Smoking and preterm labor

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Summary

The aim of the present study was to investigate the role of maternal smoking during pregnancy in the occurrence of the premature rupture of the membranes (PROM) and premature labor.

Our study consisted of 1,133 women of which 283 (group A) had premature labor (gestation ≤ 37 weeks), while 850 (group B) had term labor (gestation > 37 weeks). The two groups did not differ in their socioeconomic status and did not include women with serious complications during pregnancy.

There were no apparent effects of smoking on the length of gestation. However, our results showed that smoking had a marked effect on preterm labor of less than 32 weeks; we also found a statistically significant correlation between PROM in premature deliveries and smoking during pregnancy, but no gradient was observed between the number of cigarettes smoked per day and the risk for PROM in cases of premature labor.

We conclude that smoking during pregnancy raises the risk of delivery before the 32nd week, as well as the PROM in premature deliveries, independently of the number of cigarettes smoked per day.

Key words: Smoking; Preterm labor; Premature rupture of the membranes.

Introduction

It has been proven that maternal smoking during pregnancy correlates with delivery of low birth weight infants [9, 13]. Many authors have also suggested that smoking is associated with premature rupture of the membranes (PROM) and premature labor [1, 3, 4, 5, 11]. Nevertheless, a number of recent studies have come to question this correlation [7, 8]. Prematurity constitutes one of the most important reasons relating to increased neonatal and infantile morbidity and mortality; this, as well as the fact that the number of smokers among women of reproductive age has increased, make it essential to determine the relation between smoking during pregnancy and premature delivery.

The present study was aimed at investigating the role of maternal smoking during pregnancy in the occurrence of PROM and premature labor.

Material and Methods

The study took place at the 2nd Department of Obstetrics and Gynecology of Athens University in Areteion Hospital. Our material consisted of 1,133 primiparous women of which 283 (group A) had premature labor (gestation ≤ 37 wks) while 850 (group B) had term labor (gestation > 37 wks). The average age was 24±3.8 yrs for group A and 22±5.4 yrs for group B. The two groups did not differ significantly in their socioeconomic status.

Women with serious complications of pregnancy (hypertension, preeclampsia, diabetes mellitus or placenta previa) were not included. Furthermore, none of our patients had a history of criminal or induced abortion.

The 283 women with premature labor were divided in two subgroups: those with labor before 32 wks (n=64) and those with labor between 32 and 37 wks (n=219).

All our patients were asked about their smoking habits during pregnancy and were divided into smokers and non-smokers. Smokers were subdivided in the following groups according to the number of cigarettes they smoked during pregnancy: (1) < 5 cigarettes/day, (2) 5-10 cigarettes/day (3) >10 cigarettes/day.

From the hospital files we obtained the data regarding gestational age at delivery (based on dates and ultrasound findings and the occurrence of PROM).

Statistical analysis of the data collected was done using the X^2-test with Yates' correction.

Results

Tables 1 and 2 present the data comparing premature to term deliveries according to whether or not the mother was a smoker and according to the number of cigarettes smoked per day. Thus, out of 283 women with premature

Table 1. — *Comparison of premature to term deliveries among smokers and non-smokers*

Week's Gestation	Age		Non-smokers		Smokers	
	n	mean±SD	n	%	n	%
≤ 37	283	24±3.8*	210	(74.2)	73	(25.8)*
> 37	850	22±5.4	654	(76.9)	196	(23.1)*
	1133		864		269	

* N.S.: (No significant difference)

Table 2. — *Comparison of premature to term deliveries according to the number of cigarettes smoked per day*

No of cigarettes per day	0		< 5		5-10		> 10	
Weeks per day	n	%	n	%	n	%	n	%
≤ 37	210	(74.2)*	18	(24.7)*	32	(43.8)*	23	(31.5)*
> 37	654	(76.9)	42	(21.4)	108	(55.1)	46	(23.5)

* N.S.: (No significant difference)

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deliveries, 74.2% (n=210) were non-smokers, while 25.8% (n=73) smoked during pregnancy. The respective percentages for term deliveries were 76.9% (n=654) for non-smokers and 23.1% for smokers. Statistical analysis did not reveal a statistically significant difference between smokers and non-smokers in respect to premature or term delivery.

Out of the 64 women with premature labor at gestational age <32 wks, 53.1% (n=34) were non-smokers, while 46.9% (n=30) were smokers. In the case of preterm labor at a gestational age between 32-37 weeks, 80.3% (n=176) women were non-smokers while 13.6% (n=43) were smokers (Table 3). Statistical analysis of the data presented in the above-mentioned table, indicates a statistically significant correlation ($p<0.001$) between premature labor at gestational age <32 wks and maternal smoking during pregnancy. However, in group A patients no gradient between the number of cigarettes smoked per day and the risk for premature labor at < 32 wks was found.

Tables 5 and 6 present women with premature labor comparing women with PROM that led to premature delivery to those who delivered prematurely without PROM, all in respect to whether they were smokers or non-smokers, and the number of cigarettes smoked per day. Thus, in 84 cases of PROM 64.3% (n=54) were non-smokers and 35.7% (n=30) were smokers. The respective percentages for premature delivery without PROM were 78.4% (n=156) for non-smokers and 21.6% (n=43) for smokers. The statistical analysis of these data showed a significant correlation between premature deliveries and smoking in pregnancies with PROM, but no gradient was observed between the number of cigarettes smoked per day and the risk for PROM in cases of premature labor.

Table 3. — *Smokers and non-smokers in the group of premature labor*

Weeks' Gestation	Non-smokers		Smokers	
	n	%	n	%
≤ 32	34	(53.1)	30	(46.9)*
32-37	176	(80.3)	43	(13.6)

p* < 0.001

Table 4. — *Data regarding the number of cigarettes smoked per day and the gestational age of premature labor*

No of cigarettes per day	0		≤ 5		5-10		> 10	
Weeks' gestation	n	%	n	%	n	%	n	%
< 32	34	(16.2)*	8	(11.0)*	14	(19.2)*	8	(11.0)*
32-37	176	(83.8)	10	(13.7)	18	(24.6)	15	(20.5)

* N.S.

Table 5. — *PROM between smokers and non-smokers in the group of women with premature labor*

	Non-smokers		Smokers	
	n	%	n	%
PROM	54	(64.3)	30	(35.7)*
No-PROM	156	(78.4)	43	(21.6)

* p < 0.05

Table 6. — *PROM among women with premature labor and number of cigarettes smoked per day*

No of cigarettes per day	0		< 5		5-10		> 10	
Weeks per day	n	%	n	%	n	%	n	%
PROM	54	(25.7)*	7	(9.6)*	13	(17.8)*	10	(13.7)*
No-PROM	156	(74.3)	11	(15.1)	19	(26.0)	13	(17.8)

* N.S.

Discussion

The overall incidence of preterm delivery (gestation ≤ 37 wks) is about 8% in Caucasian pregnant women [14]. Maternal smoking during pregnancy is one of the factors that has been widely investigated as to its effect on PROM and premature labor.

It has been well established that smoking during pregnancy is associated with intrauterine growth retardation and delivery of low-birth weight neonates [7, 9].

Several studies have suggested that smoking during pregnancy correlates to PROM and premature labor [1, 3, 4, 5, 11]; of the more recent ones it is worth mentioning that by Guinn *et al.* [5] who, in an attempt to create a risk-scoring system for preterm labor in nulliparas, reached the conclusion that smoking during pregnancy is independently associated with spontaneous preterm birth. Another study (Douchette *et al.* [2]) assessed the relationship between maternal respiratory problems and preterm labor and delivery in a cohort of 3,891 women who delivered a singleton live baby; they found that women who reported a history of asthma had a higher risk of preterm labor (relative risk = 2.33, 95% confidence interval (CI) = 1.03-5.26). The analogous odds ratio estimate for women with respiratory problems during pregnancy was 2.16 (95% CI=1.14-4.10), given the association of smoking to asthma and respiratory problems in general, we can deduce its correlation with prematurity.

Nevertheless, a number of recent studies raise the question of a correlation between maternal smoking during pregnancy and preterm delivery. Peacock *et al.* [7], in a recent prospective study that aimed at examining the relation between preterm birth and socioeconomical and physiological factors as well as smoking, alcohol and caffeine consumption, concluded that smoking did not correlate with prematurity with the exception of delivery before 32 wks. Roberts *et al.* [8] reached the same conclusions in a retrospective study.

The results of our study tend to confirm the conclusion reached by the second group of authors; in a population of 1,133 women we found that smoking during pregnancy did not correlate with premature delivery, except in case of very premature birth (< 32 wks). Of course, the issue is still open and it is expected that further epidemiologic as well as experimental studies will help establish a final conclusion on this issue.

Our results indicate that smoking during pregnancy correlates with preterm PROM. This conclusion is in accordance with what has been published until now. Ekwo *et al.* [3] found that exposure to cigarette smoke

(even due to household smoking) during pregnancy independently increased the risk for PROM. Williams *et al.* [12] suggested that women who reported ever having smoked during pregnancy have a relative risk of 1.6 (95% Cl = 1.1-2.4) for PROM as compared to non-smokers.

The exact pathophysiology events that correlate smoking to preterm labor and PROM remain unknown, although a number of attempts have been made to determine them. Narahara and Johnston [6] found that cigarette smoke extract contains a potent inhibitor of platelet-activating factor-acetylhydrolase secreted by decidual macrophages. Spinillo *et al.* [10] after conducting an epidemiologic study, implicate smoking in placental abruption in preterm deliveries.

The findings of our study bring us to the conclusion that smoking during pregnancy leads to very premature deliveries (< 32 wks) and to PROM. Not finding a gradient between the above-mentioned complications and the number of cigarettes smoked per day should make us cautious. We believe that further investigation involving a larger number of cases in necessary in order to reach a more definite conclusion on this issue.

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