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MAIN RESEARCH ARTICLE

Denial of smoking-related risk among pregnant smokers

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Abstract

Objective. To examine pregnant women's denial of risk, tobacco dependence and their partner's smoking status on smoking behavior during pregnancy. *Design.* Cross-sectional design with convenience sampling. *Setting.* Data collection was carried out in hospitals and antenatal clinics in Budapest and 12 other Hungarian cities. *Population or sample.* A total of 406 adult pregnant women (mean age: 28.2 years; SD = 5.6) with a mean gestational age of 23.3 weeks ranging from 4 to 40 (SD = 8.9). *Methods.* Pregnant women were enrolled in the study by midwives and home-care attendants. *Main outcome measures.* Smoking status was assessed by self-report questions. Further measures included the Fagerstrom Test of Nicotine Dependence to assess nicotine dependence, and the Wisconsin Inventory of Smoking Dependence Motives to assess the motivational background of smoking. Risk perception was assessed by Haslam and Draper's (2000) 12-item risk perception questionnaire. *Results.* Prevalence of occasional and daily smokers was 21.7 and 29.3%, respectively. Some 59.7% of the pregnant women have a partner who smokes. Daily smokers had a higher level of risk denial than occasional or non-smokers (Welch F = 91.607; $p < 0.001$). Current smokers also had a higher denial than temporary quitters (t = -3.153; $p = 0.003$). Denial of risk correlated significantly with nicotine dependence ($r = 0.30$) and the main motivational factors ($r = 0.34–0.48$). A multinomial logistic regression model of denial of risk concurrently predicted women's smoking status ($p = 0.001$), even when controlling for age, education, partner's smoking status and parity. *Conclusions.* A higher level of risk denial seems to be one of the major determinants of women's smoking status during pregnancy.

Key words: *Pregnancy, smoking, risk perception, partner's smoking*

Introduction

Smoking during pregnancy is a major public health concern affecting the health of both the pregnant mother and the child since it has extensive and harmful effects both on the mother and on the growing fetus. Numerous studies have presented evidence that smoking affects the growing placenta negatively, both functionally and structurally (1,2). Among other factors it increases the risk of extrauterine pregnancy, placenta previa, spontaneous abortion, preterm premature rupture of the membranes, preterm birth or stillbirth, low birthweight and sudden infant death syndrome (3–6).

Negative health effects are not limited to the period of pregnancy and birth, since maternal smoking has also been associated with adverse respiratory outcomes in children (7). Intrauterine smoke exposure is associated with adverse effects on postnatal growth, such as blood pressure at the age of six (8). Several studies have demonstrated indirectly the link between smoking during pregnancy and the greater risk of childhood obesity (9–11). Furthermore, a growing number of studies support a relation between intrauterine smoke exposure and a lower level of cognitive functioning at a later age (12,13).

The number of pregnant women who smoke during pregnancy varies from country to country. For example, the rate is 21% in the Netherlands (14) and 26.4 in Australia (15). In Finland, 26.5% of pregnant women smoked during early pregnancy, but this

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rate went down to 13.1 at 20 weeks of pregnancy (6) and there is also a lower rate (10.4%) in Japan (16). We do not, however, have representative data from Hungary. Smoking status is a sensitive issue for pregnant women; it provides a possible explanation for the wide range (17). On the other hand, studies highlighting that a considerable percentage of women relapse after delivery also have great practical relevance (18).

For a better understanding of smoking during pregnancy it is important to explore the factors that influence the pregnant woman's decision to smoke or quit smoking during pregnancy. It has become evident that prevalence of smoking during pregnancy is higher among those with low socioeconomic status; however, prior research has revealed that a stable relationship seems to be a protective factor. Women smoking during pregnancy are more likely to be single, whereas non-smoking women are more likely to be married or cohabiting (6,8,19,20).

Nevertheless, one of the major determinants of smoking during pregnancy is having a smoking partner (15,16). Living with another smoker automatically increases the accessibility of cigarettes and provides continuous tobacco-related stimuli. At the same time it increases the possibility of being in a situation convenient for smoking, increases temptation and accordingly makes it more difficult to quit. Moreover, a smoking partner also means that there is a risk of second-hand smoking.

Risk perception is explained by many theoretical models (21), but it is still not clear how smoking pregnant women perceive the risk of smoking, how risky they think smoking is for the fetus, and how their risk perception level differs from that of 'quitters' and 'never smokers'. Relevant research has not been conclusive. Although some researchers have not found any relation between awareness of negative health outcomes and smoking cessation during pregnancy (16), others suggest that those pregnant women who do not realize or underestimate adverse health effects of smoking during pregnancy are less likely to quit smoking (20,22).

Using the cognitive dissonance theory, Grangé and colleagues (19) have suggested that lower risk perception is the result of denial as a coping strategy. Nevertheless, it seems that perception of the risk of smoking during pregnancy is related to the mother's higher socioeconomic status, marital status and willingness to breast-feed (20).

Suzuki and colleagues (16) have suggested that the major problem is not the lack of appropriate risk perception but transforming this perceived risk into behavioral change, that is, quitting smoking. It might be more difficult among women with stronger nicotine dependence. Heavy smokers are less likely to quit after confirmation of pregnancy; moreover, interventions have lower efficacy among them (22).

Measuring perceived risk of smoking during pregnancy is crucial in order to identify its role in smoking and smoking cessation during pregnancy. The risk perception questionnaire by Haslam and Draper (20) has not, however, been tested psychometrically. One of the aims of the present research was to provide a psychometric analysis of the scale. In the present study we examined the associations between risk perception and nicotine dependence, and the partner's smoking status among Hungarian pregnant women. We aimed to analyze how these factors influence smoking during pregnancy and hypothesized that those who perceive the risk of smoking during pregnancy to be lower are more likely to smoke than those who perceive this risk to be higher. Furthermore, we assumed that having a smoking partner would increase the probability of smoking during pregnancy.

Material and methods

A convenience sample of 406 pregnant women was interviewed in hospitals, antenatal clinics and during home-care attendances between October 2008 and January 2009 in Budapest and twelve other cities in Hungary. The inclusion criterion was: age 18 years or older. Mean age was 28.2 years (SD = 5.6). Pregnant women were in the twenty-third gestational week on average (mean = 23.3; SD = 8.9; ranging from 4 to 40). Refusal rate was low (1%, altogether four persons). Data collection was carried out by midwives and home-care attendants who handed the questionnaire to the participants and asked them to fill it out alone and give it back in a sealed envelope. Participation was voluntary and anonymous. This research was not a clinical trial, and the procedure followed was in accordance with the Helsinki Declaration.

Two-thirds (67.6%) of the mothers were married or lived together with their partners, whereas another 25.5% had a relationship, though partners were not living together. Every second woman (49.1%) had secondary education, 27.0% had finished university studies, 23.9% had only basic education and 42.1% of the women were nulliparous.

One-third of the women (29.2%) said that they had been non-smokers before pregnancy, 12.2% were occasional smokers, 41.4% were daily light smokers and 17.2% were daily heavy smokers; 59.7% lived with a smoking partner, and altogether one-quarter (25.5%) stated that they were exposed to passive smoking less frequently than weekly (Table 1).

We categorized our participants by their current smoking status into non-smokers (never smoked

Table 1. Main characteristics of the sample of pregnant women (n = 406).

	n	%
Education		
University	93	27.0
Secondary	169	49.1
Elementary	82	23.9
Marital status		
Married/cohabiting	273	67.6
Partner relationship	103	25.5
Single/divorced	28	6.9
Parity		
Nulliparous	170	42.1
Semiparous	234	57.9
Current smoking status		
Non-smoker	196	49.0
Occasional smoker	87	21.7
Daily smoker	117	29.3
Smoking status before pregnancy		
Non-smoker	117	29.2
Occasional smoker (smoked weekly)	49	12.2
Light smoker (< 15 cigarettes per day)	166	41.4
Heavy smoker (> 15 cigarettes per day)	69	17.2
Partner's current smoking status		
Smoker	236	59.7
Non-smoker	159	40.3
Exposure to passive smoking		
Rarely (monthly)	102	25.5
Sometimes (1–2 days a week)	82	20.4
Regularly (3–4 days a week)	91	22.7
Very often (5–7 days a week)	126	31.4

during pregnancy: 49.0%), occasional smokers (smoked at least once during the last two weeks: 21.7%) and daily smokers (smoked a cigarette within the last two days: 29.2%). We applied these categories to minimize the response bias.

Each woman's own and their partner's current and past smoking status were measured by self-report in an anonymous questionnaire.

The Fagerstrom Test of Nicotine Dependence (FTND) was used to assess nicotine dependence (23). This single-dimension, six-item questionnaire focuses on smoking intensity and the amount of effort exerted to maintain one's regular nicotine level. Items are summed to yield a total score, ranging from 0 to 10. Similarly to earlier studies (24,25), internal consistency was moderate in the present sample (Cronbach's α = 0.60).

The Wisconsin Inventory of Smoking Dependence Motives (WISDM-68), a 68-item, seven-point Likert scale developed by Piper and colleagues (26), was used to assess tobacco dependence. To handle nicotine dependence as a multidimensional motivational-based construct, this inventory contains 13 dimensions corresponding to 13 motivational factors that seem to be the major determinants in maintaining tobacco dependence. Internal consistency of WISDM-68 has been shown to be adequate across different populations (26). Cronbach's α of the scales ranged from 0.87 to 0.93 in our sample.

Risk perception was measured by Haslam and Draper's 12-item scale (20). Short- and long-term negative health outcomes of smoking during pregnancy, both on the mother and on the growing fetus, were listed and women were asked to score to what extent they agreed with them (1 = Strongly agree, 2 = Somewhat agree, 3 = Somewhat disagree, 4 = Strongly disagree). Because of the coding scheme, this questionnaire measures denial of smoking-related risk.

Statistical analyses

Confirmatory factor analysis was used to test the theoretical factor structure of Haslam and Draper's questionnaire. In a confirmatory factor analysis, a satisfactory degree of fit requires the comparative fit index (CFI) to be larger than 0.95 and the non-normed fit index (NNFI) or Tucker-Lewis Index (TLI) to be greater than 0.95: the third fit index applied in these models was root mean square error approximation (RMSEA). RMSEA below 0.05 indicates excellent fit, a value around 0.08 indicates adequate fit and a value above 0.10 indicates poor fit. In order to examine the psychometric properties of Haslam and Draper's questionnaire (20), we tested a single-factor model of the 12 statements with confirmatory factor analysis. Because the one-factor model did not fit well with our data (CFI = 0.876; TLI = 0.821; RMSEA = 0.087 CI_{95}(0.075–0.099)), we carried out a maximum likelihood exploratory factor analysis with a rotation that maximized the sum of the variances of the squared loadings (varimax). The factor loadings and eigenvalues are presented in Table 2. Only one factor reached the appropriate 1.0 eigenvalue by Kaiser-criterion, and this factor explained 31.7% of the variance. The other two factors also explained another 10% of the variance, but we kept only the first factor and its factor score is used in subsequent analyses. The items loading on this factor refer to denial of risk; therefore higher scores on this factor meant lower beliefs in the negative health impact of smoking and second-hand

Table 2. Exploratory factor analysis of Haslam and Draper's 12-item scale on short- and long-term negative health outcomes of smoking during pregnancy.

	Factors		
Items	1	2	3
Women who smoke are more likely to give birth preterm	0.698		
The children of women who smoke usually have more respiratory infections	0.694		
Smoking during pregnancy can affect the child's growth and development up to the age of ten	0.685		
Smoking during pregnancy has an effect on the child's IQ level	0.662		
Smoking during pregnancy results in a low birth-weight baby	0.606		
A low birth weight leads to health problems in babies	0.592		
The smoking of other adults in the house has an effect on the baby's health	0.539		
It is safe to smoke once the baby is born		0.654	
Smaller babies are easier to deliver		–0.352	
Pregnant women should be encouraged to stop smoking			0.535
There is not enough help for pregnant women who want to stop smoking			0.484
Cutting down the number of cigarettes smoked per day reduces the harm to the unborn baby			–0.268

Note: Eigenvalue = 3.81 (first factor); 0.72 (second factor); 0.49 (third factor).

smoke. The internal consistency of this scale was appropriate (Cronbach's $\alpha = 0.85$).

Correlation analysis was conducted to assess the relation between denial of risk and current smoking status, nicotine dependence, motivational factors of smoking, partner's smoking status and demographical characteristics. ANOVA and independent sample *t*-tests were used to examine group differences between non-smokers, occasional smokers and daily smokers on denial of risk. A multinomial logistic regression analysis was performed in order to investigate the predictors of smoking status of pregnant women. SPSS 17.0 and AMOS 16.0 (27) were used for all the analyses.

Results

There were significant correlations between denial of risk and demographical characteristics such as education ($r = 0.36$; $CI_{95}(0.27-0.41)$; $p < 0.001$), parity ($r = 0.24$; $CI_{95}(0.14-0.33)$; $p < 0.001$) and marital status ($r = 0.14$; $CI_{95}(0.04-0.24)$; $p < 0.001$). No significant relation was found between denial of risk and age ($r = -0.08$; $CI_{95}(-0.18-0.02)$; $p = 0.127$) or gestational age ($r = 0.07$; $CI_{95}(-0.03-0.16)$; $p = 0.20$). The highest correlation existed between denial of risk and current smoking status ($r = 0.60$; $p < 0.001$), but there was a significant correlation with the partner's smoking status ($r = 0.27$; $CI_{95}(0.53-0.67)$; $p < 0.001$) as well.

There was a significant effect on denial of risk by smoking status (Welch $F = 91.607$; $p < 0.001$). Post hoc analysis revealed that daily smokers had a significantly higher denial of risk compared with occasional smokers and non-smokers. Occasional smokers also had a higher denial score than non-smokers.

Current smokers had a higher denial score than temporary quitters ($d = -3.153$; $df = 39.98$; $p = 0.003$; Cohen $d = 0.49$) and pregnant women with higher nicotine dependence continued to smoke, despite knowing about the harmful effects of smoking. There were significant correlations between denial of risk, FTND ($r = 0.30$; $CI_{95}(-0.17-0.17)$; $p < 0.001$) and the WISDM-68 ($r = 0.49$; $CI_{95}(0.39-0.60)$; $p < 0.001$). Correlations with the WISDM-68 scales are presented in Table 3 (range from $r = 0.34$ to 0.48).

A multinomial logistic regression analysis was performed to analyze the predictors of smoking status of pregnant women. Denial of risk, partner smoking status, age, education and parity were included in the model and non-smokers were used as a reference category. Only denial of risk predicted the women's smoking status, as reported in Table 4.

Discussion

The main objective of the study was to achieve a better understanding of smoking behavior during pregnancy and the impact of denial of smoking-related risk among smokers on current smoking status. Risk denial has not been explored widely in pregnant women, and one of our major aims was therefore to identify factors connected with this construct.

Since we were not aware of any psychometric analysis of Haslam and Draper's questionnaire (20),

Table 3. Pearson's correlations between denial of risk and the WISDM-68 scales.

WISDM-68 scales	Risk perception
Affiliative attachment	0.47
Automaticity	0.43
Loss of control	0.36
Behavioral choice-melioration	0.45
Cognitive enhancement	0.36
Craving	0.44
Cue exposure-associative process	0.46
Negative reinforcement	0.44
Positive reinforcement	0.40
Social-environmental goals	0.48
Taste and sensory properties	0.38
Tolerance	0.44
Weight control	0.34

Note: All correlations are significant at $p < 0.001$.

we performed both confirmatory and exploratory factor analyses to identify the measurement model. We established that the questionnaire measures denial of risk.

Similarly to Grangé and colleagues' results (19,28), our correlation analyses demonstrated that denial of smoking-related risk is higher among women with lower education, higher nicotine dependence and a smoking partner. We also revealed that higher denial of risk is associated with higher smoking motives. The more a smoking motive scale is emphasized for a person, the more it endorses the maintenance of smoking, and the more difficult it makes it to quit (26). Furthermore, there is a relation between greater number of pregnancies and level of risk denial. We assume that previous successful pregnancies might increase the denial of risk of smoking during pregnancy.

Pregnant women with a higher nicotine dependency and those who do not quit smoking during pregnancy have been known to perceive the risks of smoking to be lower (22). Comparing women by smoking status demonstrated that denial increased by smoking status from non-smokers to daily

Table 4. A multinomial regression analysis to predict current smoking status of pregnant women.

	B (SE)	*p*	Odds ratio	95% CI
Occasional vs. non-smokers				
Intercept	0.20 (0.96)	NS		
Denial	0.84 (0.26)	0.001	2.32	1.40–3.88
Age	0.01 (0.03)	NS	1.00	0.94–1.06
Partner's smoking status				
Partner non-smoker	–0.29 (0.64)	NS	0.75	0.21–2.67
Partner occasional smoker	0.20 (0.36)	NS	1.22	0.60–2.49
Partner daily smoker	Reference			
Parity				
Nulliparous	–0.52 (0.37)	NS	0.59	0.28–1.24
Semiparous	Reference			
Daily smoker vs. non-smoker				
Intercept	0.16 (1.05)	NS		
Denial	2.15 (0.29)	<0.001	8.59	4.88–15.13
Age	–0.01 (0.03)	NS	0.99	0.93–1.06
Partner's smoking status				
Partner non-smoker	–0.95 (0.85)	NS	0.38	0.73–2.06
Partner occasional smoker	0.56 (0.39)	NS	1.76	0.80–3.84
Partner daily smoker	Reference			
Parity				
Nulliparous	−0.76 (0.42)	NS	0.46	0.21–1.06
Semiparous	Reference			

Note: $R^2 = 0.37$ (Cox & Snell); 0.42 (Nagelkerke); 0.21 (McFadden).

smokers. Women who reported quitting during pregnancy showed lower denial of risk. We also found that denial was associated with smoking status even when age, education, parity and the partner's smoking status were controlled for.

Although being highly dependent on nicotine is definitely one of the most important factors in not quitting smoking during pregnancy, taking results such as those mentioned earlier into consideration, we observed that risk perception seems to be another major determinant of pregnant women's smoking behavior. We assume that an increase of nicotine dependence can parallel increased denial.

Intervention programs for pregnant smokers should deal with risk perception along with other issues such as nicotine dependence. It is important not to stress or increase the women's sense of guilt, but to inform them correctly not only about the adverse health outcomes of smoking during pregnancy, but also about their opportunities for quitting smoking. Interventions should focus on motivational factors that promote non-smoking, and help women cope with related issues. Because the partner's smoking behavior could have a major role in pregnant women's smoking status, this has also to be taken into consideration when interventions are planned.

There are several limitations of this study. First, because of its cross-sectional nature, causality of the relations cannot be determined. Second, our sample was not representative of Hungarian pregnant women; however, the present sample includes women of different socioeconomic status, the sample size is considerably large and the refusal rate is very small. Third, our questionnaire could not measure the women's real knowledge about smoking-related risks.

Future longitudinal research is necessary to explore whether smoking leads to greater denial as a defense mechanism or, inversely, greater denial leads to continued smoking during pregnancy.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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