



Pregnant Women Quit Smoking; What about Fathers? Survey Study in Bursa Region, Turkey

Yesim Uncu, Alis Ozcakir¹, Ilker Ercan², Nazan Bilgel¹, Gurkan Uncu³

Department of Family Medicine¹, Department of Biostatistics², and Department of Obstetrics and Gynecology³, School of Medicine, Uludag University, Turkey

Aim	To evaluate maternal and paternal smoking habits during pregnancy and determine their correlation with pregnancy complications and newborn status.
Methods	The study included 499 pregnant women who delivered at the Department of Obstetrics and Gynecology in Uludag University School of Medicine, over a period of one year. Women were interviewed about their smoking habits before and during pregnancy. They were also asked about the smoking habits of their spouses. The relationship between smoking habits and pregnancy complications and newborn status was researched. The outcomes measured included pregnancy complications, gestational age at the onset of labor, Apgar scores during labor, and fetal birth weight and height.
Results	The percentage of maternal smoking before pregnancy was 26.5% (n = 132) and decreased to 9.8% (n = 49) at the end of pregnancy, with 52.5% (n = 262) of the fathers who continued to smoke at home during their wife's pregnancy. Low birth weight and preterm delivery rate were significantly higher in maternal (n = 15 [30.6%], and n = 12 [24.5%], respectively) and paternal smoking groups (n = 52 [22.4%] and n = 54 [23.3%], respectively). Paternal smoking had no effect on intrauterine growth retardation (n = 10 [4.3%]) and prenatal death (n = 4 [1.7%]), although maternal smoking had such an effect (n = 7 [14.3%] and n = 3 [6.1%], respectively).
Conclusion	Maternal smoking is a major risk factor for preterm delivery, low birth weight, intrauterine growth retardation, and intrauterine death, but paternal smoking also carries risk for the fetus. During perinatal care, we should educate the expectant parents about the side effects, not only of maternal, but also of paternal smoking.

According to the most recent definition by the World Health Organization, a person smoking only one cigarette per day, if it is done regularly, is considered to be a tobacco addict, whereas a person who uses tobacco products irregularly, considered to be an "irregular smoker" (1). Cigarette smoking continues to be a (serious) threat for health on the global level. The number of cigarettes smoked per person tends to increase more and more each year.

Since the first description of the association between smoking during pregnancy and low

birth weight by Simpson in 1957, numerous studies have been performed and there have been reports that suggest an association between smoking and pregnancy complications such as spontaneous abortion, low birth weight, premature rupture of the membranes (PROM), intrauterine growth retardation, ablatio placentae, and prenatal death (2-4). In order to protect the fetus from adverse effects of tobacco smoke, paternal smoking and exposure to paternal cigarette smoke should also be kept in mind. However, further research on this subject is needed (5).

We aimed to investigate behavioral patterns of smoking in pregnant women and the effects of maternal and paternal smoking on the fetus.

Subjects and Methods

The study was conducted over a year period, with pregnant women who were admitted to our hospital for delivery. They were chosen using a table of randomized numbers and gave their written consent to participate in the study. The women were then interviewed face-to-face using a questionnaire designed to determine whether they smoked or not. If so, information about their smoking status, both before and during pregnancy, was obtained. In addition, socio-demographic characteristics, obstetrical history, and smoking status of their spouses were obtained. The exposure of pregnant women to cigarette smoke at the workplace was not assessed in this study. According to the law No. 4207, put into effect in 1996, smoking is prohibited indoors in the Turkish Republic. The law forced the employers to establish a separate smoking room for the employees. The exposure of pregnant women to smoke was assessed on the basis of exposure to cigarette smoke at home.

In addition, gestational week at the time of delivery, birth weight, and delivery complications of pregnant women were recorded. Low weight was defined as a birth weight under 2,500 g and intrauterine growth retardation as growth less than 10th percentile of what was expected for gestational age. Multiple pregnancies or cases with incomplete data were excluded.

The study was approved by Uludag University Ethics Committee.

Statistical analysis was performed using SPSS software package, version 11.0 (SPSS Inc., Chicago, IL, USA). Pregnant women were divided into three groups based on their exposure to cigarette smoke: maternal smoking group, non-smoking group, and paternal smoking group. Homogeneity of between-group variances in birth weights was analyzed by Levene statistics and, due to non-homogeneity of variances, comparisons between three or more groups were made by using the Kruskal-Wallis test. The Mann-Whitney *U* test was used for paired comparisons. Comparison of categorical data was made by χ^2 -test or Fisher exact test. After comparing the categorical data, effects of significant data were presented with their odds ratio (OR) values.

Results

The mean age of the 499 pregnant women enrolled in our study was 28.6 ± 4.9 years (mean \pm standard deviation, range: 17-52). The mean age in non-smoking pregnant women was 28.7 ± 5.1 (17-52) and 27.6 ± 4.2 (20-39) in smoking pregnant women. When we compared the educational level of the pregnant women, 20 (40.8%) smoking pregnant women had 8 years of education or less and 29 (59.2%) were high school or university graduates. The respective numbers in non-smoking pregnant women were 150 (33.5%) and 298 (66.5%). Two women did not answer the question. In both smoking and non-smoking group, periodic doctor visits were as high as 89.8% and 92.4%, respectively. There was no significant difference between smoking and non-smoking pregnant women with respect to educational level and age (Table 1).

The percentage of pregnant women smoking throughout the pregnancy decreased to 9.8% (Table 2). When the percentage of smoking spouses was assessed, 262 (52.5%) of 499 pregnant women said that their spouses smoked, 206 (41.3%) said that their spouses did not smoke and 31 (6.2%) did not answer the question. The women were divided into three groups based on their exposure to cigarette smoke; maternal smoking group, non-smoking group, and paternal smoking group. Paternal smoking group ($n=232$ [46.5%]), was the group where the women did not

Table 1. Some sociodemographic characteristics of pregnant women*

Parameter	No. (%) of women		P
	non-smoking (n=450)	smoking (n=49)	
Education:			
less than 8 years	150 (33.5)	20 (40.8)	0.304
high school or university graduates	298 (66.5)	29 (59.2)	
Regular visits to physician:			
yes	415 (92.4)	44 (89.8)	0.572
no	34 (7.6)	5 (10.2)	

*Age (mean \pm standard deviation) in the group of smokers was 28.7 ± 5.1 and in the group of non-smokers 27.6 ± 4.2 years.

Table 2. Women's smoking habits before and during pregnancy (n=499)

Smoking (No. of cigarettes/day)	No. (%) of women smoking		
	before pregnancy	during the first trimester	during the whole pregnancy
None	367 (73.5)	434 (87.0)	450 (90.2)
1-5	47 (9.4)	44 (8.8)	35 (7.0)
6-10	46 (9.2)	13 (2.6)	7 (1.4)
11-20	32 (6.4)	7 (1.4)	6 (1.2)
>20	7 (1.4)	1 (0.2)	1 (0.2)

smoke, but their spouses smoked at home. In the non-smoking group ($n=218$ [43.7%]), neither mothers nor fathers smoked, and in maternal smoking group ($n=49$ [9.8%]), the women smoked throughout whole pregnancy.

The mean birth weight of 499 infants was $3,082 \pm 34$ g. The mean birth weight of 28 low birth weight infants of non-smoking mothers was $3,173 \pm 47$ g and the mean birth weight of 15 low birth weight infants of smoking mothers was $3,011 \pm 47$ g. The mean birth weight of 52 low birth weight infants from the paternal smoking group was $3,051 \pm 51$ g (Table 3).

When smoking and non-smoking pregnant women were compared with respect to low birth weight, a statistically significant difference was found ($P<0.01$). The difference between non-smoking group and paternal smoking group was again significant ($P<0.01$). However, no significant difference was found between maternal smoking and paternal smoking group ($P>0.05$) (Table 4).

Out of the pregnant women, 93 (18.6%) delivered before the 37th gestational week. Preterm delivery occurred at a significantly higher rate in the maternal smoking group (24.5%), compared with the non-smoking group (12.4%), and in paternal smoking group (23.3%) compared with the non-smoking group ($P<0.05$). No significant difference was found between maternal and paternal smoking group (Table 4).

There were 8.7% ($n=19$) of cases with preeclampsia in the non-smoking group, 2% ($n=1$) in maternal smoking group, and 15.1% ($n=35$) in paternal smoking group (Table 3). Paternal smoking was found to be a risk factor for the occurrence of preeclampsia, compared with non-smoking group and maternal smoking group

($P<0.05$), but it was not significantly higher when it is compared with maternal smoking group and non-smokers ($P>0.05$) (Table 4).

Of a total of 27 infants with intrauterine growth retardation, 10 (37%) were from non-smoking group, 7 (26%) from maternal smoking group, and 10 (37%) were from paternal smoking group (Table 3). Maternal smoking conferred a risk for intrauterine growth retardation ($P<0.05$), but no significant effect of paternal smoking was observed (Table 4).

A total of 8 prenatal deaths occurred, 1 (12.5%) in the non-smoking group, 4 (50%) in paternal smoking group, and 3 (37.5%) in maternal smoking group (Table 3). Prenatal death occurred at a significantly higher rate among infants in maternal smoking group, compared with the infants in non-smoking group ($P<0.05$), but no such risk was found for infants in paternal smoking group ($P>0.05$) (Table 4).

No significant differences were found between maternal or paternal smoking group and non smoking group regarding the other complications (Table 4).

Discussion

The percentage of smoking among women before pregnancy was 26.5%, but about 1/3 of these women (62.8%) quit smoking after getting pregnant. However, a similar decline in smoking rates after conception was not seen for paternal smoking, and half of the spouses (52.5%) continued to smoke at home during their wife's pregnancy.

In Norway, 27% of pregnant women smoked and 36% of them had spouses who were smokers. In the USA, the smoking rate was report-

Table 3. Characteristics of gestational complications according to smoking habits

Gestational complications	No. (%)* of gestational complications			
	non-smoking group (n=218)	maternal smoking group (n=49)	paternal smoking group (n=232)	total (n=499)
Low birth weight†	28 (29.5)	15 (15.8)	52 (54.7)	95 (100.0)
Preterm delivery†	27 (29.0)	12 (13.0)	54 (58.0)	93 (100.0)
Preeclampsia†	19 (34.6)	1 (1.8)	35 (63.6)	55 (100.0)
Premature rupture of membrane	7 (25.9)	4 (14.8)	16 (59.3)	27 (100.0)
Intrauterine growth retardation†	10 (37.0)	7 (26.0)	10 (37.0)	27 (100.0)
Carbohydrate intolerance	10 (45.5)	2 (9.0)	10 (45.5)	22 (100.0)
Congenital abnormalities	2 (25.0)	2 (25.0)	4 (50.0)	8 (100.0)
Prenatal death†	1 (12.5)	3 (37.5)	4 (50.0)	8 (100.0)
Oligohydramnios	3 (42.9)	1 (14.2)	3 (42.9)	7 (100.0)
Ablatio placentae	2 (33.3)	1 (16.7)	3 (50.0)	6 (100.0)
Placenta praevia	4 (80.0)	1 (20.0)	-	5 (100.0)

*Row percentage.

†Statistically significant differences, χ^2 -test.

Table 4. Odds ratio (OR) with 95% confidence intervals (CI) and *P* values of gestational complications in relation to smoking habit

Gestational complications	Referents	Risk	OR	95% CI	<i>P</i> *
Low birth weight	non-smoking group	paternal smoking group	1.96	1.15-3.34	0.009
	non-smoking group	maternal smoking group	2.99	1.36-6.56	0.002
	paternal smoking group	maternal smoking group	-	-	0.209
Preterm delivery	non-smoking group	paternal smoking group	2.15	1.26-3.67	0.002
	non-smoking group	maternal smoking group	2.29	1.00-5.24	0.030
	paternal smoking group	maternal smoking group	-	-	0.855
Preeclampsia	non-smoking group	paternal smoking group	1.86	1.00-3.51	0.038
	maternal smoking group	paternal smoking group	8.53	1.21-171.49	0.013
	non-smoking group	maternal smoking group	-	-	0.138
Premature rupture of membrane	non-smoking group	maternal smoking group	-	-	0.122
	non-smoking group	paternal smoking group	-	-	0.076
	maternal smoking group	paternal smoking group	-	-	0.760
Intrauterine growth retardation	non-smoking group	maternal smoking group	3.47	1.11-10.62	0.020
	paternal smoking group	maternal smoking group	3.70	1.19-11.33	0.015
	non-smoking group	paternal smoking group	-	-	0.886
Carbohydrate intolerance	non-smoking group	maternal smoking group	-	-	1.000
	non-smoking group	paternal smoking group	-	-	0.886
	maternal smoking group	paternal smoking group	-	-	1.000
Congenital abnormalities	non-smoking group	maternal smoking group	-	-	0.154
	non-smoking group	paternal smoking group	-	-	0.686
	maternal smoking group	paternal smoking group	-	-	0.281
Prenatal death	non-smoking group	maternal smoking group	14.15	1.27-361.36	0.020
	paternal smoking group	maternal smoking group	-	-	0.104
	non-smoking group	paternal smoking group	-	-	0.373
Oligohydramnios	non-smoking group	maternal smoking group	-	-	0.557
	non-smoking group	paternal smoking group	-	-	1.000
	maternal smoking group	paternal smoking group	-	-	1.000
Ablatio placentae	non-smoking group	maternal smoking group	-	-	0.457
	non-smoking group	paternal smoking group	-	-	1.000
	maternal smoking group	paternal smoking group	-	-	0.537
Placenta praevia	non-smoking group	maternal smoking group	-	-	1.000
	non-smoking group	paternal smoking group	-	-	0.054
	maternal smoking group	paternal smoking group	-	-	0.174

* χ^2 -test or Fisher's exact test.

ed to be 23% in the general population and 20% among pregnant women (6,7). However, a study in Hong-Kong showed that 50.1% of pregnant women were passively exposed to cigarette smoke, mostly their spouses who were smoking (8).

In Turkey, there has been no research on smoking among pregnant women. In studies conducted in different social segments, the reported frequency of smoking among women varied between 11 and 58% (9-11).

To date, the association between low birth weight and smoking status of the pregnant women was assessed in many studies and it was demonstrated that smoking led to low birth weight (6,8,11,13,14). Although the effects of paternal smoking on pregnancy have not been extensively studied, the small number of studies yielded different results. Haug et al (7) noted that there was no substantial difference between birth weights of infants of non-smoking mothers and infants of mothers who were exposed to cigarette smoke (passive smokers), but who were not themselves smoking, and that passive smoking among pregnant women

was not a major health concern in Norway. In their meta-analysis, Kramer et al (11) reported that there was a 150-200 g difference in birth weight between the infants of passive smokers and non-smokers. In other studies, the exposure to cigarette smoke during pregnancy had an effect on infant birth weight and preterm delivery, especially when the fathers smoked (15-17). Jun Zhang et al (15) noted that passive smoking might be even more harmful and that this could be related to faster metabolizing of nicotine by active smokers.

We found a significantly higher rate of low birth weight among infants of smoking mothers and paternal smokers, compared with infants of pregnant women who were not exposed to cigarette smoke. The mean difference in birth weight of 161 g was found between infants of smoking and non-smoking mothers. The mean difference in birth weight of 122 g was found between infants of non-smoking mothers and infants of mothers who were exposed to their spouses' smoke.

Like low birth weight or intrauterine growth retardation, preterm delivery is another

complication allegedly closely associated with smoking. Studies showed that maternal smoking increased the chance of preterm delivery (18). Ahlborg et al (19) demonstrated the association between preterm delivery and passive exposure to cigarette smoke.

Smoking and exposure to smoke increased the risk of preterm delivery about twofold. There were 93 out of 499 women who had a preterm delivery, and 54 (58%) of these 93 deliveries were in the paternal smoking group, whereas 12 (13%) were in the maternal smoking group.

There are studies showing that the frequency of carbohydrate intolerance, oligohydramnios, intrauterine growth retardation, ablatio placentae, placenta praevia, premature rupture of the membranes perinatal death, and congenital anomaly during pregnancy increased with cigarette smoking (17,20). We did not find any association between these complications and paternal smoking, although intrauterine growth retardation and prenatal death were observed at a significantly higher rate in maternal smoking group. We also did not find any significant association between other complications and maternal or paternal smoking. Studies suggest an association between the complications of pregnancy and the number of cigarettes smoked by pregnant women (21). The association between paternal smoking and pregnancy complications other than low birth weight or preterm delivery has not been studied until now. We believe that the duration and quantity of passive cigarette smoking also affects the occurrence of complications in pregnancy. In most of the studies that assessed the association between preeclampsia and cigarette smoking, it was argued that smoking decreased the incidence of preeclampsia but there are a few studies advocating the opposite opinion (22). In our study, active cigarette smoking was not a risk factor for the occurrence of preeclampsia, but paternal smoking was established as a risk factor for preeclampsia. Preeclampsia was observed 2 to 8 times more frequently in paternal smoking group than in non-smoking group. Although these findings seem contradictory, this could have been a result of differences in nicotine metabolism among active and passive smokers and desensitization of nicotinic receptors. Since passive smoking has not been well studied, further studies exploring different aspects would be extremely valuable.

Whereas numerous studies showed that smoking during pregnancy increased the occurrence of many pregnancy complications, only one-third of pregnant women quit smoking during their pregnancy (6,17). However, it was observed that there was not enough awareness that paternal smoking could cause similar adverse effects. Smoking is generally a part of the partnership and a change in the spouse's life-style after conception may be difficult, but the spouse's continued smoking habit does have a direct adverse effect on the fetus. Another unfavorable effect of paternal smoking is that it decreases the chance that the pregnant woman will quit smoking.

In conclusion, smoking during pregnancy increased the possibility of a preterm delivery, low birth weight, and prenatal death, but a low or moderate level of smoking did not confer a risk for other pregnancy complications. Another important result of this study was that paternal smoking during pregnancy could also lead to pregnancy complications. The adverse effects of smoking on pregnancy should be discussed with pregnant women, as well as with their spouses, during regular check-ups. They should be educated about the adverse effects of exposure to cigarette smoke during pregnancy.

Acknowledgment

The study was presented at the 17th World Conference of Family Doctors, WONCA, 2004 in Orlando/USA, on 14 October, 2004.

References

- 1 Kaufman N, Yach D. Tobacco control – challenges and prospects. *Bull World Health Organ.* 2000;78:867.
- 2 Simpson WJ. A preliminary report on cigarette smoking and the incidence of prematurity. *Am J Obstet Gynecol.* 1957;73:807-15.
- 3 Corrao MA, Guindon GE, Cokkinides V, Sharma N. Building the evidence base for global tobacco control. *Bull World Health Organ.* 2000;78:884-90.
- 4 Hughes EG, Brennan BG. Does cigarette smoking impair natural or assisted fecundity? *Fertil Steril.* 1996;66:679-89.
- 5 DiClemente CC, Dolan-Mullen P, Windsor RA. The process of pregnancy smoking cessation: implications for interventions. *Tob Control.* 2000;9 Suppl 3:16-21.
- 6 Nusbaum ML, Gordon M, Nusbaum D, McCarthy MA, Vasilakis D. Smoke alarm: a review of the clinical impact of smoking on women. *Prim Care Update Ob Gyns.* 2000;7:207-214.
- 7 Haug K, Irgens LM, Skjaerven R, Markestad T, Baste V, Schreuder P. Maternal smoking and birthweight: effect

- modification of period, maternal age and paternal smoking. *Acta Obstet Gynecol Scand.* 2000;79:485-9.
- 8 Leung GM, Ho LM, Lam TH. Maternal, paternal and environmental tobacco smoking and breast feeding. *Paediatr Perinat Epidemiol.* 2002;16:236-45.
- 9 Satman I, Yilmaz T, Sengul A, Salman S, Salman F, Uygur S, et al. Population-based study of diabetes and risk characteristics in Turkey: results of the turkish diabetes epidemiology study (TURDEP). *Diabetes Care.* 2002;25:1551-6.
- 10 Onat A. Risk factors and cardiovascular disease in Turkey. *Atherosclerosis.* 2001;156:1-10.
- 11 Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. *Bull World Health Organ.* 1987;65:663-737.
- 12 Saatci E, Inan S, Bozdemir N, Akpınar E, Ergun G. Predictors of smoking behavior of first year university students: questionnaire survey. *Croat Med J.* 2004;45:76-9.
- 13 Backe B. Maternal smoking and age. Effect on birthweight and risk for small-for-gestational age births. *Acta Obstet Gynecol Scand.* 1993;72:172-6.
- 14 Brooke OG, Anderson HR, Bland JM, Peacock JL, Stewart CM. Effects on birth weight of smoking, alcohol, caffeine, socioeconomic factors, and psychosocial stress. *BMJ.* 1989;298:795-801.
- 15 Zhang J, Ratcliffe JM. Paternal smoking and birthweight in Shanghai. *Am J Public Health.* 1993;83:207-10.
- 16 Martinez FD, Wright AL, Taussig LM. The effect of paternal smoking on the birthweight of newborns whose mothers did not smoke. *Group Health Medical Associates.* *Am J Public Health.* 1994;84:1489-91.
- 17 Andres RL, Day MC. Perinatal complications associated with maternal tobacco use. *Semin Neonatol.* 2000;5:231-41.
- 18 Shah NR, Bracken MB. A systematic review and meta-analysis of prospective studies on the association between maternal cigarette smoking and preterm delivery. *Am J Obstet Gynecol.* 2000;182:465-72.
- 19 Ahlborg G Jr, Bodin L. Tobacco smoke exposure and pregnancy outcome among working women. A prospective study at prenatal care centers in Orebro County, Sweden. *Am J Epidemiol.* 1991;133:338-47.
- 20 Conde-Agudelo A, Althabe F, Belizan JM, Kafury-Goeta AC. Cigarette smoking during pregnancy and risk of preeclampsia: a systematic review. *Am J Obstet Gynecol.* 1999;181:1026-35.
- 21 Habek D, Habek JC, Ivanisevic M, Djelmis J. Fetal tobacco syndrome and perinatal outcome. *Fetal Diagn Ther.* 2002;17:367-71.
- 22 Kobashi G, Ohta K, Hata A, Shido K, Yamada H, Fujimoto S, et al. An association between maternal smoking and preeclampsia in Japanese women. *Semin Thromb Hemost.* 2002;28:507-10.

Received: May 5, 2005

Accepted: June 26, 2005

Correspondence to:

Yesim Uncu

Uludag University, School of Medicine,
Department of Family Medicine

Gorukle/Bursa 16069, Turkey

yesimuncu@uludag.edu.tr