The effect of passive inhalation of nicotine smoke on the course and outcome of pregnancy

MARZENA BUCHOLC¹, JAN OLESZCZUK²

Abstract
There is some evidence in the literature that the exposure to passive smoking contributes to the premature delivery. Therefore the research has been undertaken to find out if passive inhalation of tobacco smoke affects the course and outcome of the delivery and what factors are involved. Following investigation tools have been applied: standardized EUROPOP GROUP poll questionnaire with own adjustments to Polish conditions and self designed poll questionnaire concerning woman’s lifestyle during pregnancy and medical records analysis. The study was conducted in the Clinic of Obstetrics and Perinatal Medicine at Self-Dependent Public Clinical Hospital No 4 in Lublin. The study group consisted of 185 respondents, whose pregnancy ended between 22 and 36 completed gestational week, calculated from the first day of last menstrual bleeding. Passive inhalation of tobacco smoke in the group of women who experienced premature delivery seems to be related to their level of education and has created the need for hospitalization during pregnancy. Women with risk factors in the obstetric history more often avoided the exposure to ETS during pregnancy. There was no relationship between the exposure to passive smoking during pregnancy and premature delivery (up to 32th week or later).

Key words: passive inhalation of nicotine smoke, preterm delivery

The problem of tobacco smoking is considered from various points of view depending on the area of interest of particular researchers. The effects of cigarette smoking are connected with its two aspects: addiction to nicotine and active and passive exposure of the body to more than 4000 harmful chemicals found in nicotine smoke [2, 8, 9, 15]. One of the most controversial factors affecting the course and duration of pregnancy is passive inhalation of tobacco smoke called environmental exposure to tobacco smoke (ETS). ETS consists of tobacco smoke produced at intervals between drags as a result of smoldering (a side wisp of smoke – BS), and smoke inhaled by smokers [8, 15]. Persons in the environment filled with cigarette smoke are exposed to the effect of harmful substances contained in this smoke much more than smokers themselves. Chemicals that are found in high concentration in BS are carbon oxide (3-5 fold/times, ammonia (40-170 times), volatile nitrozamine (6-100 times) and formaldehyde (50 times) [8, 15]. Even if a pregnant woman does not smoke, she is exposed to cigarette smoke at a workplace or at home because cigarette smoking is very common in Poland. There is some evidence in the literature [1, 3, 5, 10-14, 17-19] that the exposure to passive smoking contributes to the premature delivery.

Therefore the research has been undertaken to find out if passive inhalation of tobacco smoke affects the course and outcome of the delivery and what factors are involved.

Material and methods
Following investigation tools have been applied: standardized EUROPOP GROUP poll questionnaire with own adjustments to Polish conditions and self designed poll questionnaire concerning woman’s lifestyle during pregnancy. Medical records analysis extracted with EUROPOP GROUP questionnaire aimed to: woman’s gynecological and obstetrical history assessment, establishment of pregnancy duration, pathological signs occurring in the course of pregnancy, mode of delivery, neonate data.

The study was conducted in the Clinic of Obstetrics and Perinatal Medicine at Self-Dependent Public Clinical Hospital No 4 in Lublin, in the period from January 2002 to January 2003. The pilot study had been carried out beforehand, which allowed to verify the questions contained in the own investigation tool.

The study group consisted of 185 respondents, whose pregnancy ended between 22 and 36 completed gestational weeks, calculated from the first day of last menstrual bleeding. The age of the respondents was in the range of 18-48 years, including 119 (64,3%) at the age of 30 or younger, whereas 66 (35,7%) were older. The educational level of respondents varied – 105 (56,8%) middle or higher, 80 (43,2%) basic professional or basic. Pregnancy at its end, according to obstetrical, ultrasonographical and neonatal assessment, continued for 22 to 36 weeks, with the median value of 32 weeks. In more than a half of women (105, i.e 56,8%) pregnancy ended before 32 week, and in the remaining 80 (43,2%) after this period.

Obtained study results were subjected to statistical analysis. Analysed parameters, measured on the nominal scale, were determined according to the number and percentage. To detect existing differences or dependence between analysed qualitative features homogeneity χ² or independence χ² tests were employed. Conclusive error was assumed 5% and a significance level connected with it $p < 0.05$; indicating statistically significant differences or relationship.

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Statistical analyses were carried out by means of STATISTICA V.6.1 computer programme (Stat Soft, Poland) [16].

Results

Living with a smoking husband was mentioned by 71 (38.4%) pregnant women and 114 (61.6%) said that their husband did not smoke. Women with a smoking husband were with him every day (29 women, 40.8%), most of the days of the week (27 women, 38.1%) or sporadically (15 women, 21.1%), so the exposure was 4 hours a day on average (25 percentile – 2, 75 percentile – 6).

Staying in the room where other people (apart from the husband) smoked cigarettes was admitted by 112 (60.5%) women, and 67 (59.8%) women were exposed sporadically, 25 (22.3%) women most of the days of the week and 20 women (17.9%) every day. The exposure was 2 hours a day on average (25 percentile – 1, 75 percentile – 5). The remaining 73 (39.5%) women said that they were not exposed to passive smoking. As many as 133 (71.9%) women were exposed to tobacco smoke inhalation at home or in other places and the remaining 52 (28.1%) women were not exposed. The relation between the exposure to passive smoking in pregnancy and analysed variables (education, place of living) is presented in Table 1.

More women (70, that is 87.5%) with primary or vocational education than with secondary or college education (63, that is 60.0%) were exposed to passive smoking.

A reverse ratio was found among non exposed women (10, that is 12.5% and 42, that is 40.0%) respectively. Differences between study groups were statistically highly significant ($p = 0.00004$).

In the study group there were 55 women (29.7%) with risk factors in the obstetric history (early and/or late previous miscarriages, premature delivery), and 130 women (70.3%) did not present risk factors. From the obstetric, ultrasound and neonatal point of view the duration of pregnancy at the time of the delivery was 22 to 36 weeks of pregnancy, median was 32.0. In more than a half of these women (105, that is 56.8%) pregnancy ended before the 32$^{th}$ week, and in the remaining 80 women (43.2%) after this time. A large majority (144 women, 77.8%) required hospitalization and medical treatment in the course of pregnancy. The remaining 41 women (22.2%) were not treated with drugs and presented themselves in hospital with intensive contractions. More data regarding this problem in relation to particular factors is presented in Table 2.

The presented data reveal that significantly more often ($p = 0.04$) women without risk factors in the obstetric history were exposed to passive smoking. The reverse tendency was observed among women with risk factors. The relationship between hospitalization in the course of pregnancy and the exposure to passive smoking was found to be close to significance ($p = 0.07$). Women exposed to tobacco smoke were hospitalized more often. The term of the delivery was not affected in this case.

### Table 1. The exposure to passive smoking in pregnancy in relation to other variables

<table>
<thead>
<tr>
<th>Exposure to passive smoking in pregnancy</th>
<th>Education</th>
<th>Place of living</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Secondary or college $N=105$ (56.8%)</td>
<td>Primary or vocational $N=80$ (43.2%)</td>
</tr>
<tr>
<td></td>
<td>Town $N=111$ (60.0%)</td>
<td>Village $N=74$ (40.0%)</td>
</tr>
<tr>
<td>No $N=52$ (28.1%)</td>
<td>$n$</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>40.0</td>
</tr>
<tr>
<td>Yes $N=133$ (71.9%)</td>
<td>63</td>
<td>60.0</td>
</tr>
<tr>
<td>Significance</td>
<td>$\chi^2 = 16.9$</td>
<td>$p = 0.00004$</td>
</tr>
</tbody>
</table>

### Table 2. The exposure to passive smoking in pregnancy in relation to the obstetric history, hospitalization and term of delivery

<table>
<thead>
<tr>
<th>Exposure to passive smoking in pregnancy</th>
<th>Obstetric history</th>
<th>Hospitalisation in pregnancy</th>
<th>Term of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With risk factors $N=130$ (70.3%)</td>
<td>No risk factors $N=55$ (9.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes $N=144$ (77.8%)</td>
<td>No $N=41$ (22.2%)</td>
<td>Up to 32$^{nd}$ week $N=105$ (56.8%)</td>
</tr>
<tr>
<td>No $N=52$ (28.1%)</td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>23.8</td>
<td>21</td>
</tr>
<tr>
<td>Yes $N=133$ (71.9%)</td>
<td>99</td>
<td>76.2</td>
<td>34</td>
</tr>
<tr>
<td>Significance</td>
<td>$\chi^2 = 3.93$</td>
<td>$p = 0.04$</td>
<td>$\chi^2 = 3.10$</td>
</tr>
</tbody>
</table>
**Discussion**

The education of the mother may be a factor determining the premature delivery. Astolfi and Zonta [4] found that the delivery before the 37th week of pregnancy occurred four times more often among poorly educated women. Similar observations are presented in the studies by Cnattingius [5], Meis [13], Kyrklund-Blomberg [11]. There are many studies revealing that the level of education affects also other factors connected with the course and term of the delivery. Studies by Farley [7] show that poor education of mother was an important factor predictive of birth defect in neural tube. It is thought that poor education has a negative effect on the behaviour of mother during her pregnancy e.g. cigarette smoking or drinking alcohol, which has been proved by Wisborg et al. [18], Szamotulska [17] and Phung [14]. This thesis was confirmed in our study because women exposed to passive inhalation of tobacco smoke received only primary or vocational education. It seems that a quality of education produces awareness among women which, in turn, affects the course and outcome of pregnancy. Therefore this fact should be an implication for a pre-natal care, especially paying special attention to poorly educated pregnant women.

The effect of nicotine on the duration of pregnancy and the condition of an infant is presented also in the context of environmental exposure to tobacco smoke [1, 3, 5, 10-14, 17-19]. Florek et al. [9] discovered an increased risk for premature delivery in women exposed to ETS. In the group of women exposed to passive smoking Anholcer et al. [3] revealed statistically significant differences between full term deliveries and premature deliveries. In the population of studied women the majority was exposed the inhalation of nicotine smoke during pregnancy, both at home and outside home. This did not affect the term of delivery before 32 or up to 37 week of pregnancy, which was consistent with the results of the study by Leonardi-Bee et al. [12]. It was found, however, that women exposed to passive smoking required hospitalization more often during pregnancy. It seems positive and promising that women with risk factors in obstetric history avoided being exposed to tobacco smoke, so it may be concluded that they were aware of the health hazard connected with passive smoking.

**Conclusions**

Passive inhalation of tobacco smoke in the group of women who experienced premature delivery seems to be related to their level of education and has created the need for hospitalization during pregnancy. Women with risk factors in the obstetric history more often avoided the exposure to ETS during pregnancy.

There was no relationship between the exposure to passive smoking during pregnancy and premature delivery (up to 32th week or later).

**References**