

Received: 25.10.2018

Accepted: 12.03.2019

Published: 31.07.2019

Agnieszka Momora, Jan Krupa

Dietary habits of pregnant women in rural areas

Zwyczaje żywieniowe kobiet ciężarnych zamieszkałych na obszarach wiejskich

University of Information Technology and Management in Rzeszów, Rzeszów, Poland

Correspondence: Agnieszka Momora, University of Information Technology and Management in Rzeszów, Sucharskiego 2, 35-225 Rzeszów, Poland, e-mail: amomora@wsiz.rzeszow.pl

Abstract

Introduction: Pregnant women should take special care to maintain proper nutrition. During pregnancy, there is an increased need for energy and various nutrients. Diet exerts a fundamental influence on foetal development and the child's extrauterine health. Research shows that women's knowledge about nutrition during pregnancy is still unsatisfactory. This phenomenon is particularly pronounced among women living in rural areas. **Aims:** The study aimed to specify the dietary habits of pregnant women living in rural areas as well as to analyse the respondents' most frequent nutritional mistakes. The study assessed respondents' knowledge and awareness of nutrition during pregnancy. **Material and methods:** The study was conducted from 1 February to 1 May 2018 and used authors' own questionnaire. It included 57 pregnant women from rural areas. More than half of the study participants (57%) were not in gainful employment and did not continue their education. **Results:** Although most of respondents believed that they had proper dietary habits, the study found that their knowledge and awareness of diet during pregnancy were at a low level. Most women (54%) paid no attention to the nutritional information on food labels. During pregnancy, the respondents chose products posing a potential threat to the developing foetus. **Conclusions:** Due to the unsatisfactory results, it was concluded that there is a need to disseminate knowledge on nutrition. A method that would provide long-term effects is needed to increase its efficiency. Telemedicine could be a solution.

Keywords: dietary habits, pregnant women, rural areas, questionnaire survey

Streszczenie

Wstęp: Kobiety ciężarne powinny szczególnie dbać o właściwy sposób odżywiania. W okresie ciąży wzrasta zapotrzebowanie na energię i poszczególne składniki odżywcze. Dieta ma fundamentalny wpływ na rozwój płodu i stan zdrowia dziecka w okresie pozajonowym. Według badań wiedza kobiet na temat odżywiania się w ciąży znajduje się nadal na niezadowolającym poziomie. Zjawisko to zauważalne jest szczególnie wśród kobiet zamieszkałych na obszarach wiejskich. **Cele pracy:** Badanie miało na celu określenie zwyczajów żywieniowych kobiet ciężarnych z terenów wiejskich oraz przeanalizowanie najczęściej popełnianych przez respondentki błędów w tym zakresie. Ocenie zostały poddane wiedza i świadomość respondentek na temat odżywiania się podczas ciąży. **Materiał i metody:** Badanie objęło 57 kobiet ciężarnych, zamieszkujących obszary wiejskie. Przeprowadzono je na podstawie autorskiego kwestionariusza ankiet w okresie od 1 lutego do 1 maja 2018 roku. Ponad połowa uczestniczek badania (57%) pozostawała nieaktywna zawodowo i nie kontynuowała dalszej edukacji. **Wyniki:** Pomimo że większość respondentek uważała, iż odżywia się właściwie, w badaniu wykazano, że stan wiedzy oraz świadomość z zakresu diety w ciąży były na niskim poziomie. Większość kobiet (54%) nie zwracała uwagi na skład etykiet produktów spożywczych. Respondentki sięgały po produkty stanowiące potencjalne zagrożenie dla rozwijającego się płodu. **Wnioski:** Ze względu na niezadowolające wyniki istnieje potrzeba szerzenia edukacji żywieniowej. W celu zwiększenia jej efektywności należałoby wybrać taką metodę, która będzie przynosić długoterminowy skutek. Jednym z rozwiązań może być zastosowanie technik telemedycyny.

Słowa kluczowe: zwyczaje żywieniowe, kobiety ciężarne, obszary wiejskie, badania ankietowe

INTRODUCTION

Pregnant women should take special care to maintain proper nutrition. During pregnancy, there is an increased need for energy and various nutrients. Diet exerts a fundamental influence on the foetal development and the child's extrauterine health⁽¹⁾. Pregnant women whose dietary intake is improper are at risk of giving birth to a child with excessively low or high birth weight⁽²⁾. Improper diet increases the risk of pre-eclampsia and nutrient deficiency, including iron deficiency induced anaemia. In addition, it may contribute to abnormal foetal development, congenital defects and a wide range of health problems which may become apparent in the extrauterine period of life.

The research showed that women's knowledge and awareness of nutrition during pregnancy is unsatisfactory. The phenomenon is observable particularly among women living in rural areas. Nutritional recommendations should be individually adjusted to the stage of pregnancy, maternal health condition and dietary preferences. The woman's lifestyle and financial circumstances should also be taken into account.

The article aims to specify dietary habits of pregnant women from rural areas and to analyse respondents' most frequent dietary mistakes. We also attempted to analyse the level of respondents' knowledge and awareness of nutrition during pregnancy.

MATERIAL AND METHODS

A total of 57 pregnant women participated in the survey. The study area encompassed rural areas of Rzeszów powiat in Podkarpackie voivodeship. The study was conducted from 1 February to 1 May 2018 using an authors' survey questionnaire, consisting of 24 questions and demographic and social data. The questionnaire included a set of questions about pregnant women's dietary habits and preferences. In this part, the respondents were asked, inter alia, about the regularity and number of consumed meals, type and quality of consumed food, frequency of consumption of selected food products, amount and type of consumed beverages, preferred type of technological food processing, etc. Furthermore, the survey aimed to test the respondents' knowledge and awareness in the scope of diet and supplementation during pregnancy. The demographic and social section inquired about age, height, pregestational body weight, professional activity and financial circumstances.

Body mass index (BMI) was measured based on the pregestational anthropometric parameters of women. Most respondents (46 women) had a normal weight/height ratio before pregnancy. The BMI was very low in 2, and very high in 9 respondents. The participants were aged from 19 to 42 years. The majority of women were in their thirties.

Primigravidas accounted for the highest number of respondents (44%). The percentage of secundigravidas was also high (30%). A total of 12% of respondents were in their third pregnancy, whereas multigravidas (fourth pregnancy) accounted for 11% of the study group. Only 4% of women were in their fifth pregnancy. Considering the stage of pregnancy, over half of respondents (57%) were in the second trimester of pregnancy. Other women (23%) were 11–13 weeks pregnant. Women in the third trimester constituted the lowest percentage of the study group (20%). In terms of professional activity, 26% of respondents had an employment contract and the same percentage of women neither worked nor was busy with household, whereas 31% of study participants took care of the household. Three women (6%) were students, whereas 6 women (11%) both worked and studied. Six respondents (11%) estimated that their financial circumstances were difficult, and 26 (47%) thought that they were neither difficult nor easy. Another group of women (38%) believed that their financial circumstances were good, and only 4% of them thought that they were very good.

RESULTS

The respondents were asked to evaluate their nutritional regimen during pregnancy. Almost half of the respondents (49%) were unable to specify if they followed proper diet, i.e. diet compliant with the recommendations of the Institute of Mother and Child. More than 1/3 of women (39%) declared that their nutrition was proper, whereas 12% of respondents considered it to be improper.

The time of the first meal of the day is very important for pregnant women. Almost half of respondents (49%) had their breakfast within 1 hour after waking up, whereas 34% of women had breakfast within 2 hours. A smaller number of respondents (16%) paid no attention to the time of their first meal, consuming it within 3 hours after waking up. Almost 4% of respondents did not eat breakfast at all, consuming their first meal at least 3 hours after waking up.

The study also assessed the frequency of meals, i.e. planned dishes in the daily menu. Over half of respondents (53%) had 3–4 meals a day. Women who consumed 5 or more meals daily accounted for a slightly lower percentage (47%). Each of the survey participants consumed at least 3 meals a day. Another important dietary question referred to the regularity of meals. Most women (55%) made an effort to maintain fixed time intervals between meals (3–4 hours). Other respondents (45%) consumed meals at 2–3 hour intervals. No other responses about regularity of meals were provided. The respondents were also asked whether they had any snacks between meals. Only 14% of future mothers did not consume any snacks or refreshments. A preferred type of snack is also worth mentioning. Fruits were most common (38%). Sweets were consumed by 29% of respondents. Other products

included fruit yoghurts (12%), rice waffles (10%) and fast food (7%). The lowest number of women (4%) consumed raw vegetables. The percentage distribution for the most common snacks is presented in Fig. 1.

The following variants could be chosen in the question about the frequency of consumption of selected food products: “a few times daily,” “once daily,” “twice to four times a week,” “once a week,” “once a month,” or “never.” Almost half of respondents gave up daily intake of highly processed products such as fast food, instant products or salty snacks. These were consumed not more than once a month. Crisps and salty snacks were chosen with a varying frequency. They were consumed 2–4 times a week by 25%, once a week by 21%, and once a month by 26% of respondents. Over 1/5 of the surveyed women did not consume such products at all.

The authors' questionnaire showed that bottled water was the most common beverage among respondents. It was consumed several times a day by more than 3/4 of women. Other respondents (23%) drank bottled water only once a day. A high percentage of respondents (41%) had strong coffee or tea once a month. The study found that 13% of respondents consumed these beverages 2–4 times weekly, 7% – once a week and 4% – once a day. About 35% of respondents discontinued coffee and tea. Sugary carbonated drinks were chosen with varying frequency: they were consumed once a month by 25%, 2–4 times a week by 22%, once a week by 15%, and once a day by 6% of respondents. Other respondents (22%) did not drink them at all. Alcoholic beverages, strictly forbidden during pregnancy, were consumed once a month by 10% of women. Other respondents were in abstinence.

The surveyed women were also asked about their daily intake of water (litres). Women who consumed 1–2 litres of

water made up the highest percentage (68%). Less than a litre of water was drunk by 18%, whereas more than 2 litres were drunk by 14% of respondents.

One of the questions verified eating out, e.g. in bars or restaurants. Over half of respondents (57%) seldom went to bars or restaurants. The study showed that 1/4 of respondents (25%) declared frequent consumption of ready-made products prepared in gastronomic venues. The remaining women (18%) never ate out.

The study found that most women paid no attention to nutritional information on food labels (54%). They were persuaded by the packaging, price or producer's brand when shopping for food. The study showed that 39% of women analysed food labels, whereas the lowest percentage of respondents (7%) claimed that they always read about the ingredients before purchase. It was also revealed that the same number of participants (7%) purchased only organic food or food from the so-called health food stores. The largest group (72%) chose nearby stores and supermarkets for shopping. It was also reported by some participants (21%) that they occasionally purchased local organic food or visited health food stores.

As for regular physical activity during pregnancy, it was declared by half of respondents. The other half resigned from physical exercise. Walking was the most common physical activity (35%). Women who attended swimming pools or fitness centres accounted for 7% and 8%, respectively.

The surveyed women were also asked about their sources of information about the principles of healthy eating during pregnancy. The data shows that the highest number of pregnant women (36%) relied on the Internet. A similar number of respondents (35%) relied on family members. The lowest percentage of respondents

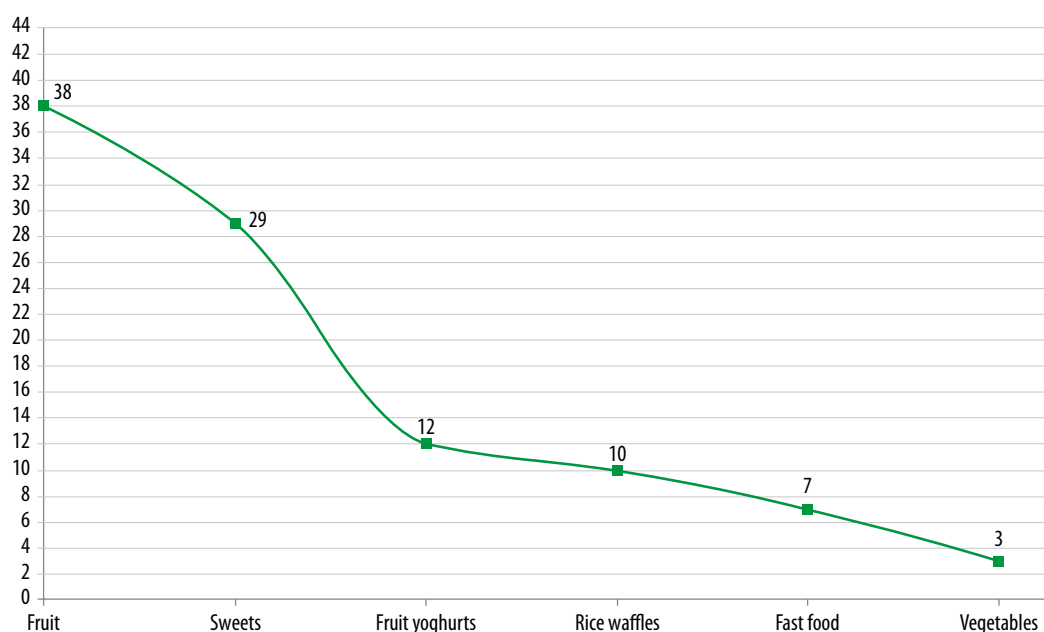


Fig. 1. Percentage distribution of snacks most frequently consumed by pregnant women

(20%) declared that books and magazines for women were their main source of information. Only few respondents (5%) relied on the information from acquaintances and friends. The lowest percentage (4%) sought doctor's guidance. None of the respondents used professional dietary counselling provided by a competent person. The percentage distribution of responses in this respect is presented in Fig. 2.

It was also verified whether the respondents had knowledge on the food products contraindicated in the diet of a pregnant woman. Almost $\frac{1}{3}$ of participants (30%) responded that it was raw meat, whereas 18% of women declared that it were unpasteurised dairy products. According to 16% of respondents, fish and seafood were contraindicated, whereas 10% of women indicated alcohol as a contraindicated product. Only 10% of respondents believed that consumption of liver was contraindicated. One of the surveyed women thought that red pepper should be avoided. No other responses were provided.

Consumption of a larger quantity of more caloric food than recommended is a common dietary habit among pregnant women. It is recommended that a pregnant woman should not eat two meals for two people but one meal for two people. It means that meals should be composed in such a way that their nutritional value is higher than their calorific value. Over half of respondents (56%) agreed with the statement above. Women who believed that eating two meals for two people was more appropriate accounted for 46% of the study group. Almost half of the pregnant women (49%) maintained that overweight and obesity may have a negative impact on the health of the future mother and her child, whereas $\frac{1}{3}$ of respondents were not able to provide an answer to the above question. Other respondents (16%) claimed that

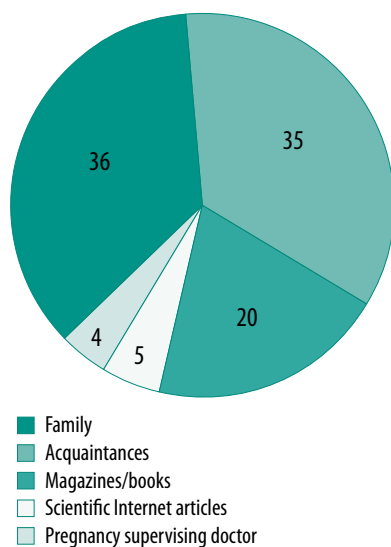


Fig. 2. Percentage distribution of the responses on sources of information on reasonable nutrition during pregnancy

there was no correlation between excessive maternal body weight and the course of pregnancy or the child's health after birth. Responses to the above question are presented in Fig. 3.

The authors' survey showed that the majority of women (89%) used supplementation recommended by their supervising doctor, whereas 11% of respondents did not consume any dietary supplements contrary to the doctor's recommendations.

DISCUSSION

The correlation between the quality of pregnant women's diet and the level of their education and financial circumstances has been confirmed in numerous studies conducted in Poland and across Europe⁽³⁻⁵⁾. Lee et al. found a statistically significant correlation between pregnant women's nutritional knowledge and their education and income ($p < 0.05$)⁽⁶⁾.

Obese women are at increased risk of gestational complications and giving birth to a child with excessive body weight⁽⁷⁾. On the other hand, women with very low adipose tissue content are at increased risk of pre-eclampsia and iron deficiency induced anaemia. A 2009–2018 meta-analysis among pregnant obese women showed that a multi-layered approach incorporating a balanced diet and physical exercise of mild to moderate intensity should be recommended for these patients (30–60 minutes a day for 3–5 days a week). This recommendation should be implemented already in the first trimester of pregnancy and continued in the postnatal period⁽⁸⁾.

During pregnancy, the respondents chose products that posed a risk to the developing foetus. According to Lewańska et al.⁽⁹⁾, infectious disease caused by *Listeria monocytogenes* still constitutes a crucial epidemiological

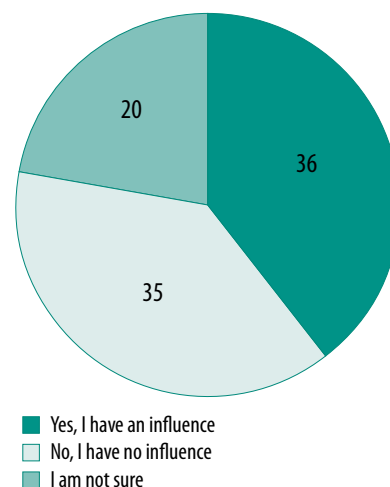


Fig. 3. Percentage distribution of responses on the impact of maternal overweight and obesity before and during pregnancy on the child's health condition

problem. A systematic study review published in 2018 evaluated correlations between listeriosis morbidity and pregnant women's diet⁽¹⁰⁾. The problem was mainly due to consumption of unpasteurised milk products such as raw milk or cheese. Listeriosis is associated with serious complications for the mother, the foetus and the neonate⁽⁹⁾. The authors stressed that a sparsely populated place of residence and low level of education were determinants of higher dietary content of the above mentioned products.

Liver is also one of the products forbidden in the diet of pregnant women. The absolute contraindication to its consumption results from high retinol concentration in a single portion: 100 g of pork liver contains a dose ($\mu\text{g}/100\text{ g}$) exceeding recommended daily human consumption by several dozen times. High intake of vitamin A has teratogenic and embryotoxic properties. The most important structures affected by teratogenesis due to improper retinoid levels in the developing foetus include the central nervous system, the respiratory system, thymus, heart, diaphragm, the genitourinary system, gonads and kidneys⁽¹¹⁾.

Based on the national data, it can be concluded that alcohol consumption by pregnant women is still an essential problem^(12,13). The degree of its impact on foetal development remains controversial. It is difficult to estimate potentially toxic and potentially safe doses for the foetus⁽¹⁴⁾. There are considerable individual differences in alcohol absorption in the digestive system and the speed of its metabolism. Therefore, the same doses of alcohol may have diverse effects on foetuses. Animal studies showed that foetal susceptibility to the teratogenic effects of alcohol may be determined genetically⁽¹⁵⁾.

Sugary carbonated drinks are also contraindicated during pregnancy. This recommendation results from excessive sugar content. Furthermore, such beverages contain sweetening substances, which may pose a threat to the developing foetus. According to the Polish Association for the Study on Obesity and the Polish Diabetes Association, saccharin is the most dangerous sugary substance due to its ability to permeate foetal membranes and its unclear influence on the foetus⁽¹⁶⁾.

It can be concluded from the 2017 review studies that there is a strong correlation between the intake of highly processed food and anthropometry of newborns, namely the thickness of subcutaneous and femoral folds and the percentage of adipose tissue. Highly processed food products include mainly salty snacks, fast food and instant products as well as extra sweetened beverages. The research showed that on average $13.2\% \pm 54.4\%$ of energy intake in the diet of participants came from highly processed products. A 1% increase in energy from this type of food was linked to an increase in the newborns' body weight by 1.33 kg. The study showed that many pregnant women obtained most energy, sucrose, fat or sodium from highly processed food, which adversely

impacted their child's health. This correlation was found both in slim and obese mothers. The authors stressed that health education of pregnant women about the principles of healthy eating should underlie the need to maintain moderation when consuming salt, sugar and fat additives, also when preparing home meals⁽¹⁷⁾.

Pregnant women should consume proper quantity of milk and dairy. The authors' survey showed that pregnant women consumed the recommended amount of milk and fermented milk products. This was also confirmed by Godala et al. and Kobiółka et al.^(5,18).

Literature data indicates that women begin to pay more attention to their eating habits after they become pregnant. Wishing to improve their menu both in terms of quality and quantity, they introduce certain dietary modifications. Lee et al. demonstrated that women at the beginning of their pregnancy considerably increased the consumption of milk and its products as well as fruit, vegetables and other products with high fibre content⁽⁶⁾. This correlation was confirmed in a longitudinal study by Skredend et al., which included women ($N = 575$) who were patients of prenatal clinics in southern Norway⁽¹⁹⁾. After becoming pregnant, most of them reduced the intake of coffee and artificially sweetened beverages in favour of low sugar fruit juices and milk. Unfortunately, other clinical studies indicate that pregnant women have a tendency to exclude fish from the diet^(20,21). The authors suggest that such a phenomenon may be caused by the fear of delivering too much xenobiotics, mainly mercury and heavy metals, into the body. They are eliminated from the diet most often due to the lack of knowledge about species and portions of fish which are recommended and do not pose any risk to the mother or the foetus. Introduction of dietary modifications without proper knowledge involves the risk of deficiencies, which may adversely affect maternal and foetal health.

There are very few papers in Polish literature about physical activity in pregnant women⁽²²⁾. A meta-analysis of 8 cohort studies ($N = 72,694$) confirmed that proper physical activity reduces the risk of macrosomia and large for gestational age (LGA), i.e. greater than the 90th percentile for age⁽²³⁾. Positive results in this field were obtained for pregnancy >30 weeks. Wojtyła et al. showed in their study in a group of 2,852 women that pregnancy supervising doctors did not talk about physical activity with over half of the study participants (55.8%)⁽²⁴⁾. Many authors stress the correlation between education of pregnant women on proper physical activity and uneventful pregnancy^(25–27). It is recommended that a pregnant woman should exercise at least 3 times a week⁽²⁸⁾.

A large body of relevant data indicate that nutritional counselling is rare both in medical and obstetrical care⁽²⁹⁾. Lack of this type of education in the procreational and gestational period is a widespread problem. The research confirmed that information on recommended diet during pregnancy is mostly obtained from friends or close relatives.

Popular science articles available on the Internet are yet another essential source of information⁽³⁰⁾.

One of the ways to optimise mother's diet is to provide education by nutritional counselling. A retrospective study was conducted in obese pregnant women to assess the effectiveness of this type of education. The results of participants attending one 90-minute group session were compared with the results of women who received standard care. A significant reduction in body weight gain was observed in the first group ($p = 0.010$). In the author's view, this type of interdisciplinary intervention brings better results compared to standard health care. However, further studies to specify and adopt the most optimal methods of education are needed⁽³¹⁾.

A randomised clinical trial in pregnant Chicago women demonstrated beneficial effects of dietary intervention with the use of telemedicine (TM) methods. Female participants were randomised at 16 weeks of pregnancy⁽³²⁾. They were encouraged to follow a dietary regimen by phone calls, text messages, suggested websites and e-mail alerts. Consequently, more children with proper birth weight were born in the intervention group⁽³³⁾.

SUMMARY

Diet has a significant influence on foetal development as well as mother and child's health. The research showed that the level of women's knowledge and awareness about proper nutrition is low. This phenomenon is particularly pronounced among women living in rural areas. The unsatisfactory results point to the need to disseminate nutritional knowledge. A single dietary consultation usually fails to produce long-term effects. When planning health education, limiting factors need to be taken into consideration, such as impeded access to health care or inability to search for information supported by evidence-based medicine (EBM). In order to increase the effectiveness of nutritional education, a method that would produce long-term effects needs to be developed. TM-based consultations may be one of such solutions. There is a growing number of publications which confirm the beneficial effects of such a form of health education^(34,35). TM methods and cooperation with a qualified dietician might increase female awareness in the field of nutrition. It should be emphasised that TM effectiveness depends on the level of engagement of a health care providing entity.

Conflict of interest

Authors do not report any financial or personal affiliations with other people or organisations which might adversely influence the content of the publications or claim a right to this publication.

References

- Świątkowska D: Poradnik żywienia kobiet w ciąży. Instytut Matki i Dziecka. Available from: <http://www.imid.med.pl/images/poradnik-zywienia-dla-kobiet-w-ciazy.pdf> [cited: 2 July 2019]; 1–122.
- Laraia A, Siega-Riz A, Kaufman JS et al.: Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Prev Med* 2004; 39: 869–875.
- Bojar I, Humeniuk E, Wdowiak I et al.: Zachowania żywieniowe kobiet ciężarnych. *Probl Hig Epidemiol* 2007; 88: 74–77.
- Suliga E: Zachowania żywieniowe kobiet w ciąży. *Pediatr Endocrinol* 2011; 17: 76–81.
- Godala M, Pietrzak K, Laszek M et al.: Zachowania zdrowotne łódzkich kobiet w ciąży. Cz. I. Sposób żywienia i suplementacja witaminowo-mineralna. *Probl Hig Epidemiol* 2012; 93: 38–42.
- Lee A, Belski R, Radcliffe J et al.: What do pregnant women know about the healthy eating guidelines for pregnancy? A web-based questionnaire. *Matern Child Health J* 2016; 20: 2179–2188.
- Laraia BA, Bodnar LM, Siega-Riz AM: Pregravid body mass index is negatively associated with diet quality during pregnancy. *Public Health Nutr* 2007; 10: 920–926.
- Farpour-Lambert NJ, Ells LJ, Martinez de Tejada B et al.: Obesity and weight gain in pregnancy and postpartum: an evidence review of lifestyle interventions to inform maternal and child health policies. *Front Endocrinol (Lausanne)* 2018; 9: 546.
- Lewańska M, Godala A, Myga-Nowak M: Listerioza. Współczesne postrzeganie zagrożenia epidemiologicznego. *Post Mikrobiol* 2018; 57: 106–116.
- Moran LJ, Verwił Y, Bahri Khomami M et al.: Nutrition and listeriosis during pregnancy: a systematic review. *J Nutr Sci* 2018; 24: 1–9.
- Boryczka M, Pasker B, Sosada M: Retinoidy jako substancje czynne produktów leczniczych, kosmetyków i suplementów diety. *Farm Przegl Nauk* 2010; 8: 8–16.
- Wierzejska R, Jarosz M, Sawicki W et al.: Antyzdrowotne zachowania kobiet ciężarnych. Tytoń, alkohol, kofeina. *Żyw Człow* 2011; 38: 84–98.
- Szycha W, Skoczylas M, Laudański T: Spożywanie alkoholu i palenie tytoniu przez kobiety w ciąży – przegląd badań. *Perinatol Neonatol Ginekol* 2008; 1: 309–313.
- American Academy of Pediatrics Committee on Substance Abuse and Committee on Children with Disabilities: Fetal alcohol syndrome and fetal alcohol effects. *Pediatrics* 1993; 91: 1004–1006.
- Clarren KS, Bowden MD, Astley S: The brain in the fetal alcohol syndrome. Observations in the human and nonhuman primates. *Alcohol Health Res World* 1985; 10: 20–23.
- Aneks 5: Stanowisko Polskiego Towarzystwa Badań nad Otyłością i Polskiego Towarzystwa Diabetologicznego w sprawie stosowania niskokalorycznych substancji słodzących. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę. *Diabetologia Kliniczna* 2013; 2: 63–64.
- Rohatgi KW, Tinus RA, Cade WT et al.: Relationships between consumption of ultra-processed foods, gestational weight gain and neonatal outcomes in a sample of US pregnant women. *Peer J* 2017; 7: e4091.
- Kobiółka A, Goraus M, Mężyk I et al.: Wpływ ciąży na zmianę nawyków żywieniowych kobiet w wieku rozrodczym. *Zdrowie i Dobrostan* 2015; 2: 187–205.
- Skreden M, Bere E, Sagedal LR et al.: Changes in beverage consumption from pre-pregnancy to early pregnancy in the Norwegian Fit for Delivery study. *Public Health Nutr* 2015; 18: 1187–1196.
- Shimshack JP, Ward MB, Beatty TKM: Mercury advisories: information, education, and fish consumption. *J Environ Econ Manage* 2007; 53: 158–179.
- Frithsen I: Awareness and implications of fish consumption advisories in a women's health setting. *J Reprod Med* 2009; 54: 267–272.
- Torbé D, Torbé A, Kregiel K et al.: Ocena wiedzy kobiet ciężarnych na temat aktywności fizycznej w ciąży. *Nowa Med* 2014; 21: 149–155.
- Pastorino S, Bishop T, Crozier SR et al.: Associations between maternal physical activity in early and late pregnancy and offspring birth size: remote federated individual level meta-analysis from eight cohort studies. *BJOG* 2019; 126: 459–470.

24. Wojtyła A, Kapka-Skrzypczak L, Paprzycki P et al.: Epidemiological studies in Poland on effect of physical activity of pregnant women on the health of offspring and future generations – adaptation of the hypothesis development origin of health and diseases. *Ann Agric Environ Med* 2012; 19: 315–326.
25. Fraś M, Gniadek A, Poznańska-Skrzypiec J et al.: Styl życia kobiet w ciąży. *Hygeia Public Health* 2012; 47: 412–417.
26. Wałęskiewicz K, Kolesińska-Janowczyk N, Rajewski P et al.: Aktywność fizyczna kobiet w ciąży. In: Muszkieta R, Żukow W, Napierała M et al. (eds.): Stan i rozwój regionalnego sportu i rekreacji. Ośrodek Rekreacji, Sportu i Edukacji w Poznaniu, Bydgoszcz 2010: 192–197.
27. Kozłowska J: Ćwiczenia fizyczne kobiet w ciąży. Aktualne (2006 r.) stanowisko Royal College of Obstetricians and Gynaecologists. *Med Prakt Gin Pol* 2007; 5: 13–18.
28. Artal R, O'Toole M: Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. *BR J Sports Med* 2003; 37: 6–12.
29. Myszkowska-Rygiak J, Gurtatowska A, Harton A et al.: Poziom wiedzy żywieniowej a wybrane aspekty sposobu żywienia kobiet w okresie ciąży. *Probl Hig Epidemiol* 2013; 94: 600–604.
30. Szymandera-Buszka K, Jędrusek-Golińska A, Waszkowiak K: Analiza postrzegania żywności bioaktywnej wśród kobiet w ciąży z miasta Poznań. *Handel Wewnętrzny* 2018; 3: 371–379.
31. Dorise B, Byth K, McGee T et al.: A low intensity dietary intervention for reducing excessive gestational weight gain in an overweight and obese pregnant cohort. *Eat Weight Disord* 2018; 1–7.
32. Peaceman AM, Clifton RG, Phelan S et al.: Lifestyle interventions limit gestational weight gain in women with overweight or obesity: LIFE-Moms prospective meta-analysis. *Obesity (Silver Spring)* 2018; 26: 1396–1404.
33. Komunikat Komisji do Parlamentu Europejskiego, Rady, Europejskiego komitetu ekonomiczno-społecznego oraz Komitetu regionów w sprawie korzyści telemedycyny dla pacjentów, systemów opieki zdrowotnej i społeczeństwa. 2009. Available from: <https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:52008DC0689&from=PL> [cited: 4 July 2019]: 1–15.
34. Zdrojewicz Z, Głód J, Dołowiec A: Telemedycyna – przyszłość lekarza rodzinnego. *Fam Med Primary Care Rev* 2014; 16: 382–386.
35. Flodgren G, Rachas A, Farmer AJ et al.: Interactive telemedicine: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2015; 9: 1396–1404.