The impact of secondhand smoke on neonatal biometric outcomes and gestational age in Hungary

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Summary

Introduction. Prenatal secondhand tobacco smoke (SHS) is a substantial problem in Hungary’s four underdeveloped northeastern counties, where a considerable ethnic Roma population resides.

Aim. We aimed to explore the correlation of at-home SHS exposure and consequences on neonatal outcomes in the four Hungary’s northeastern counties.

Material and methods. Data were collected from mothers in Hungary’s four underdeveloped counties who were delivered of live born babies in years 2009-2011 (n = 16,859). The neonates’ biometric parameters (birth weight, body length, head and chest circumference, gestational age) were obtained from medical records. Demographic and sociocultural data of mothers were obtained from in-person surveys. The response rate was 74.5%. We conducted binary logistic regression analysis of maternal variables for SHS exposure, frequency analysis for central tendencies and dispersion and t-probes for comparing the means of neonatal measurements using significance level p < 0.05 (IBM-SPSS v. 23 software).

Results. In the non-smoking sample (n = 8,497), pregnant women exposed to SHS were typically less educated (OR = 3.32, 95% CI = 2.64-4.18), of Roma ethnicity (OR = 1.71, 95% CI = 1.36-2.15), living without amenities (OR = 1.70, 95% CI = 1.37-2.11) and of extramarital status (OR = 1.52, 95% CI = 1.27-1.82). The negative difference of birth weight following foetal SHS exposure was 154.9 grams (95% CI = -188.5 – -121.3), the difference of body length – 0.8 cm (95% CI = -1.06-0.6), and of head and chest circumference – 0.5 cm (95% CI = -0.6-0.3 and -0.7-0.3, respectively). Gestational age was shortened by mean 0.4 week.

Conclusions. At-home SHS exposure has an impact on biometric and obstetrical parameters of newborn babies. Tobacco cessation programs for pregnant women must also focus on lowering SHS exposure, especially in households with lower socio-economic status, where such exposure is prevalent.

Keywords: secondhand smoke during pregnancy, newborns’ biometric data, mothers’ social status

INTRODUCTION

Tobacco smoking is responsible for nearly 6 million deaths each year worldwide, including 600,000 non-smokers exposed to secondhand smoke (SHS) (1). An estimated 700,000 deaths are annually attributable to smoking in the European Union (EU) alone (2). Fourteen percent of non-smoking EU citizens are exposed at home to other people’s tobacco smoke every day or almost every day (3).

In Hungary, tobacco smoking imposes a significant strain on public health and on the national economy. Based on the representative studies conducted in the 2000s, the prevalence of regular and occasional smoking in Hungary’s adult population is 36-38%, which is one of the worst outcomes of all the European nations (4). In 2010, the direct and indirect expenditures caused by smoking accounted for more than 441 billion HUF in Hungary, which equals approximately 1.63 billion USD (5). Since the early 1990s, the Hungarian government enacted a series of anti-tobacco laws, such as the obligation to appoint separated smoking areas in workplaces (1993), banning advertising of tobacco products (1997) and prohibiting selling them to underage buyers (1999) (6). After 2004, when Hungary joined the EU, tax revenues rose substantially due to the increase of the excise taxes on tobacco products. By
2008, it mounted to 350 thousand millions HUF (approx. 1.3 billion USD), which accounted for 4% of the whole state budget (5). In 2012, Hungary implemented very strict legislation, banning smoking in all confined public places, such as restaurants, workplaces, health care and educational facilities, as well as in specific outdoor public places, including bus stops and playgrounds (7). Recent data suggest decreasing prevalence of smoking, as it was reported to be 29% in 2014 (8).

It is well-established that factors of the environment act on the maternal-foetal blood supply by influencing the haemodynamic and vascular functions of the mother, as well as the microstructure and function of the placenta. This way, maternal smoking during the pregnancy is harmful for mother and foetus alike (9). This leads to more frequent ectopic pregnancies, spontaneous abortions, abnormal placental adhesions, stillbirths, preterm birth and low-birth-weight babies and the occurrence of intrauterine growth restriction after repeated tobacco exposure (10, 11). Although SHS results in lower concentrations of harmful compounds than mainstream smoke, its harms, e.g., increased risk of sudden infant death syndrome, preterm birth and low birth weight, are also well-documented (12, 13). Thus, the health impact is similar to that of the active smoking and depends on the time of exposure and the SHS concentration caused by the smoking frequency of workplace colleagues and partners or relatives smoking in the pregnant women’s house. Non-smoking family members, mainly infants and children, are at a higher risk of SHS consequences (14).

AIM

The aim of this study was to describe the sociodemographic characteristics of women exposed to SHS in their houses and to evaluate the influence of SHS exposure on the neonatal gestational age and biometric data.

MATERIAL AND METHODS

Human subjects' approval of our survey was issued by the Ethics Committee of Semmelweis University in Budapest, Hungary (TUKEB 103/2009). This retrospective cohort study targeted all women that delivered of live born babies in Hungary’s four northeastern counties within the years 2009-2011 (n = 16,859). The target area is the most underdeveloped region of the country with a considerable Roma population. Data included neonates’ and mothers’ biometric data abstracted from medical records by local nurses of Maternity and Child Health Care (MCHC). MCHS also conducted questionnaire-based interviews among women (response rate 74.5%, n = 12,587). Questionnaires were excluded from this analysis if a big part of the data was missing (n = 35) or the women had twins and triplets (n = 81) due to the confounding influence of multiple births on gestational age and biometric data of the neonates.

Non-smoking status of mothers was defined if they did not smoke prior to the pregnancy (including never smokers and former smokers) or stopped smoking as soon as they had learned they were pregnant. It was asked if their husband or partner was a smoker. SHS was defined as at-home SHS exposition generated by regularly or occasionally smoking husband or partner in confined places of the household. We defined non-exposure as a situation when a woman had a non-smoking husband/partner or smoking husband/partner that never smoked in confined places of the household during the pregnancy.

Demographic data of the mothers included age (life-years), Body Mass Index calculated from the body weight and height found in medical records (BMI = body weight in kg divided by squared body height in meters), self-admitted education (basic: eight or less than eight classes, middle school, college or university), marital status (married, cohabitation, single, divorced). Dwellings were divided into following categories: having full amenities (central heating, connection to the water supply system and to the sewage system), having partial amenities (lacking of one of the three components mentioned above), and having no amenities (lack of all the components). Dichotomous variables were determined by dividing the patients into groups according to the age: under 18 and 18 or over years of age, to BMI: underweight and normal, overweight and obese (≥18.49 vs. ≥18.5), to education: eight or less basic classes and more than eight basic classes, to marital status: cohabitation, single, divorced and married. Two variables were originally dichotomous as being Roma and non-Roma by self-identification, and settlement type classified as rural and non-rural.

Neonatal biometric data (body weight in grams, body length, head and chest circumference in centimeters) and gestational time (in weeks) were recorded by the MCHS nurses using medical records.

Using IBM-SPSS v. 23 software, we conducted a binary logistic regression analysis of sociodemographic characteristics of maternal-foetal SHS exposure with odds ratios (ORs) 95% confidence intervals (95% CI) as well as a frequency analysis of newborn babies’ biometric data indicating central tendency (means, medians, modes), dispersion (standard deviations) and independent samples t-tests for comparing the results between groups (mean differences, standard errors, 95% confidence intervals).

RESULTS

8,497 mothers have not smoked during their pregnancy. Half of the respondents reported that they had never smoked or had only smoked a single cigarette in their lifetime (50.3%). The overall prevalence of smoking during pregnancy was 26.8%. It is worth to note that it was almost two times higher in women who
self-identified as Roma (51.3%). 20.1% of the respondents were of Roma ethnicity. The age was from 13 to 47 years of age. 2.8% of the respondents were aged less than 18. The BMI ranged from 12.89 to 62.72, with 7.5% of respondents in the underweight category. 24.3% had only basic or less than basic education, 49.9% – medium, and 25.4% – higher education. 60.5% of the participants were married, 34.8% lived in cohabitation, and 4.7% were single. 49.4% of the respondents lived in rural areas, 50.6% in the cities. 72.9% of the participants had their houses equipped with full amenities, 15.4% with partial amenities, and 11.7% lived in households without amenities.

Table 1 shows the correlation of the maternal demographic and socioeconomic variables and the SHS exposure during pregnancy in non-smoking. Women with lower education were more than 3 times more likely to be exposed to SHS (OR = 3.32, 95% CI = 2.64-4.18). Roma ethnicity (OR = 1.71, 95% CI = 1.36-2.15) and lack of amenities (OR = 1.70, 95% CI = 1.37-2.11) also increased the risk of exposure. The type of settlement in the household also correlated with the SHS exposure, although the correlation was milder than for the factors mentioned above (OR = 1.19, 95% CI = 1.01-1.41). Maternal age proved not to be a significant factor (p = 0.161).

Table 2 shows the newborns’ basic biometric data, including birth weight in grams, body length, head and chest circumference in centimetres and gestational age. All of the above mentioned variables followed the normal distribution pattern, which was also confirmed by the frequency analysis, as median and mode values were equal for the body length, head and chest circumference as well as gestational age (52 cm, 34 cm, 34 cm and 39 weeks). Mean and median values of the birth weight remained comparable (3,305.5 and 3,300.0, respectively) and the mode was only 100 grams smaller.

Table 3 compares the mean difference values of the neonatal birth weight (-154.9 grams), body length (-0.8 cm), head and chest circumference (-0.5 cm for both of the variables) and gestational age (-0.4 weeks) between the children of women exposed to SHS and those whose mothers were not exposed to passive smoking. All of the biometric data were significantly impacted by the SHS exposure (p < 0.001).

DISCUSSION

The risk of SHS exposure is dependant on woman’s demographic and social status and on her sociocultural environment. A study about passive smoking in India demonstrated that SHS exposure during pregnancy
Danish researchers examined the added impact of SHS outside and inside the household on the babies’ body length as well as head and chest circumference. The negative difference in body length was 0.8 cm, in head and chest circumference – 0.5 cm and 0.5 cm, respectively (21). In a study conducted in Saudi Arabia, the mean length of the babies whose mothers were exposed to the cigarette smoke was 0.26 cm smaller (22). In Poland, pregnant women prenatally exposed to SHS delivered babies on average 1.1 cm shorter and with the chest circumference 1.3 cm smaller (23). Our results are in perfect accordance with these of Danish researchers and near to these observed in Poland. We did not find a quantitative study of SHS impact on th gestational age, however, a recently published meta-analysis of 11 eligible studies published in the years 2008-13 demonstrated that the smoke-free legislation was associated with substantial reductions in preterm birth cases worldwide (24).

CONCLUSIONS
Supporting smoking cessation during the pregnancy should be the primary aim of the public health programs. The latest Hungarian tobacco legislation in 2012 banned smoking in all public confined places, nevertheless, non-smoking women may continue to be exposed to harmful effects of SHS through their husbands and partners in their own housing facilities, which is not protected by the national clean air legislation. We conclude that the reduction of SHS exposure, especially targeting the most vulnerable populations such as the foetus and child, should be promoted as an integral part of the cessation programs.

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Conflict of interest
None

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