight to avoid excessive weight gain. In a study by *Wójcik et al.* [31], 38% of the surveyed women had attempted to lose weight during pregnancy.

Despite a steady increase in education levels, nutrition knowledge has not changed significantly in the general population [7]. Women of reproductive age tend to repeat poor dietary behaviors from childhood and adolescence. In a subjective nutritional assessment conducted by *Myszkowska-Ryciak et al.* [23], more than $\frac{2}{3}$ of the surveyed women claimed that they ate healthy diets during pregnancy, whereas 74% of the respondents declared that they had changed their diets after becoming pregnant. In the present study, 67% of the respondents were of the opinion that they followed a healthy diet, 14% claimed that they did not eat right during pregnancy, but were not motivated to make any changes or seek advice from a physician or a dietician. The most frequently introduced dietary modifications included a higher number of meals (65%), larger portions (36%), higher intake of fruits (74%), reduced intake of fast foods (31%) and healthier food choices

(25%). *Myszkowska-Ryciak* et al. [23] reported different dietary modifications: the respondents modified their diets by eating a higher number of smaller meals (100%), increasing their intake of vegetables (100%) and fruits (94%), reducing their intake of fast foods (78%) and sweets (69%), and eliminating coffee from their diets (56%). In turn, in the work of *Tymczyna* et al. [28], most pregnant women focused on food quality and increased their consumption of dairy products (20.78%), fruits and vegetables (19.48%) and cereal products (12.99%). Pregnant women from the region of Łódź modified their dietary behaviors by eliminating coffee, fast foods, salty snacks and sweets from their diets [8]. A study conducted in Poznań revealed that pregnant women had insufficient knowledge about the impact of maternal nutrition on pregnancy outcomes. More than half (54%) of the respondents did not change their dietary behaviors after becoming pregnant, and 2% completely ignored nutritional guidelines [11].

Research clearly indicates that eating disorders such as pregnancy-related vomiting and hyperemesis, maternal anemia and infections, increase the risk of pregnancy complications compared with healthy pregnant controls [14]. Eating disorders have negative outcomes, especially nutrition- and growth-related outcomes, for neonates. Maternal anorexia nervosa, including extreme underweight and dietary restriction, has been associated with intrauterine growth restriction, small-for-gestational age infants and low birth weight [24, 27]. Postpartum depression is yet another complication of eating disorders; it affects around 9% of mothers, usually 6-12 weeks after giving birth [29]. In the current study, postpartum depression was reported by 14% of the respondents, and it was significantly more prevalent among women with a low BMI ($p < 0.05$) and women with gestational diabetes ($p < 0.05$). Recent research suggests that anemia and iron deficiency are among the causes of postpartum depression [2,12]. Iron deficiency can contribute to postpartum depression by disrupting the metabolism of thyroid hormones and decreasing IL-2 production. Iron also participates in the synthesis of neurotransmitters such as dopamine, serotonin and noradrenaline, and low levels of these neurotransmitters can lead to depression. Anemia has been also linked with depression in non-pregnant women. *Goshtasebi* et al. [9] demonstrated that perinatal hemoglobin values lower than 11 g/dl were associated with a higher risk of postpartum depression. However, further research is needed to confirm these observations.

Placental abruption is a serious complication of pregnancy [5]. Low maternal pre-pregnancy BMI has been associated with a high risk of placental abruption, which can be reduced by healthy weight gain during pregnancy [5]. Similar results were reported by *Połocka-Molińska* et al. [25] who observed placental

abnormalities in 21.7% of women with low weight gain, but in only 4.8% of women who gained the right amount of weight during pregnancy.

CONCLUSIONS

1. The respondents were aware that weight gain during pregnancy is a normal physiological process, but 1/3 of the respondents did not feel comfortable with the observed changes.
2. Most pregnant women with a normal BMI gained the right amount of weight during pregnancy, but women who were overweight or obese before pregnancy gained excessive weight during pregnancy.
3. The respondents did not have sufficient knowledge about the influence of maternal weight on fetal development, in particular in the group of pregnant women and mothers.
4. The use of diuretics and laxatives by pregnant women without medical consultation is a worrying phenomenon that could compromise maternal nutritional status and give rise to eating disorders during pregnancy.
5. Pregnant women and women planning to start a family should have better access to knowledge about healthy nutrition during pregnancy.
6. Courses focusing on healthy diet and supplementation during pregnancy should be introduced in antenatal care programs.

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Conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. *Agrawal S., Singh A.*: Obesity or Underweight – What is Worse in Pregnancy? *J Obstet Gynaecol India* 2016;66(6):448–452 doi:10.1007/s13224-015-0735-4.
2. *Azami M., Badfar G., Khalighi Z., Qasemi P., Shohani M., Soleymani A., Abbasalizadeh S.*: The association between anemia and postpartum depression: A systematic review and meta-analysis. *Caspian J Intern Med* 2019;10(2):115-124 doi:10.22088/cjim.10.2.115.
3. *Bator E., Bronkowska M., Ślepecki D., Biernat J.*: Anoreksja – przyczyny, przebieg, leczenie [Anorexia – causes, course, treatment]. *Now Lek* 2011;3(80):184–191 (in Polish).
4. *Claydon E.A., Davidov D.M., Zullig K.J., Lilly C.L., Cottrell L., Zerwas S.C.*: Waking up every day in a body

- that is not yours: a qualitative research inquiry into the intersection between eating disorders and pregnancy. *BMC Pregnancy Childbirth* 2018;18(1):463 doi:10.1186/s12884-018-2105-6.
5. *Deutsch A.B., Lynch O., Alio A.P., Salihu H.M., Spellacy W.N.*: Increased risk of placental abruption in underweight women. *Am J Perinatol* 2010;27(3):235–240 doi:10.1055/s-0029-1239490.
 6. *Franko D.L., Blais M.A., Becker A.E., Delinsky S.S., Greenwood D.N., Flores A.T., Ekeblad E.R., Eddy K.T., Herzog D.B.*: Pregnancy complications and neonatal outcomes in women with eating disorders. *Am J Psychiatry* 2001;158(9):1461-1466 doi:10.1176/appi.ajp.158.9.1461.
 7. *Fraś M., Gniadek A., Poznańska-Skrzypiec J., Kadłubowska M.*: Styl życia kobiet w ciąży [Lifestyle of pregnant women]. *Hygeia Publ Health* 2012;47(4):412-417 (in Polish).
 8. *Godala M., Pietrzak K., Łaszek M., Gawron-Skarbek A., Szatko F.*: Zachowania zdrowotne łódzkich kobiet w ciąży. Cz. I. Sposób żywienia i suplementacja witaminowo-mineralna [Health behaviours of pregnant residents of Łódź. Part I. Diet and vitamin-mineral supplementation]. *Probl Hig Epidemiol* 2012;93(1):38-42 (in Polish).
 9. *Goshtasebi A., Alizadeh M., Gandevani S.B.*: Association between Maternal Anaemia and Postpartum Depression in an Urban Sample of Pregnant Women in Iran. *J Health Popul Nut* 2013;31(3):398–402 doi:10.3329/jhpn.v31i3.16832.
 10. *Harasim-Piszczatowska E., Krajewska-Kulak E.*: Pregoreksja - anoreksja kobiet ciężarnych [Pregorexia – anorexia of pregnant women]. *Pediatr Med Rodz* 2017;13(3):363–367 doi:10.15557/PiMR.2017.0038.
 11. *Hyżyk A.K., Sokalska N.*: Ocena zmiany masy ciała u kobiet w ciąży [The evaluation of body mass changes in pregnant women]. *Now Lek* 2011;80(3):174-177 (in Polish).
 12. *Kang S.Y., Kim H.B., Sunwoo S.*: Association between anemia and maternal depression: A systematic review and meta-analysis. *J Psychiatr Res* 2020;122:88-96 doi:10.1016/j.jpsychires.2020.01.001.
 13. *Krisjanous J., Richard J.E., Gazley A.*: The Perfect Little Bump: Does the Media Portrayal of Pregnant Celebrities Influence Prenatal Attachment? *Psychology and Marketing* 2014;31(9):758–773 doi:10.1002/mar.20732.
 14. *Linna M.S., Raevuori A., Haukka J., Suvisaari J.M., Suokas J.T., Gissler M.*: Pregnancy, obstetric, and perinatal health outcomes in eating disorders. *Am J Obstet Gynecol* 2014;211(4):392-398 doi:10.1016/j.ajog.2014.03.067.
 15. *Łepecka-Klusek C., Syty K., Pilewska-Kozak C., Jakiel G.*: Sense of own attractiveness among women in advanced pregnancy. *Prog Health Sci* 2015;5(1):7–13.
 16. *Mandera A., Pawlikowska A., Szuster M., Calkosińska A., Kostrzewska P., Majewski M.*: The pregorexia-anorexia during the pregnancy. *J Educ Health Sport* 2019;9(5):137–144 doi:10.5281/zenodo.2718477.
 17. *Mazer-Poline C., Fornari V.*: Anorexia nervosa and pregnancy: having a baby when you are dying to this-case report and proposed treatment guidelines. *Int J Eat Disord* 2009;42(4):382-384 doi:10.1002/eat.20607.
 18. *Mierzejewska E., Honorato-Rzeszewicz T., Świątkowska D., Jurczak-Czaplicka M., Maciejewski T., Fijałkowska A., Szulc-Kamińska J., Czach A., Nalecz H., Szostak-Węgierek D., Szamotulska K.*: Evaluation of questionnaire as an instrument to measure the level of nutritional and weight gain knowledge in pregnant women in Poland. A pilot study. *PLoS One*. 2020;15(1):e0227682. doi: 10.1371/journal.pone.0227682.
 19. *Meštrović Z., Roje D., Vulić M., Zec M.*: Calculation of optimal gestation weight gain in pre-pregnancy underweight women due to body mass index change in relation to mother’s height. *Arch Gynecol Obstet* 2017;295(1):81–86 doi:10.1007/s00404-016-4218-3.
 20. *Mitchell-Bieleghem A., Mittelstaedt M., Bulik C.M.*: Eating disorders and childbearing: concealment and consequences. *Birth* 2002;29(3):182-191 doi:10.1046/j.1523-536x.2002.00186.x.
 21. *Możdżonek P., Antosik K.*: Creating of dietary trends in the media and their influence on the development of eating disorders. *Public Health Nurs* 2017;7(2):159–164 doi:10.17219/pzpp/66329.
 22. *Müldner-Nieckowski L., Cyranka K., Smiatek-Mazgaj B., Mielimaka M., Sobański J.A., Rutkowski K.*: Multiaxial changes in pregnancy: Mental health - A review of the literature. *Ginekol Pol* 2014;85(10):784–787.
 23. *Myszkowska-Ryciak J., Gurtatowska A., Harton A., Gajewska D.*: Poziom wiedzy żywieniowej a wybrane aspekty sposobu żywienia kobiet w okresie ciąży [Nutritional knowledge and selected aspects of the diet of pregnant women]. *Probl Hig Epidemiol* 2013;94(3):600-604.
 24. *Pasternak Y., Weintraub A.Y., Shoham-Vardi I., Sergienko R., Guez J., Wiznitzer A., Shalev H., Sheiner E.*: Obstetric and perinatal outcomes in women with eating disorders. *J Womens Health (Larchmt)* 2012;21(1):61-65 doi:10.1089/jwh.2011.2907.
 25. *Połocka-Molińska P., Plagens-Rotman K., Pawlak M.*: Wpływ masy ciała matki na przebieg ciąży, porodu oraz stan noworodka [The influence of mother body weight on the pregnancy, childbirth and the condition of a new-born child]: *Pol Prz Nauk Zdr* 2017;4(53):452-463 doi:10.20883/ppnoz.2017.63 (in Polish).
 26. *Rzońca E., Bień A., Iwanowicz-Palus G.*: Zaburzenia odżywiania – problem wciąż aktualny [Eating disorders—an ongoing problem]. *J Educ Health Sport* 2016;6(12):267-273 doi:10.5281/zenodo.198734.
 27. *Solmi F., Sallis H., Stahl D., Treasure J., Micali N.*: Low birth weight in the offspring of women with anorexia nervosa. *Epidemiol Rev* 2014;36(1):49-56 doi:10.1093/epirev/mxt004.
 28. *Tymczyzna B., Sarna-Boś K., Krochmalska E., Skorupska-Okon A., Ciukiewicz A.*: Ocena wiedzy ciężarnych na temat wpływu odżywiania na uzębienie dziecka [Assessment of the knowledge of pregnant women about the influence of nutrition on the teeth of a child]. *Zdr Publ* 2004;114(4):541-544 (in Polish).

29. *Wassef A., Nguyen Q.D., St-André M.*: Anaemia and depletion of iron stores as risk factors for postpartum depression: a literature review. *J Psychosom Obstet Gynaecol* 2019;40(1):19-28 doi:10.1080/0167482X.2018.1427725.
30. *Wender-Ozegowska E., Bomba-Opoń D., Brazert J., Celewicz Z., Czajkowski K., Karowicz-Bilińska A., Malinowska-Polubiec A., Meczekalski B., Zawiejska A.*: Polish Gynecological Society. Standardy Polskiego Towarzystwa Ginekologicznego “Opieka położnicza nad ciężarną otyłą” [Recommendations of Polish Gynecological Society concerning perinatal care in obese pregnant women]. *Ginekol Pol.* 2012;83(10):795-9. (in Polish)
31. *Wójcik R., Mojs E., Michalska M.M., Samulak D.*: Podejmowanie odchudzania w okresie ciąży a poporodowe surowicze stężenia żelaza u kobiet – badanie wstępne [Attempts to lose weight during pregnancy and the postpartum serum iron concentration in women – a preliminary test]. *Probl Hig Emidemiol* 2013;94(4):893-896.
32. <https://1000dni.pl/sites/default/files/guides/poradnik-zywienie-kobiet-w-okresie-ciazy-teoria-i-praktyka.pdf> (available: 12.04.2022)

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