

## **Socioeconomic factors of tobacco smoking during pregnancy**

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### **Summary**

Tobacco smoking during pregnancy is a serious public health concern because of its health consequences on the mother and the foetus. Some expectant mothers quit smoking immediately as soon as they learn they are pregnant, but many others continue the habit. Numerous factors play a significant role in smoking during pregnancy, but the most important one is the initiation at a very young age. Thus, this information is essential while planning any intervention. Additional factors, mainly in disadvantaged families, also contribute to smoking during pregnancy such as poverty, limited education and the psychosocial stress associated with these factors. Health costs and the health status of the society could significantly be improved by efficient intervention programs for girls and women of reproductive age.

### **Individual and social consequences of tobacco use in the fertile population**

Based on data of the international literature, the prevalence of smoking is highest among women in Austria and Greece, i.e. above 40%, followed by Hungary, Chile, and the Czech Republic with more than 30% [1]. The prevalence of smoking among women above the age of 15 is the highest in the European region, i.e. 24.3%. While male smoking prevalence has a declining or stagnant trend in middle and high-income countries, it is slightly increasing among women. This is especially apparent in the case of underprivileged women in the same countries, the level of education of whom is lower, the economic activity is weaker, and social exclusion is higher [2]. In Hungary, according to TÁRKI's (Social Research Institute) survey, the chance of smoking is almost twice as much (OR: 1.7) among women of the lowest income categories. Based on the Global Youth Tobacco Survey 2012, smoking among Hungarian young people exceeds the European average. Between the ages of 13 and 15, 52% of girls have already tried smoking, and at the time of data collection, 23% of were smoking regularly. In addition, almost 1 in 4 (23%) of

17-year-old girls were smoking on a daily basis. 27.1% of women between 18 and 24 years were smoking on a daily basis, and only 2.7% occasionally. In Hungary, the prevalence of smoking has increased by 1% among women since 2009. The rates of smoking are considerably higher among women on low socioeconomic status; 37% of women living in deep poverty are smokers compared to 19% having average financial circumstances and 35% are wealthy. Smoking habits have changed markedly in the past three years in this country. Although, the number of consumed cigarettes has declined, the use of hand-rolled cigarettes with increased the health risks has almost doubled [3]. In Hungary, the prevalence of smoking among pregnant women is 15% on average; however, this proportion is above 26% in disadvantaged counties [4].

The consequences of smoking have a considerably negative effect on women of reproductive age. Cardiovascular risk is higher, and lung cancer is more prevalent. Painful menstruation is more common, the symptoms of premenstrual syndrome (PMS) are stronger, and the primary and secondary amenorrhea with infertility can be related to tobacco smoking [5,6].

### **The consequences of smoking during pregnancy**

Smoking significantly endangers the health of expectant mothers. The short-term effects of smoking prior to and during pregnancy lead to more frequent ectopic pregnancies, spontaneous abortions, abnormal placental adhesions, preterm birth (PTB) and low-birth-weight (LBW) babies and the occurrence of intrauterine growth restriction. In case of second-hand smoke (SHS), the chance of PTB and LBW is also higher [7]. One of the most serious consequences of smoking is stillbirth. The most important reason of stillbirth is placental disorder and as a result, the development of Intrauterine Growth Restriction (IUGR), which is the strongest predictor of stillbirth. Among smoking pregnant women, the chance of stillbirth is 2.5 times higher compared to non-smokers [8]. When exposed to SHS the foetus' development is imperfect. If the mother smokes post-partum in the presence of her child, his/her lung development might be slower; the occurrence of upper- and lower respiratory tract disorders is higher, and because of the threatening apnea, Sudden Infant Death Syndrome (SIDS) becomes more frequent [9]. The consequence of smoking during pregnancy and SHS can be fatal by structural and physiological disorders of the foetus' brain, thus children become irritable, will experience disorders of cognitive functions, behavioural disorders, and in general, weaker performance at school. As a long-term effect, nicotine dependency will increase [10].

Low socio-economic status and related psychological stress in the family worsen the effects of smoking during pregnancy on obstetric outcomes. It is well-documented that low education increases nicotine dependency. During

pregnancy, more than ten cigarettes a day indicates strong addiction with more unfavourable obstetrical outcomes. Among strong nicotine addicts, some lifestyle factors like diet, physical exercise and personal hygiene can worsen and other addictions are more frequent, as well. As a result, pregnant women who smoke present themselves later at maternity and child health service, thus their medical care and opportunity for tobacco cessation counselling starts later [10, 11, 12].

## Material and Method

We collected data of mothers with live births in 2009 and 2010 in four counties of Hungary (Szabolcs-Szatmár-Bereg, Borsod-Abaúj-Zemplén, Nógrád, Heves), and in the 10<sup>th</sup> district of Budapest. Our target population according to the Central Statistical Office was all live births during 2009 and 2010 (N=17,329) [13], of which our research team interviewed 75.35% (n=13,057). The final number of singleton births was 12,936. Our research was approved by the Regional and Institutional Review Board of the Semmelweis University (Ref. No. 103/2009). Mothers were informed about the aims of the research and the method we applied, and they provided formal consent to participate. Data collection with questionnaires supported the National Public Health Medical Officers Service. The first part of questionnaires was administered by district nurses of the Maternity and Child Health Service (MCHS). The second one was a structured interview questionnaire assisted by the same MCHS nurses.

### *The content of the first part*

1. Pregnancy care documentation (with detailed demographic data, the time of taking into MCHS care and the frequency of visits, general medical and obstetrical history, MCHS examinations, conditions during pregnancy, data of hospital stays and drug addictions)
2. The mother's obstetrical hospital report
3. The neonate's hospital report

### *The content of the second part (structured interview)*

1. Demographic, social, and economic status
2. The mother's illnesses, symptoms prior to and during pregnancy
3. Obstetrical and gynaecology history
4. The neonate's biometrical data, adaptation, diseases, number of days of hospital stay

- 5.) Maternal smoking, questions related to SHS (we used the Fagerström Nicotine Dependency questionnaire) [14]
- 6.) Edinburgh Postnatal Depression Scale (EPDS) questionnaire [15]

In this study, we compare the socio-economic status and obstetrical outcomes of expectant mothers who gave up smoking and those expectant mothers who continued smoking during pregnancy.

Descriptive statistics (mean, standard deviation, frequency) were used to describe the sample. We compared the groups of pregnant smokers and quitters applying Chi-square test in case of discrete variables. We tested the potential predictors of smoking during pregnancy applying binary logistic regression analysis. All data were analysed using the SPSS 20.0 statistical program.

## Features of expectant mothers smoking during pregnancy

### *Social impacts and interrelations*

Smoking habits during pregnancy were reported by 11,440 persons, which comprise our analytical sample. 8% (n=910) were smokers who did not change their smoking habits when they learned they were pregnant. 18.1% (n=2,073) continued smoking, but decreased the daily number of cigarettes. 15.4% (n=1,761) stopped smoking immediately and 58.5% (n=6,696) reported they were non-smokers prior to pregnancy. In other words, 41.5% were smokers when they learned they were pregnant, and among smokers, 62.9% continued smoking throughout their pregnancy.

*Table 1 Socioeconomic factors of pregnant women (N=4744) who continued (n=2983) or quitted smoking (n=1761) during the pregnancy*

Maternal characteristics	Overall (N)	Quitted smoking	Continued smoking	p-values
Maternal age mean	26.94	28.31	26.13	<< 0.001*
± S.D.	(6.11)	5.48	6.32	
min-max:	14-46	15-46	14-45	
<b>Age categories (n, %)</b>	<b>4744</b>	<b>1761</b>	<b>2983</b>	<b>&lt;&lt; 0.001</b>
<<18	167	28 (1.69)	139 (4.7)	
18-34	3952	1492 (84.7)	2460 (82.5)	
35-40	532	216 (12.3)	316 (10.6)	
41+	93	25 (1.4)	68 (2.3)	
<b>Settlement (n, %)</b>	<b>4608</b>	<b>1707</b>	<b>2901</b>	<b>&lt;&lt; 0.001</b>
urban	1916	880 (51.6)	1036 (35.7)	
rural	2692	827 (48.4)	1865 (64.3)	

<b>Family status (n %)</b>	<b>4726</b>	<b>1758</b>	<b>2968</b>	<< 0.001
marriage	1822	933 (53.1)	889 (30)	
cohabitation	2561	711 (40.4)	1850 (62.3)	
single	103	26 (1.5)	77 (2.6)	
others**	240	88 (5.0)	152 (5.1)	
<b>Education (n, %)</b>	<b>4732</b>	<b>1758</b>	<b>2974</b>	<< 0.001
≤8 basic	2392	338 (19.2)	2054 (69.1)	
secondary	1995	1125 (64.0)	870 (29.3)	
University/college	345	295 (16.8)	50 (1.7)	
<b>Level of income/capita (n, %)</b>	<b>4577</b>	<b>1673</b>	<b>2904</b>	<< 0.001
Deep poverty	2639	523 (31.3)	2116 (72.9)	
Poverty	1191	610 (36.5)	581 (20.0)	
At poverty level	451	316 (18.9)	135 (4.6)	
Sufficient/Wealthy	296	224 (13.4)	72 (2.5)	
<b>BMI categories (n, %)</b>	<b>4733</b>	<b>1756</b>	<b>2977</b>	<< 0.001
Underweight	829	210 (12.0)	619 (20.8)	
Normal	2787	1030 (58.7)	1757 (59.0)	
Overweight	722	325 (18.5)	397 (13.3)	
Obesity	395	191 (10.9)	204 (6.9)	
<b>Employment before birth (n, %)</b>	<b>4720</b>	<b>1758</b>	<b>2962</b>	<< 0.001
Employed	1552	1006 (57.2)	546 (18.4)	
Unemployed	1441	355 (20.2)	1086 (36.7)	
Varia***	1727	397 (22.6)	1330 (44.9)	
<b>Housing condition (n, %)</b>	<b>4519</b>	<b>1653</b>	<b>2866</b>	<< 0.001
Full amenities	2650	1382 (83.6)	1268 (44.2)	
Partial amenities	1553	242 (14.6)	1311 (45.7)	
Without amenities	316	29 (1.8)	287 (10.0)	
<b>Ethnicity (n, %)</b>	<b>4078</b>	<b>1468</b>	<b>2610</b>	<< 0.001
Roma	1693	203 (13.8)	1490 (57.1)	
non-Roma	2385	1265 (86.2)	1120 (42.9)	

\*t-probe, \*\*others: separated, widowed, divorced, \*\*\*varia: disabled, student, ect.

Quitters gave up smoking on average on the 7.7<sup>th</sup> week of pregnancy (SD. 5.56). 75.6% were smoking less than 10 cigarettes a day, 19.5% were smoking 11-20 cigarettes a day, and 4.9% smoked ≥21 cigarettes. Table 1 shows the relationships between social, economic, and demographic factors and smoking status among pregnant women. The average age of smoking expectants was 26.13 years compared to 28.31 in case of quitters. Based on age grouping, the proportion of smokers under 18 was 4.7%, and among quitters was 1.7%. While half of quitters live in cities or towns, the other half in rural areas, 1/3 of

smokers are living in cities or towns, 2/3 in rural areas. More than half of quitters were married (53.1%), but only 30% of those who smoke were married. The occurrence of low level of education ( $\leq 8$  grades) was 69% among smokers versus 19.2% among quitters. High level of education (university/college) among quitters was 16.8%, among smokers it was 1.7%. 72.9% of smokers and 31.3% of quitters lived in deep poverty.

The normal body mass index (BMI) value was almost the same in the two groups. Among smokers, the proportion of low BMI was higher, but among quitters, the proportion of overweight and obese people was higher. Among quitters, employed status was three times more frequent than among smokers (57.2%-18.4%). 10% of smokers lived in flat/house without amenities, among quitters it was only 1.8%. While more than half of smokers were Roma (57%), only 13.8% of quitters were of the same ethnicity.

We compared the smokers', quitters', and non-smokers' obstetrical outcomes (Table 2). The average of previous pregnancies and deliveries was higher among smokers, as opposed to non-smokers and quitters. Infant weight mean was 2,960 grams if the mother was smoking during pregnancy, versus 3,314 grams among quitters, versus 3,304 grams among non-smokers. There was a significant difference between the ratio of PTBs and LBWs across these three groups. The proportion of PTB was 11.9% among smokers, 6.4% among quitters, and 6.2% among non-smokers. In case of LBW, the difference was higher, thus, its proportion was 15.7% among smokers, 6.2% among quitters, and 5.5% among non-smokers. Based on the multivariable logistic regression model (Table 3), smoking cessation during pregnancy was significantly influenced by the level of education. If the mother had only a primary ( $\leq 8$  grades) versus secondary education, her chance was three times higher (OR=3.08; 95% CI: 2.35 – 4.04) to continue smoking. If the mother was living in deep poverty as opposed to the other groups as poor (OR=1.38; 95% CI: 1.08-1.78), of average income (OR=1.83; 95% CI: 1.3-2.57), or wealthy (OR=2.08; 95% CI: 1.36-3.17), she had a lower chance to quit smoking. Roma versus non-Roma pregnant women (OR=2.36; 95% CI: 1.77-3.16) were more than twice as likely to continue smoking. Smoking of husbands/partners was also an important predictor of continued smoking (OR=1.77; 95% CI: 1.41-2.22). Also, women who were unemployed were 1.4 times as likely to continue smoking (OR=1.44; 95% CI: 1.13-1.84).

Table 2 Obstetrical and perinatal data among non-smoking women (n= 6696), and women who were smoking (n=2983) and quit (n=1761) during the pregnancy

	Non-smokers n=6696	Quitters n=1761	Smokers n=2983
<b>N. of labour</b>			
mean	1.95	1.69	2.72
(±SD)	(1.23)	(0.95)	(1.94)
<b>N. of pregnancy</b>			
mean	2.34	2.12	3.52
(±SD)	(1.66)	(1.39)	(2.61)
<b>Infant weight</b>			
mean	3304	3314	2960
(±SD)	(514)	(547)	(533)
min-max	530-5400	690-5300	530-4700
<b>1-min Apgar score</b>			
mean	9.32	9.26	9.17
(±SD)	(0.93)	(0.95)	(1.03)
<b>5-min Apgar score</b>			
mean	9.88	9.85	9.8
(±SD)	(0.42)	(0.49)	(0.56)
<b>PTB</b>	6.2 %	6.4 %	11.9 %
<b>LBW</b>	5.5 %	6.2 %	15.7 %

Table 3 Multivariable logistic regression model of women who were smoking during the pregnancy versus women who quit smoking (N=4744) by socioeconomic, demographic characteristic in Northern counties of Hungary

VARIABLES	OR	95% C.I.		<<p-value
		Lower	Upper	
<b>Education ≤8 grades vs.</b>				
secondary	3.08	2.35	4.04	0.001
university/college	6.10	3.86	9.64	0.001
<b>Family status vs. Married</b>				
non-contractual cohabitation	1.06	0.55	2.02	0.870
separated or divorced	0.66	0.35	1.26	0.207
single or widowed	0.68	0.25	1.83	0.440
<b>Deep poverty of the family vs.</b>				
poverty	1.38	1.08	1.78	0.010
at poverty level	1.83	1.30	2.57	0.001
sufficient/wealthy	2.08	1.36	3.17	0.001
<b>Roma vs. non-Roma</b>	2.36	1.77	3.16	0.001

<b>BMI underweight vs.</b>				
normal	0.97	0.72	1.32	0.868
overweight	1.16	0.80	1.67	0.436
obese	1.20	0.78	1.84	0.394
<b>Age vs. &lt; 18 years</b>				
18-34	0.74	0.15	3.71	0.712
35-40	1.63	0.81	3.28	0.172
> 41	1.12	0.54	2.35	0.762
<b>Husband smoking vs. non-smoking</b>	1.77	1.41	2.22	0.001
<b>Unemployed vs. employed</b>	1.44	1.13	1.84	0.003
<b>Urban vs. rural</b>	1.16	0.95	1.43	0.155

### *Conclusion*

Our results represent the socio-economic status, smoking behaviour, and obstetrical results of women who delivered a live birth in 2009 and 2010 living in the North-Hungarian region. According to our data, more than  $\frac{1}{4}$  of the expectants were smoking in the target region. The occurrence of smoking and other negative health behavioural patterns were more frequent among disadvantaged people [12]. Low levels of education, unemployment, and poverty (low socioeconomic status – SES) increased the prevalence of smoking [17]. During the pregnancy, the proportions of levels of education were very different among quitters and regular smokers in the sample. Those who decided to quit smoking had a higher level of education. Education also affected some other indicators of health behaviour. Parents of higher level of education were more aware of the consequences of smoking, which could help them in smoking cessation. One of the strongest stress factors was the low family income [18]. It was obviously related to unemployment. There were much less unemployed mothers among those who gave up smoking. The results of the multivariable logistic regression model showed that low level of education, low income, and unemployment was independent predictors of smoking continued during pregnancy. Expectant mothers living in deep poverty, beyond expenses of smoking, were likely to have insufficient resources to pay for proper diet and nutritional supplements, which increased the risks associated poor foetal development and birth outcomes. At a younger age, it was more difficult to cope with stress situations. The average age of smoking among expectant mothers was lower, and among them, the proportion of those under 18 was higher. Without adequate experiences and coping strategies, negative affect is more likely to develop, and as a way of stress management, expectant mothers may use tobacco smoking to self-medicate [19]. The absence of a con-



solidated personal relationship can further increase the impact of the psychosocial stress. During pregnancy, mothers need increased emotional support, primarily by the partner's contribution [20, 21]. Among quitters, the proportion of married mothers is higher, and there are less single expectants. A greater proportion of those expectants who give up smoking live in urban areas as opposed to those who continued smoking. This can be related to the easier access to primary prevention and health care services, because it is more difficult in rural areas [22]. Smoking during pregnancy is four times more frequent in Roma communities. This population can be characterized by deep poverty, low level of education, lack of relevant knowledge, and unemployment [23]. Smoking during pregnancy has serious health consequences in obstetrical terms as PTB, LBW, and IUGR. There are significant differences between the birth weights of the babies. The frequency of LBW is twice bigger among smokers [7, 9, 24]. In case of smoking expectants, the neonates' weight is significantly lower as opposed to those of quitters'. In our sample, the difference was 354 grams, which was both statistically and clinically significant. Post-partum effects of smoking during pregnancy occur with higher chance of SIDS, respiratory illnesses, cardio-vascular risk in childhood, and behavioural problems. Smoking expectants have more pregnancies and deliveries in their history as opposed to quitters and non-smokers. Most of smoking expectants live in socially disadvantaged communities with minimum level of knowledge about family planning (9, 10, 11).

### *Suggestions*

To reduce tobacco smoking during pregnancy, the first choice is primary prevention. Young reproductive age women's level of relevant knowledge has to be increased, and their health behaviours need to be influenced effectively, because initiation occurs at an early age. Thus, it is necessary to improve the methods of basic school smoking prevention programs. Besides providing information, interactive education has to be implemented.

It is indispensable to apply special advisory methods in the cessation programs of expectant mothers. In this activity, the most efficient way is to train MCHS nurses. Minimal intervention has to be used, as well as methods of behavioural sciences with supporting techniques for groups and individuals.

As smoking during pregnancy is related to low social status, in the long term, it is necessary to increase disadvantaged people's level of employment. However, this should be a program of the central government.

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