

## Health behaviours of pregnant women and gestational weight gains – a pilot study

### Zachowania zdrowotne kobiet w ciąży a wielkość ciążowych przyrostów masy ciała – wstępne wyniki

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**Key words:** body mass index, gestational weight gain, eating habits.

**Słowa kluczowe:** wskaźnik masy ciała, ciążowe przyrosty masy, żywienie.

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#### Abstract

**Introduction:** Abnormal weight gain during pregnancy may exert a negative effect on the development of the foetus, the course of pregnancy, and later the state of health of the mother and her baby. Due to the unfavourable health consequences of abnormal body weight gains in expectant mothers studies of the factors that determine the amount of these gains are important.

**Aim of the research:** Evaluation of the relationship between health behaviours in pregnancy, nutritional status before pregnancy, selected socio-demographic factors, and gestational weight gain.

**Material and methods:** The investigation included 274 women. Using a questionnaire, information was collected pertaining to the place of residence, age, body height and weight, cigarette smoking, and eating habits during pregnancy. The total weight gain during pregnancy was calculated as the difference between perinatal weight and pre-pregnancy body weight. Gestational weight gains were classified as low, recommended, or high.

**Results:** Increased risk of high weight gain was associated with the consumption of alcoholic beverages (odds ratio (OR) = 2.82), especially beer (OR = 2.72), high consumption of products supplying proteins of animal origin (OR = 2.87), and overweight before pregnancy (OR = 3.37), as well as the delivery being the mother's first, compared to the third and subsequent childbirth (OR = 4.17).

**Conclusions:** This study indicates that there is a need for health education among females at reproductive age in order to reduce excess weight before conception, and promotion of adequate health behaviours in pregnancy, which would allow the maintenance of normal weight gain during this period.

#### Streszczenie

**Wprowadzenie:** Nieprawidłowe przyrosty masy ciała kobiet w ciąży mogą negatywnie wpływać na rozwój płodu, przebieg porodu oraz późniejszy stan zdrowia matki i dziecka. Niekorzystne konsekwencje zdrowotne nieprawidłowych przyrostów masy ciała przyszłych matek sprawiają, że istotne są badania czynników determinujących ich wielkość.

**Cel pracy:** Ocena zależności pomiędzy zachowaniami zdrowotnymi w czasie ciąży, stanem odżywienia przed ciążą oraz niektórymi czynnikami socjodemograficznymi a wielkością przyrostów masy ciała w ciąży.

**Materiał i metody:** Badaniem objęto 274 kobiety. Za pomocą ankiety zebrano informacje na temat miejsca zamieszkania, wieku, wysokości i masy ciała, palenia papierosów oraz sposobu żywienia w czasie ciąży. Całkowity przyrost masy ciała w czasie ciąży obliczono jako różnicę między okołoporodową a przedciążową masą ciała. Przyrosty masy ciała w ciąży sklasyfikowano jako niskie, zalecane lub wysokie.

**Wyniki:** Przyrost masy w ciąży sklasyfikowany jako zalecany w odniesieniu do wskaźnika masy ciała przed ciążą odnotowano jedynie u 37% pacjentek, a u niemal 40% stwierdzono wysokie przyrosty. Konsumpcja w czasie ciąży napojów alkoholowych (OR = 2,82), zwłaszcza piwa (OR = 2,72), wysokie spożycie produktów dostarczających białka zwierzęcego, tj. 3 lub więcej porcji w ciągu dnia (OR = 2,86), a także nadwaga przed ciążą (OR = 3,37) oraz pierwszy poród w porównaniu z trzecim lub kolejnym (OR = 4,17) wiązały się ze zwiększonym ryzykiem wystąpienia wysokich przyrostów masy ciała.

**Wnioski:** Przeprowadzone badania wskazują na potrzebę edukacji zdrowotnej kobiet w wieku rozrodczym w celu zmniejszenia nadmiarów masy ciała przed zajściem w ciążę oraz promowania właściwych zachowań zdrowotnych w czasie ciąży, które pozwolą na utrzymanie prawidłowych przyrostów masy w tym okresie.

## Introduction

Abnormal weight gain during pregnancy may exert a negative effect on the development of the foetus, the course of pregnancy, and the later state of health of the mother and her baby. In recent years, an alarming phenomenon has been observed: the increasingly frequent occurrence of excessive body weight gain during pregnancy [1, 2]. This is associated with the risk of giving birth to a large-for-gestational-age baby, macrosomia, shoulder dystocia, pregnancy-induced hypertension, gestational diabetes, caesarean section, longer period of hospitalisation, and the mother maintaining an increased postpartum body weight, which predisposed to later obesity [3–6]. Due to the unfavourable health consequences of abnormal body weight gains in expectant mothers studies of the factors that determine the amount of these gains are important.

## Aim of the research

The objective of the study was an evaluation of the relationship between health behaviours in pregnancy, nutritional status before pregnancy, selected socio-demographic factors, and gestational weight gain.

## Material and methods

The research material was data concerning 274 women who during delivery were hospitalised in the Clinic of Obstetrics and Gynaecology at the Regional Polyclinic Hospital in Kielce. In the study were women enrolled who delivered a healthy baby (without congenital defects). Two patients with twin pregnancy, 43 patients who gave birth before 38 weeks of gestation, and 4 patients with gestational diabetes were excluded from further analysis. Data concerning birth order, and the course and duration of pregnancy was obtained based on the analysis of medical records. Using a questionnaire, information was collected pertaining to the place of residence, age, body height and weight, cigarette smoking, and eating habits during pregnancy. The questions in the survey related to the number of portions of individual groups of food products consumed. The size of food portions was determined in accordance with the principles presented in the relevant literature [7]. The nutritional status prior to pregnancy was assessed based on the declared data concerning body height and weight, which served to calculate the body mass index (BMI), and groups of patients distinguished with: underweight (BMI < 18.5 kg/m<sup>2</sup>), normal body weight (18.5–24.9 kg/m<sup>2</sup>), and overweight or obesity (BMI ≥ 25 kg/m<sup>2</sup>). The total weight gain during pregnancy was calculated as the difference between perinatal weight and pre-pregnancy body weight. Gestational weight gains were classified as low, recommended, or high, according to the guidelines of the Institute of Medicine (IOM) and National Academy of Sciences (NAS) in the USA [1]. The recommended weight gain for women who were underweight before pregnancy is 12.5–18.0 kg, with a normal body weight 11.5–16.0 kg, while for overweight and obese women it is 7–11.5 kg and 5–9 kg, respectively. The study was approved by the Committee on Bioethics at the Faculty of Health Sciences.

### Statistical analysis

Statistical analysis was performed using software Statistica 6.0 (StatSoft). For assessment of the differences between health behaviours, state of nutrition before pregnancy, socio-demographic factors, and the amount of gestational weight gains the  $\chi^2$  test for the highest reliability was applied (Tables 1–4). The risk of occurrence of high and low body weight gain in pregnancy was evaluated using logistic regression (Table 5). Values of  $p < 0.05$  were considered statistically significant.

## Results

The characteristics of the study participants are shown in Table 1. Overweight and obesity before pregnancy was observed in nearly 1/5 of respondents. Gestational weight gain, classified as recommended in

**Table 1.** General characteristics of the women examined

Factors		N	Percentage
Place of living	City	111	51.9
	Village	107	48.1
Age [years]	< 30	133	58.0
	≥ 30	85	42.0
Birth order	First	97	48.7
	Second	83	40.3
	Third or subsequent	17	11.0
Pre-pregnancy BMI [kg/m <sup>2</sup> ]	< 18.5	13	7.6
	18.5–24.9	162	72.9
	≥ 25.0	43	19.5
Gestational weight gain	Low	51	23.4
	Recommended	80	36.7
	High	87	39.9
Cigarette smoking during pregnancy	Non-smokers	151	70.4
	Exposed	42	19.5
	Smokers	22	10.1
Alcohol consumption during pregnancy	No	147	79.8
	Yes	44	20.2

**Table 2.** Percentage of women with low, recommended, and high gestational weight gain

Factors		Gestational weight gain		
		Low	Recommended	High
Pre-pregnancy BMI <i>p</i> = 0.0004	< 18.5	11.8	6.3	2.3
	18.5–24.9	80.4	81.3	64.4
	≥ 25.0	7.8	12.5	33.3
Birth order <i>p</i> = 0.0055	First	31.9	44.4	64.1
	Second	55.3	44.4	32.1
	Third or subsequent	12.8	11.1	3.9
Age <i>p</i> = 0.2430	< 30 years	51.0	65.0	63.2
	≥ 30 years	49.0	35.0	36.8
Place of residence <i>p</i> = 0.1300	City	54.9	55.0	44.8
	Village	45.1	45.0	55.2
Cigarette smoking during pregnancy <i>p</i> = 0.4131	Non-smokers	72.0	76.0	64.0
	Exposed	16.0	17.7	23.3
	Smokers	12.0	6.3	12.8

**Table 3.** Percentage of women with low, recommended, and high gestational weight gain according to frequency of consumption of selected products during pregnancy

Products and meals	Number of servings	Gestational weight gain		
		Low	Recommended	High
Fruit <i>p</i> = 0.1889	< 1 serving daily	9.8	8.8	9.2
	1–2 servings daily	52.9	67.5	50.6
	≥ 3 servings daily	37.3	23.8	40.2
Vegetables <i>p</i> = 0.5303	< 1 serving daily	23.5	18.7	17.3
	1–2 servings daily	43.2	57.5	51.7
	≥ 3 servings daily	33.3	23.8	31.0
Milk and dairy products in total <i>p</i> = 0.1889	< 1 serving daily	21.6	25.0	21.8
	1–2 servings daily	56.9	62.5	50.6
	≥ 3 servings daily	21.6	12.5	27.6
Animal protein (meat, fish, eggs) <i>p</i> = 0.0260	< 1 servings daily or never	25.5	16.3	25.3
	1–2 servings daily	60.8	68.7	46.0
	≥ 3 servings daily	13.7	15.0	28.7
Sea fish <i>p</i> = 0.3452	Never	15.7	11.2	17.3
	< 1 serving weekly	35.3	51.3	47.1
	≥ 1 serving weekly	49.0	37.5	35.6
Sweets, cakes <i>p</i> = 0.3692	≤ 3 servings weekly	51.0	53.7	39.1
	4–7 servings weekly	29.4	27.5	33.3
	> 1 serving daily	19.6	18.8	27.6
Number of meals daily <i>p</i> = 0.0521	≤ 3	21.6	5.0	14.9
	4	29.4	40.0	37.9
	≥ 5	49.0	55.0	47.2
Snacking between meals <i>p</i> = 0.0699	< 1 daily	26.0	46.2	32.2
	1 daily	48.0	30.0	33.3
	> 1 daily	26.0	23.8	34.5

**Table 4.** Percentage of women with low, recommended, and high gestational weight gain according to frequency of consumption of selected beverages during pregnancy

Beverages	Number of servings	Gestational weight gain		
		Low	Recommended	High
Sweetened carbonated beverages <i>p</i> = 0.6856	Never	41.2	37.5	36.8
	≤ 3 glasses weekly	41.2	43.7	36.8
	≥ 4 glasses weekly	17.7	18.8	26.4
Fruit juice <i>p</i> = 0.4509	< 1 glass weekly or never	23.5	21.5	15.0
	1–6 glasses weekly	41.2	36.7	49.4
	≥ 1 glass daily	35.3	41.8	35.6
Milk <i>p</i> = 0.7250	< 1 glass weekly or never	32.0	33.7	33.3
	1–6 glasses weekly	32.0	38.8	41.4
	≥ 1 glass daily	36.0	27.5	25.3
Consumption of alcohol <i>p</i> = 0.0286	No	82.4	87.5	71.3
	Yes	17.7	12.5	28.7
Consumption of beer <i>p</i> = 0.0451	No	90.2	91.3	79.3
	Yes	9.8	8.8	20.7

**Table 5.** Statistically significant factors related with an increased risk of high body weight gain in pregnancy

Factors		OR	95% CI
Pre-pregnancy BMI [kg/m <sup>2</sup> ]	≥ 25.0	3.37	1.51–7.51
	18.5–24.9	1.00	–
	< 18.5	0.46	0.09–2.49
Birth order	Third or subsequent	1.00	–
	Second	2.08	0.50–8.67
	First	4.17	1.03–16.88
Consumption of products supplying protein of animal origin (meat, fish, eggs)	Mediocre (1–2 servings daily)	1.00	–
	High (≥ 3 servings daily)	2.86	1.26–6.34
Consumption of alcohol during pregnancy	No	1.00	–
	Yes	2.82	1.26–6.34
Consumption of beer during pregnancy	No	1.00	–
	Yes	2.72	1.07–6.92

relation to the pre-pregnancy BMI value, was noted in less than 37% of patients, and high gains were found in almost 40%. Every 5<sup>th</sup> woman consumed alcoholic beverages during pregnancy, and every 10<sup>th</sup> woman declared that she smoked cigarettes, whereas nearly every 5<sup>th</sup> was exposed to tobacco smoke in her nearest environment.

High body weight gains occurred in 1/3 of patients who were overweight before pregnancy and, most rarely, in only 2.3% of underweight women, also, in patients who gave birth for the first time, while most rarely in those who delivered the third or subsequent child (Table 2). However, no differences were found

in the percentage of women with different amount of body weight gains according to the respondents' place of residence and age. Also, no significant differences were observed between cigarette smoking and exposure to tobacco smoke and weight gains; nevertheless, the highest percentage of patients with abnormal body weight gains was found among smokers.

Among women who declared consumption of the highest amount of food products supplying proteins of animal origin the percentage of patients with a high gestational weight gain was the highest, whereas consumption of food supplying animal proteins was the lowest among patients with low gain (Table 3).

In addition, a tendency was observed towards a more frequent occurrence of high gains among women who consumed a larger number of portions of sweets, as well as milk and dairy products jointly. However, these relationships were statistically insignificant.

Generally, 20.2% of respondents declared that they consumed alcohol during pregnancy, most frequently beer (13.8%), followed by wine (11.9%), and most rarely high proof alcohol (1.8%), while 6.4% of respondents reported that they consumed at least two different types of alcohol. High weight gains in relation to pre-pregnancy BMI were observed significantly more frequently in patients who mentioned alcohol consumption when pregnant, including especially the consumption of beer (Table 4). Women who did not consume alcohol more often had normal weight gains. No differences in gestational weight gains were noted according to the consumption of the remaining beverages; however, a tendency was found towards more frequent occurrence of high weight gains in the group of women who consumed the largest amount of carbonated sweetened beverages.

The results of logistic regression showed that in the group examined, none of the analysed factors was significantly related with an increased risk of low body weight gain during pregnancy (data not shown). Nevertheless it was confirmed that an increased risk of high gain was associated with the consumption of alcoholic beverages, especially beer, high consumption of products supplying proteins of animal origin, i.e. three or more portions daily, as well as overweight, before pregnancy, also the first delivery, compared to the third and subsequent childbirth (Table 5).

## Discussion

Analysis of the data obtained allowed the presumption that in the population examined the frequency of occurrence of high weight gains during pregnancy (39.9%) was significantly higher, compared to low weight gains (23.4%). The results of studies carried out in recent years have confirmed that a high percentage of pregnant women reach weight gains exceeding the values recommended by the IOM and NAS [1]. Olafsdottir *et al.* [8] showed the occurrence of excessive weight gain in 34% of women, whereas in 26% – gains lower than the recommended values. Herring *et al.* [9] found that in approximately 28% of pregnant women body weight gains were lower than recommended by the IOM, while in 41% – these gains were higher. Wierzejska *et al.* [2] reported that as many as 48% of patients reached gestational weight gain exceeding the recommended values, whereas only 14.2% obtained weight gain lower than recommended. The results of many studies also confirm that excessive weight gain during pregnancy to the highest degree concerned women who were overweight prior to conceiving, and this occurred in 55–60.5% of patients [8–10]. The

results of our own studies showed that weight gains higher than the recommended values were obtained by as many as 67.4% of overweight women.

High weight gains during pregnancy were significantly more often noted in primiparas patients, and most rarely in those who gave birth to the third or subsequent child. This may result from the fact that women who delivered for the third or subsequent time were considerably older compared to the total number of respondents; 80.8% of them were aged 30 or over. According to many researchers young women have higher weight gains during pregnancy [1]. In the presented study, no significant differences in weight gains were found according to the respondents' age; nevertheless, a clear tendency was observed towards reaching higher weight gain among women aged under 30.

The percentages of women who smoked during pregnancy or those exposed to tobacco smoke in their closest environment (10.1% and 19.5%, respectively) were close to the results obtained by other researchers. Wojtyła *et al.* [11] found that 12.2% of pregnant Polish women smoked during pregnancy. In 15 European countries, 9.24% of women on average continued smoking in pregnancy, ranging from 4.2% (Iceland) to 18.9% (Croatia) [12]. Exposure to tobacco smoke in the closest environment (passive smoking) was declared by 19.2% of pregnant women from Warsaw [10]. No significant differences in weight gains in the group of women examined were observed according to smoking and exposure to smoke; however, a tendency was noted towards a more frequent occurrence of abnormal weight gain among smokers. Weight gains in accordance with the recommended values were most often found in non-smokers. In the literature, cigarette smoking by pregnant women was most often analysed from the aspect of its effect on birth weight of infants, and the relationship with gestational weight gains in future mothers were considerably less often considered. Analyses by the IOM and NAS show that smokers are at increased risk of occurrence of low weight gain (OR = 1.3) [1].

Excessive body weight gains in pregnancy were related with the consumption of an excessive amount of products supplying proteins of animal origin. According to the recommendations, pregnant women should consume in the first trimester 1 portion of poultry, fish, meat or other protein products daily, and 1.5 portions in the second trimester [7]. In contrast, nearly 57% of women who had weight gains higher than recommended consumed 3 or more portions of these products daily. It is noteworthy that in this group of products the consumption of fish was very low. More than 60% of the total number of respondents consumed fish less often than once a week, including 14.8% who did not consume it at all. High consumption of products of animal origin, includ-

ing mainly meat and cold cuts, is usually related with a higher energetic value of daily food portions, and a higher content of fat and proteins in the diet, accompanied by a lower content of carbohydrates, which may be conducive to excessive weight gain. The results of studies by other researchers confirm the presence of similar relationships. Lagiou *et al.* [13] showed that increased gestational weight gains at the end of the second trimester of pregnancy occurred not only in women who consumed meals that were more caloric, but also in those who consumed more proteins and fat of animal origin. Olafsdottir *et al.* [8] reported that food ratios of overweight women who had excessive weight gains during pregnancy supplied more energy from fat, and less from carbohydrates. Stuebe *et al.* [14] observed an increased risk of weight gains below the recommendations by the IOM and NAS in women who applied a vegetarian diet in the first trimester of pregnancy.

Consumption of alcoholic beverages during pregnancy was admitted by 20.2% of the total number of respondents. The results of previously conducted studies indicate large discrepancies in the declared frequency of alcohol consumption by pregnant women, i.e. 15.3–38.5% in Poland and 5.5–85% in other European countries [10, 15–20]. Consumption of alcohol in pregnancy, especially beer, was associated with significantly more frequent occurrence of excessive body weight gains. Alcohol may contribute to the development of obesity in many ways, may constitute an important source of calories in the diet, affect the regulation of appetite, and disturb the hormone balance of the body [21]. Alcohol consumption may also be one of the components of the entire complex of anti-health behaviours, which show a tendency towards co-occurrence in the same individuals and may contribute to excessive body weight. Based on long-term studies it was confirmed that the increases in BMI were lower in males who abstained from alcohol ( $-0.62 \text{ kg/m}^2$ ) and in females who consumed alcohol more rarely than once a month ( $-0.38 \text{ kg/m}^2$ ) compared to those drinking once to twice per month [22]. Analysis of the type of alcohol consumed showed that a high consumption of beer especially contributed to the development of abdominal obesity [23]. To date, few reports have been published concerning the relationship between alcohol consumption by pregnant women and the amount of gestational weight gains. In one of the reports it was mentioned that alcoholic beverages were more often consumed by women with rapid weight gain [24]. However, another report did not confirm the relationship between alcohol consumption and the occurrence of abnormal weight gain in pregnancy [25].

The results of many studies suggest also that physical activity of pregnant women is an important factor determining the amount of gestational weight gain [9, 26, 27]. Thus, the lack of data concerning the

physical activity of the examined women is a limitation of the present study. Nevertheless, in literature attention is paid to a generally low level of physical activity among Polish women, both before conception and during pregnancy [28].

The result of intervention studies confirm that changes in the lifestyle of pregnant women contribute to a reduction of the risk of excessive gestational weight gain [26, 27, 29]. Interventions concerning changes in eating habits turned out to be the most effective, leading not only to the reduction of gestational weight gain, but also to the decrease in the risk of pre-eclampsia, pregnancy-induced hypertension, and shoulder dystocia [29]. The presented report, which is an introduction to further studies, confirms an important effect of health behaviours during pregnancy on gestational weight gains. The data obtained will be useful in the elaboration of effective prophylactic programmes for disorders in the nutritional status of pregnant women and the accompanying unfavourable health consequences in the lives of mothers and their children. Pregnancy may be a good moment for women to change their health behaviours, using the additional motivation which, at that time, is the effect on their health of their children.

## Conclusions

The frequency of occurrence of high weight gains during pregnancy in the population examined was considerably higher than that of low weight gains. An increased risk of gestational weight gain higher than recommended was significantly related with many modifiable health behaviours, i.e. consumption of alcoholic beverages during pregnancy, especially beer, increased risk of the consumption of products supplying proteins of animal origin, as well as overweight before becoming pregnant. This study indicates that there is a need for health education among females at reproductive age in order to reduce excess weight before conception, and promotion of adequate health behaviours in pregnancy, which would allow the maintenance of normal weight gain during this period.

## Conflict of interest

The authors declare no conflict of interest.

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