

# KEY DETERMINANTS INFLUENCING THE HEALTH LITERACY OF PREGNANT WOMEN IN THE CZECH REPUBLIC

## KLJUČNE DETERMINANTE, KI VPLIVAJO NA ZDRAVSTVENO PISMENOST NOSEČNIC NA ČEŠKEM

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### ABSTRACT

#### Keywords:

health literacy, pregnancy, prenatal care, primary prevention, midwife

**Background.** Health literacy is a critical determinant of women's and children's health and therefore has immense consequences for the health of society as well. Evidence from epidemiological, clinical and experimental studies indicates that unhealthy lifestyles and risky behavioural habits of parents before conception and during pregnancy influence the etiology of various health defects. Decreasing primary risk factors, practicing physical wellness, monitoring physiological markers and preparing for labour, breastfeeding and newborn care should be the main parental responsibilities during the prenatal period.

**Methods.** Our study focused on specifying the main determinants of health literacy among 360 pregnant Czech women by using an anonymous questionnaire and selected anthropometric data of mothers. The criteria for study participation produced a sample representing 1.41% of Czech women in labour during a given 2012 reference period.

**Results.** Despite quite adequate knowledge of both risks and supporting factors for pregnancy and foetal development, the lifestyles of a majority of the women surveyed were far from optimum: only 30% reported good dietary and physical activity habits, 24% were active or passive smokers and one third of the women occasionally drank alcohol, more often among those who were university educated.

**Conclusion.** Our results have confirmed previously published data noting that health literacy and a healthier lifestyle of pregnant women are associated with a higher level of education (except for alcohol drinking) and with contact with a midwife (in some examined parameters) in prenatal courses.

### IZVLEČEK

#### Ključne besede:

zdravstvena pismenost, nosečnost, predporodna nega, primarno preprečevanje, babice

**Uvod.** Zdravstvena pismenost je ključna determinanta zdravja žensk in otrok, ki ima ogromne posledice tudi na zdravje družbe. Dokazi iz epidemioloških, kliničnih in eksperimentalnih študij kažejo, da nezdravi življenjski slogi ter tvegano vedenje staršev pred zanositvijo in med nosečnostjo vplivajo na etiologijo različnih zdravstvenih okvar. Zmanjševanje dejavnikov tveganja, skrb za fizično dobro počutje, spremljanje fizioloških markerjev ter priprava na porod, dojenje in nego novorojenčka bi morali biti glavna odgovornost staršev v predporodnem obdobju.

**Metode.** Naša študija je bila namenjena določitvi glavnih determinant zdravstvene pismenosti med 360 češkimi nosečnicami s pomočjo anonimnega vprašalnika in izbranih antropometričnih podatkov o materah. Na podlagi meril za sodelovanje v študiji je bil izbran vzorec, ki je predstavljal 1,41 % nosečih žensk na Češkem v zadevnem obdobju leta 2012.

**Rezultati.** Kljub dokaj dobremu poznavanju tveganj in podpornih dejavnikov za nosečnost in razvoj zarodka so se življenjski slogi večine žensk, vključenih v raziskavo, močno razlikovali od optimalnih: samo 30 % jih je poročalo o dobrih prehranskih navadah in telesni aktivnosti, 24 % je bilo aktivnih ali pasivnih kadilk, ena tretjina žensk je občasno pila alkohol, pogosteje univerzitetno izobražene.

**Zaključki.** Naši rezultati so potrdili predhodno objavljene podatke, ki kažejo, da sta zdravstvena pismenost in bolj zdrav življenjski slog nosečnic povezana z višjo stopnjo izobrazbe (razen pitja alkohola) in stikom z babico (pri nekaterih proučenih parametrih) na predporodnih tečajih.

## 1 INTRODUCTION

The experience of pregnancy and labour is a significant factor in the global development of both women and children. Recent research results affirm that the future health of an individual is influenced during the early prenatal period. Sources considering epigenetical mechanisms specifically refer to the preconceptional influence resulting from gene environment interactions (1, 2).

Prenatally, a mother positively or negatively determines both the physical and mental health of her child through her decisions and behaviour, which in turn affect her general health conditions later in life. It was recently confirmed that an unfavourable prenatal environment could facilitate vulnerability to cardiovascular and metabolic diseases, which are presently at near epidemic levels among the general population (3, 4).

When efficiently utilised, the health-care system can significantly eliminate risks for the mother and child and encourage practices that protect the woman's health and the child's capacity for development. In the Czech Republic, a long history of high levels of prenatal and neonatal care has resulted in low perinatal mortality and morbidity. On the other hand, the prevalence of low-birth-weight newborns has increased significantly from 5% to 8% (5). The Czech system of preventive observations by obstetricians in physiological pregnancies uses the officially recommended and unified secondary prevention methods at one-month intervals: monitoring of anthropometric parameters, blood pressure and kidney functions and ultrasound examination. Care oriented towards primary prevention is neither adequate nor effective. Current prenatal care recommends extra examinations for women with physiological pregnancy, and it faces the risk of overmedicalisation. Prenatal care provided by a midwife is not covered by any health insurance in the Czech Republic.

Pregnant women can be exposed to many physical and psychological burdens as well as sources of stress, fear and anxiety. Too many women deal with this stress by smoking, consuming alcohol and eating inappropriate foods, which are recognised risk factors for worst-case pregnancy outcomes. Alcohol and smoking are considered to be preventable risk factors for human reproduction with no safe threshold, human neuro-teratogens (6, 7). However, many prenatal care providers in the Czech Republic do not ask about this risk behaviour and some of them even tolerate it. Questions about nutrition, physical activity, stress and occupational hazard exposure are also not included into the routine treatment schedule of many prenatal care providers. They do not offer professional advice for promoting health changes either.

One recommended technique for decreasing the levels of prenatal anxiety and stress is aerobic exercise, which has a wide spectrum of additional benefits: better oxygenation both for mother and foetal tissues, improves mobility and better coordination as a suitable preparation for labour and birth and shortens active phase of labour. Physical activity enhances the capacity to deal with everyday issues related to stress and unexpected situations, and the

risk of depression after delivery is lower (8). Adequate activity has no negative impact on a newborn's weight. Women involved with special pregnancy exercise programs had significantly higher life wellbeing scores (9).

According to the experiences reported in some other countries, a new approach to prenatal care is "Group care pregnancy", where an individual check-up is replaced by a longer group session. The basic prenatal examination is accompanied by education, sharing of personal experiences and discussions with a midwife. The Dutch model incorporates somatic and psycho-social needs, and support involves focused attention on a woman's individuality, and the level of responsibility for women's health is increased (10). This model typifies a complex type of care that, when practiced, supports a healthy pregnancy process (11). In the 1970s, a similar model was successfully implemented in daily practice in Sweden and resulted in positive lifestyle changes for women and an overall improvement of family well-being (12). Attention is currently focused even on the preconceptional period, when the health problems of both potential parents should be identified and treated (13).

This new point of view offers a new role for midwives: they can provide information to expectant parents about a healthy lifestyle and the detrimental factors that could negatively influence healthy foetal development and potential and try to help with changes. The midwives can also prepare the couple for labour, the postnatal period, breastfeeding and parenthood. This new trend includes focus on perinatal outcomes along with the woman's prenatal care and the psychosocial needs of women's and children's health not only during pregnancy but also after delivery and throughout their lifetimes as well (14, 15). Evidence about increased smoking, alcohol consumption, malnutrition and hypoactivity, especially among young women, indicate that primary prevention should be a part of standard prenatal care (16-18). Participation in primary prevention lessons is an opportunity for a woman to deal with the changes associated with her lifestyle and expectations regarding pregnancy, labour and motherhood; all of this can be a potential source of anxiety and stress. Educational intervention should include the documentation of positive experiences, the dissemination of pregnancy-related information (including reproductive process physiology) and the strengthening of faith in individual abilities (19, 20). In many countries, including the Czech Republic, there is an increasing interest in "schools for mothers". Unfortunately, the majority of such lessons are offered as an additional, self-paid service of standard secondary prevention, without officially unified and supervised content. This education is not available for lower-income women, who are usually undereducated and are more likely to have adopted an unhealthy lifestyle. Voluntary courses for pregnant women, managed by midwives, are oriented towards preparation for delivery, breastfeeding and newborn care, but they do not yet include lifestyle factors. The fact that pregnancy may be the new source of stress for some women, who therefore need special psychological support, is also ignored (21, 22).

Our survey goals were to determine the current health literacy of pregnant women (i.e. their awareness of critical and protective procedures, the risk factors in their lifestyles and the changes they made during pregnancy) and to identify the main determining factors of health literacy (education, parity, place of residence and participation in prenatal courses).

## 2 METHODS AND SAMPLE

A retrospective anonymous questionnaire and a data analysis, collected from July to October 2012, were used. We created a random and proportional sample of women. The primary sample included the 108,000 single babies born in 2011 in Czech hospitals. The second basic sample included the approximately 25,000 single babies born during the quarter when our study was organised. According to these data, the number of participants for our study was established at 540 women (2% of the second basic sample). Five of a total of fourteen Czech districts were chosen by random selection and the particular maternity hospitals in each district were chosen in the same manner. To keep the proportionality of the sample, the number of participating women from each individual clinic was related to the annual/quarterly number of newborns. Women were contacted during the postpartum period. Of the 540 women contacted, a total 393 returned the completed questionnaire (response rate was 72.77%), of which 33 had to be excluded due to incomplete data. The final sample thus consisted of 360 women representing 1.41% of women who had given birth during the study period.

All of the women participating in the study signed an informed consent form and an agreement with the Ethics Committee of University Hospital, Faculty of Medicine, Masaryk University. Fully trained medical staff collected the data.

The main sample characteristics are shown in Table 1. There was a nearly proportional rate of primiparous and multiparous women as well as those with university and high school education; one fifth had only a basic level of education. The level of education was the marker of socioeconomic status. The average age was 30.5 years (median = 31). In terms of parity and age (in comparison with statistical data for the Czech Republic), it is possible to consider the sample as representative. The majority (81%) gave birth vaginally; 19% had a Caesarean section. Twice as many participants lived in towns as in villages.

The structure of the questionnaire was based on the Health Promotion Model (23) and on certain items from the standardised questionnaire used in the ELSPAC (European Longitudinal Study of Pregnancy and Childhood) (24). In addition to demographic data, particular blocks of questions were oriented towards factors important for a woman's health and the healthy development of the foetus during pregnancy. These blocks of questions covered both the woman's knowledge and her behaviour (dietary habits, time and type of active physical exercise, body weight and weight gain during pregnancy, smoking, alcohol consumption, il-

licit drug use and emotional challenges). A dietary habits index with 10 questions and 32 possible answers (questions focused on the frequency of intake of protective and risk foods) was created, and for each correct answer (according to the food pyramid), one point was counted. Index distribution values ranged from 0 (the worst habits) to 10 (the best habits), index distribution: median = 6. A risk factors awareness index was created with values ranging from 0 to 21, index distribution: median = 18. A Likert scale was used to evaluate the feeling of stress during pregnancy and the postpartum period. Self-reported data were not objectively confirmed, with the exception of BMI and weight gain. The questionnaire was completed with data from obstetrician's protocols and included weight and height before pregnancy, weight gain during pregnancy, the form of delivery and newborn status.

Pearson's  $\chi^2$  (chi-square) test and the ANOVA variance analysis were used to evaluate differences between groups with (a) varied educational levels and (b) frequency of participation in prenatal lessons with midwives; the acceptable value for significance was  $p \leq 0.05$ , sampling error 5.4%.

Table 1. The characteristic of the sample.

Item		N	%
Number of participants		360	100
Age	Average	30.5 y	
	Median	31 y	
Education	Basic	69	19.1
	High school	145	40.3
	University	146	40.6
Residence	Town	259	71.9
	Village	101	28.1
Parity	Primipara	178	49.4
	Secundipara	146	40.6
	Multipara	36	10.0
Smoking	Never	230	63.6
	Former	109	30.0
	Current	22	6.1
Alcohol in pregnancy (occasionally)		112	31.1
Illicit drugs	Never	299	83.0
	Former	32	8.9
	Current	29	8.1

## 3 RESULTS

The majority of participants had a revealing family health history. The most frequent disease was hypertension (in 51% of families), 40% had diabetes mellitus in the family, 30% of families had atopy and 60% reported a background of smokers within their family of origin. More than one half of participants (55%) reported positive unhealthy personal histories: allergies, asthma, recurrent urinary tract infections and anaemia were among the most frequent issues. Nearly two thirds (62%) reported gynaecological problems including repeated gynaecological inflammation, spontaneous abortion and menstrual cycle problems. The

interruption of a previous pregnancy was reported by 12%. Nearly two thirds (64%) used hormonal contraception.

The body mass index (BMI) values of the surveyed women at the beginning of pregnancy reflected a Gaussian curve distribution. The average BMI was inversely related to the level of education and place of residence; see Table 2. More participants with the lowest level of education were overweight or obese before pregnancy (BMI 25.0 and higher) compared to those with a university education (40% vs. 24% respectively,  $p < 0.001$ ). Women living in villages had a BMI of 25.0 and higher more often than women living in towns (35% in villages vs. 24% in towns,  $p = 0.006$ ).

**Table 2.** Average BMI before pregnancy.

	N	BMI Mean	Std. deviation
<b>Education:</b>			
Basic	69	24.5	4.6
High school	145	23.2	4.5
University	146	22.8	3.4
<b>Residence:</b>			
Town	259	22.9	4.0
Village	101	24.2	4.5
<i>Total</i>	<i>360</i>	<i>23.3</i>	<i>4.2</i>

The average weight gain was 13.4 kg. The highest prevalence of low, optimal and high weight gain is presented in Table 3. More women with the lowest education had higher (more than 15 kg) weight gain (36% vs. 23% women with university education,  $p = 0.005$ ). A tendency towards higher weight gain was found among primiparous women (35% vs. 28% multiparous women) and among women living in villages (35% vs. 30% in towns).

BMI and pregnancy weight gain were influenced by dietary habits; better dietary habits (with higher index value) lowered the first-input BMI of women and their pregnancy weight gain to the recommended optimal range ( $p < 0.001$ ;  $p = 0.021$  respectively).

Half of the participants (50%) reported some preconceptional preparation; 25% six months or more. Preconceptional preparation was reported more often by primiparous and women with higher education than multiparous and women with lower education. A majority of them considered the omission of contraceptive pills to be a type of preparation for pregnancy.

Prenatal preparation lessons were attended by 39% of respondents; 17% attended only a one-time course (focused on information about the labour process and breastfeed-

**Table 3.** Education, place of residence, parity and weight gain in pregnancy.

	Count Percent*	Weight gain			
		Suboptimal	Optimal	High	Total
<b>Education:</b>					
Basic	N	12	32	25	69
	%	16.7	47.0	36.4	100.0
High school	N	11	83	51	145
	%	7.6	57.2	35.2	100.0
University	N	20	91	35	146
	%	14.0	62.2	23.8	100.0
<i>Total</i>	<i>N</i>	<i>43</i>	<i>207</i>	<i>110</i>	<i>360</i>
	<i>%</i>	<i>11.9</i>	<i>57.3</i>	<i>30.8</i>	<i>100.0</i>
<b>Residence:</b>					
Town	N	32	152	75	259
	%	12.2	58.8	29.0	100.0
Village	N	11	54	36	101
	%	11.3	53.6	35.1	100.0
<i>Total</i>	<i>N</i>	<i>43</i>	<i>206</i>	<i>111</i>	<i>360</i>
	<i>%</i>	<i>11.9</i>	<i>57.4</i>	<i>30.7</i>	<i>100.0</i>
<b>Parity:</b>					
Primipara	N	21	95	62	178
	%	11.9	53.4	34.7	100.0
Secundipara	N	18	89	39	146
	%	12.5	61.1	26.4	100.0
Multipara	N	3	22	11	36
	%	8.8	61.8	29.4	100.0
<i>Total</i>	<i>N</i>	<i>42</i>	<i>206</i>	<i>112</i>	<i>360</i>
	<i>%</i>	<i>11.9</i>	<i>57.3</i>	<i>30.8</i>	<i>100.0</i>

\* Row percentages presented

ing); 21% attended only a couple of theoretical lessons and 62% completed both theory lessons and exercise and practical skills (on average 10 lessons focused on pregnancy, labour, puerperium, infant care and breastfeeding). In most cases, lessons were led by midwives (96%) with a bachelor's education. In 4% of cases, the courses were led by a doula (an informed nonmedical person who accompanies and emotionally supports the pregnant woman but who must not interfere with the competencies of a midwife). Factors determining the participation in prenatal courses attendance were mainly contact with a midwife during previous pregnancy ( $p < 0.001$ ), preconceptional preparation ( $p < 0.001$ ), a higher level of education ( $p < 0.001$ ) and primiparity ( $p < 0.001$ ). Place of residence was not a determining factor ( $p = 0.089$ ). Determinants of prenatal course visitation are shown in Table 4.

Table 4. Determinants of prenatal course visitations.

	Count Percent*	Attendance of prenatal courses		
		Yes	No	Total
<b>Education:</b>				
Basic	N	9	60	69
	%	13.0	87.0	100.0
High school	N	54	91	145
	%	37.2	62.8	100.0
University	N	76	70	146
	%	52.1	47.9	100.0
Total	N	139	221	360
	%	38.6	61.4	100.0
<b>Residence:</b>				
Town	N	108	151	259
	%	41.7	58.3	100.0
Village	N	32	69	101
	%	31.3	68.7	100.0
Total	N	140	220	360
	%	38.8	61.2	100.0
<b>Parity:</b>				
Primipara	N	95	83	178
	%	53.4	46.6	100.0
Secundipara	N	36	110	146
	%	24.7	75.3	100.0
Multipara	N	8	28	36
	%	22.2	77.8	100.0
Total	N	139	221	360
	%	38.6	61.4	100.0

\* Row percentages presented

According to the respondents' reports, the content of the courses was focused mostly on labour and pain management, breastfeeding information, the postpartum period and infant care. About two-thirds (67%) noted that the obtained information related to healthy lifestyle during pregnancy, and approximately half of them (57%) received information about risk factors affecting healthy foetal development. None of the respondents mentioned any intervention for changing risk factors in the lifestyle. Nevertheless, the majority were satisfied with the lessons.

According to self-reported data, the majority of respondents (85%) were informed about principal risk factors (Table 5 and 6). Their knowledge increased in proportion with educational level (Table 5); almost all differences in the frequency of correct answers between women with basic and university education were significant. Contact with a midwife during pregnancy (Table 6) seems to be very informative, but the imbalance in participation of women with different levels of education is an important confounding factor. The prevalence of those exposed to preventable risk factors was (inversely) associated with the level of education.

The most common source of information for 75% of respondents was the internet, 50% relied on their gynaecologist or special literature and 32% reported friends or mother as a source of information. A prenatal course provided information for 26% of the women. The lowest numbers of women listed school (6%) or doula (3%) as their information source. A majority of respondents (80%) believed that information obtained during prenatal check-ups was sufficient for a healthy pregnancy.

Nearly all participants had been informed about cardinal risk factors: drug abuse, smoking (both active and passive), stress, excessive physical load, alcohol in any amount, high levels of caffeine and malnutrition (Table 5 and 6). A majority (86%) of the respondents were aware of the positive impact of adequate physical activity during low risk pregnancy on both the mother's and infant's health. Unfortunately, 10% believed that physical activity has no impact and another 3% believed that physical activity positively influences only the mother's health while negatively affecting the infant's health; 1% was convinced that physical activity during pregnancy can have a negative impact on both mother and infant.

Regarding the questions about changes to a healthier lifestyle, more than half of the participants (56%) thought they improved their diet in terms of quality and diversity, with 2.5% following a special medical diet. A majority consumed milk products (and occasional junk food) daily (85%), favoured white meat (75%), wholegrain bakery products (73%) and vegetable oils (73%) and ate at least 3 portions of fresh fruit (55%) and fresh or steamed vegetables daily (58%). Nearly three quarters (73%) focused on healthy food shopping and prioritised better methods of cooking (boiling and stewing). Half (43%) consumed fish at least once a week, but 33% stated frequent consumption of smoked meat products. Nearly one third (30%) attained very good dietary habits (index: 8 to 10 points), and 6% of respondents fulfilled all the main dietary recommendations. Nevertheless, one quarter (25%) had an index value of 5 or less. About one third (31%) modified habits before they became pregnant, and another 50% made positive changes during pregnancy. Some women (24%) said that information received from a midwife was an impulse to improve their lifestyle.

A majority (83%) reported multivitamin supplement consumption during the whole pregnancy; 38% daily and 45% occasionally. Almost all of these women (75%) had consulted with a professional about the vitamin supplementation.

**Table 5.** Awareness of pregnant women of risk factors for healthy infant development (education).

Risk factors	Education						Pearson's x2 test p-value
	Basic		High school		University		
	Count	Percent	Count	Percent	Count	Percent	
proportion of YES responses							
Large or small weight gain in pregnancy	35	55.6	76	56.3	97	70.8	0.024
Obesity of mother	46	70.8	121	85.2	134	95.7	<0.001
Malnutrition of mother	57	86.4	139	97.2	138	97.2	<0.001
Non-acceptance of pregnancy	45	71.4	118	88.7	124	89.9	<0.001
Smoking during pregnancy	55	84.6	140	97.9	144	99.3	<0.001
Partner's smoking at home	46	73.0	126	90.6	142	98.6	<0.001
Lack of physical activity	38	60.3	88	64.7	109	82.0	<0.001
Huge physical load	55	83.3	130	92.9	133	95.7	0.008
Mother's negative emotions (anger, rage, fear)	50	76.9	119	83.8	118	86.8	0.210
Mother's stress	57	86.4	134	93.7	140	97.9	0.005
Reduction diet or non-consulted vegetarian diet	37	56.1	130	93.5	134	95.0	<0.001
Alcohol consumption (of any amount)	57	86.4	134	94.4	121	88.3	0.105
Higher amount of coffee/caffeine	50	76.9	122	87.8	120	89.6	0.042
Illegal drugs	62	93.9	142	99.3	143	98.6	0.028
Workload, including prolonged standing at work (more than 2 hours)	48	72.7	97	71.3	103	77.4	0.501
Lack of knowledge about risks for infant's development	40	60.6	94	69.1	110	79.7	0.012
Lack of rest and sleep	50	76.9	115	83.9	121	89.0	0.083

**Table 6.** Awareness of pregnant women of risk factors for healthy infant development (contact with midwife).

Risk factors	Contact with midwife in course				Pearson's x2 test p-value
	Yes		No		
	Count	Percent	Count	Percent	
proportion of YES responses					
Large or small weight gain in pregnancy	87	62.6	121	54.8	0.309
Obesity of mother	128	92.1	173	78.3	0.034
Malnutrition of mother	139	100.0	195	88.2	0.012
Non-acceptance of pregnancy	125	89.9	162	73.3	0.020
Smoking during pregnancy	139	100.0	200	90.5	<0.001
Partner's smoking at home	136	97.8	178	80.5	0.019
Lack of physical activity	104	78.2	131	59.3	0.015
Huge physical load	134	94.4	184	83.3	0.205
Mother's negative emotions (anger, rage, fear)	126	89.4	161	72.9	0.017
Mother's stress	139	100.0	192	86.9	0.031
Reduction diet or non-consulted vegetarian diet	128	90.8	173	78.3	0.083
Alcohol consumption (of any amount)	131	92.3	181	81.9	0.337
Higher amount of coffee/caffeine	125	89.3	167	75.6	0.192
Illegal drugs	139	100.0	208	94.1	0.136
Workload, including prolonged standing at work (more than 2 hours)	101	75.4	147	66.5	0.647
Lack of knowledge about risks for infant's development	103	74.6	141	63.8	0.331
Lack of rest and sleep	122	89.7	164	74.2	0.033

Inadequate physical activity was a typical phenomenon for most participants; 29% engaged in regular recommended levels before pregnancy; 55% participated in occasional physical activity; and 16% admitted to “no physical activity”. During pregnancy, 38% of the women reduced their physical activity; 17% of respondents stated no change and kept good physical habits; 37% had no or insufficient physical activity and 8% enhanced their exercise activities in comparison with the situation before pregnancy.

Patterns of smoking were significantly influenced by educational level: 64% never smoked, out of which 78% were university educated women and 22% had a lower level of education ( $p < 0.001$ ), while 6% kept smoking even during pregnancy (no university educated women continued to smoke); 4% of the non-smokers were exposed to passive smoking (Table 7). In the whole sample, 24% of foetuses were exposed to cigarette smoke for various lengths of time. These relationships were highly significant ( $p <$

0.001), especially with long term lessons involving skill practice (Table 8). In this survey sample, no relationship was seen between smoking and medical problems during pregnancy and labour. Nearly 10% of respondents had abstained from alcohol throughout their lifetimes; the number of abstained has increased during pregnancy. Nearly 1% drank alcoholic beverages every day. The frequency of alcohol drinkers was significantly higher among university educated women. Neither prenatal lessons attendance nor parity influenced alcohol consumption. A majority (90%) stated they had never tried any illegal drugs; 10% reported elimination of this habit before or during pregnancy (Table 7); and 2.5% of women declined to answer questions regarding drug consumption.

Some stress was very often experienced by 41% of women at the beginning of pregnancy, by 19% during the whole pregnancy and by nearly one half (44%) before labour. Medium and very high levels of stress were experienced by

**Table 7.** Most critical risk factors based on education level.

Risk factor (smoking, alcohol consumption, drugs)		Education			Pearson's $\chi^2$ test: p-value
		Basic	High school	University	
Never smoked	Count	14	83	114	
	Percent	20.6	59.7	78.1	
Gave up before pregnancy	Count	14	26	18	
	Percent	20.6	18.7	12.3	
Gave up during pregnancy	Count	19	20	11	<0.001
	Percent	27.9	14.4	7.5	
Current smoker (even during pregnancy)	Count	16	4	0	
	Percent	23.5	2.9	0.0	
Passive smoking during pregnancy	Count	5	6	3	
	Percent	7.4	4.3	2.1	
Never drank alcohol	Count	11	10	6	
	Percent	16.4	7.0	4.1	
Gave up before pregnancy	Count	42	88	86	0.017
	Percent	62.7	62.0	58.9	
Occasionally during pregnancy	Count	14	44	52	
	Percent	20.9	31.0	35.6	
Current alcohol consumption (even during pregnancy)	Count	0	0	2	
	Percent	0.0	0.0	1.4	
Never tried illicit drugs	Count	57	130	129	
	Percent	87.7	92.9	88.4	
Gave up before pregnancy	Count	6	9	17	0.117
	Percent	9.2	6.4	11.6	
Gave up during pregnancy	Count	2	1	0	
	Percent	3.1	0.7	0.0	
Occasionally during pregnancy	Count	0	0	0	
	Percent	0.0	0.0	0.0	

\* Column percentages presented

60% of those reporting stress. No stress during pregnancy was reported by 19%. To cope with stress, one third of women used daily relaxation techniques including psycho-hygienic prevention and stress management, and another 50% used these methods occasionally. Participation in prenatal courses had a statistically insignificant effect on stress before labour (Table 8).

**Table 8.** Influence of prenatal course on lifestyle during pregnancy.

Item		Participation in prenatal course:				Total
		None	One lesson	Theoretical lessons	Whole course	
Average index of dietary habit	N	221	24	29	86	360
	Mean	6.19	6.67	6.38	7.27	6.49
	Std. Deviation	1.99	1.66	1.59	1.79	1.94
Index of dietary habit*	Poor	54.5	33.3	41.7	25.5	44.9
	Good	45.5	66.7	58.3	74.5	55.1
	Total	100.0	100.0	100.0	100.0	100.0
Change of physical activity*	The same	51.0	47.8	53.8	42.2	48.8
	Reduced	45.0	30.4	42.3	37.3	41.9
	Enhanced	4.0	21.7	3.8	20.5	9.3
	Total	100.0	100.0	100.0	100.0	100.0
Smoking*	Never or quit during planning	69.4	75.0	89.7	89.3	76.2
	Quit during pregnancy	18.5	8.3	6.9	7.1	14.2
	Still smoking (or smoking environment)	12.0	16.7	3.4	3.6	9.6
	Total	100.0	100.0	100.0	100.0	100.0
Alcohol*	No	70.8	62.5	58.6	67.4	68.5
	Yes	29.2	37.5	41.4	32.6	31.5
	Total	100.0	100.0	100.0	100.0	100.0
Stress reduction techniques change*	Yes, before the pregnancy	16.3	17.4	22.2	30.5	20.2
	Yes, during the pregnancy	40.2	47.8	33.3	37.8	39.6
	No	43.5	34.8	44.4	31.7	40.2
	Total	100.0	100.0	100.0	100.0	100.0

\* Column percentages presented

#### 4 DISCUSSION

Pregnancy is a very important time for both the mother and the child. A well-planned pregnancy should consider optimal timing according to parental age, health condition, mental maturity, supporting social environment and acceptance of recommendations for healthy lifestyle with necessary supplementation (25). Many contemporary women feel that physical observations by an obstetrician alone are insufficient care and some of them ask for prenatal education that will help them to be prepared for labour and parenthood (26, 27). The best course curriculum should also involve educational lessons, effective interventions for lifestyle change, training methods for coping with stress and anxiety and useful skills during delivery and postnatal care of newborns and infants. Such complex subjects should be prepared by professionals, comprehensively unified and presented by midwives upon completion of their certification. The content of prenatal courses is not yet unified in the Czech Republic and in many other countries. Our study indicates that the largest amount of available

information and skills were related to labour. Since women must pay for course participation, opportunities for this specialised education may be limited or inaccessible for the unemployed or economically-challenged. In our study, determining factors for prenatal course participation were primiparity, previous contact with a midwife and holding a university degree. These conditions result in health education and prenatal behaviour. Women with lower education had poorer health literacy (knowledge and habits)

and participated in prenatal courses less often. The most frequent sources of information are mass media and the internet. This should be a signal for health educators to monitor the accuracy of the information available on the internet and to motivate less educated women to attend prenatal courses.

In our entire sample, nearly all of the participants were well informed about critical health risk factors for mother and child: smoking, alcohol, drugs and stress. The knowledge index value increased with higher education and long-term midwife contact in a course, but not with prenatal obstetrician visits. Despite this knowledge, one quarter of the respondents were exposed actively or passively to cigarette smoke during pregnancy. Those women were more frequently less educated and involved with a smoking family. As such exposure represents important risks for pregnancy and the foetus, comprehensive anti-smoking education and intervention must be focused on this vulnerable group of women: younger, less educated with lower social status and low social support, without a partner or with a smoking partner, with many children, living with



stress, experiencing life trauma and lacking love in their lives (28). These conditions restrict access to socially acceptable dopamine resources, minimising participation in pleasant daily events, and these women tend, therefore, to smoke significantly more often during pregnancy (29). Intervention should be oriented towards fathers as well, since their smoking is a source of environmental toxins and can initiate hereditary malformations and reproduction malfunctions (30).

In contrast to pregnant smokers, women consuming alcohol during pregnancy are more often older (>35 years), multiparas and with higher educational levels and socio-economic status (31). Our study confirmed these data. Neither visiting prenatal courses nor parity were significant determinants for alcohol consumption during pregnancy. The most significant determinant was the level of education.

In our sample, knowledge about dietary recommendations and nutritional habits were not optimal. Concordant with foreign studies (32), the obese respondents were usually less educated and smoked. The majority obtained no individual recommendation during early pregnancy for optimal weight gain, although high entry BMI value negatively influences the woman's health and the pregnancy with a higher risk of hypertension, gestational diabetes, preeclampsia, prolonged pregnancy, macrosomia and late foetal death, Caesarean delivery, infectious complications in the postnatal period and obesity and diabetes for both mother and child. It is important to note that imperfect maternal nutrition can be a risk factor even during preimplantation and placental development (33, 34).

We found that age, parity and experience from a previous pregnancy are significant predictors of prenatal stress and anxiety, so very young and less educated primiparas and multiparas with traumatic experiences are at a higher risk of stress, even when their actual pregnancy is physiological. Although the current health care model is not sufficiently developed to identify these at-risk women (35), participation in prenatal lectures during our study reduced the number of anxious mothers before labour. A lower incidence of stress was identified in the group of higher-educated women.

The results of a US study showed that many family doctors and obstetricians are not familiar with the latest recommendations for physical activity during pregnancy. Many women reduce their physical activity during pregnancy, especially in the third trimester when they consider passive relaxation and rest to be more important (36, 37). In our study, the quality of physical activity was higher within the group of highly educated women, findings similar to those of a Swiss survey (38), but in general, exercise during pregnancy did not correspond with the current recommendations for optimal levels.

Special education and training for midwives in consulting, intervention methods and skill training is essential, as it can be the best way for them to become valuable sources of information, motivation and support (39). In the Czech Republic, most prenatal courses are provided by midwives (with certification from the regular educational state system), but they can be provided by almost anybody who arranges a business certificate for educational activities,

which can be obtained without any proof of professional qualifications at the Trade Office. In our sample, only one third (32%) were in long-term contact with a midwife in prenatal courses. These participants reported that they were better prepared overall for labour and birth and felt less stressed at the end of pregnancy; more of them opted for breastfeeding. The feeling of readiness for labour and birth proportionally increased with the length of contact with a midwife, initiated through the women's higher knowledge index value and higher degree of education. These enlightened and well-educated women clearly stated that the information provided to them by midwives helped them to manage the postnatal period, and that they plan to be in contact with midwives during future pregnancies.

A serious limitation of our study is the selection of the subgroup of pregnant women who decided to participate in prenatal courses: the majority of them were university educated and thus of higher social strata. Due to this selection, we were able to describe determinants of their knowledge, behaviour and attendance but not to clearly assess the influence of prenatal courses on pregnancy, labour and early maternal care for newborns. We think it possible that economic barriers are the main reason for this selection, as lectures are offered as paid services, above standard secondary prevention.

## 5 CONCLUSION

Our results from the sample of pregnant women in the Czech Republic confirmed previously published data noting that health literacy and healthier lifestyle of pregnant women are associated with a higher level of education and long-term contact with a midwife in prenatal courses. Professional intervention and advice on primary prevention topics are necessary in order to achieve the goals of decreasing smoking, alcohol consumption and bad nutritional habits and improving support and skills for coping with stress. Therefore, we recommend improving and unifying the content of prenatal lessons, reviewing lecturers' qualifications and establishing economic conditions that permit all women to participate in prenatal educational programs free of charge with the support of public health insurance companies.

## CONFLICT OF INTEREST

The authors declare that no conflict of interest exist.

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