CEOG Clinical and Experimental Obstetrics & Gynecology

Antenatal counseling against passive smoking may improve birth weight for gestational age

O.B. Akkar[1], C. Yildiz[1], S. Karakus[1], I. Akkar[2], A. Cetin[1], A. Yanik[1], A.G.I. Yenicesu[1], A. Boztosun[1]

[1] Departments of Obstetrics and Gynecology, Cumhuriyet University Faculty of Medicine, Sivas
[2] Department of Pediatrics, Sivas State Hospital, Sivas (Turkey)

Summary

Aim: The authors determined the impact of antenatal counseling against exposure to environmental cigarette smoke on the prevention of reduced neonatal birth weight according to gestational age. *Materials and Methods:* A cross-sectional study was conducted in pregnant women, with 77 passive smokers and 88 non-smokers. During motivational interviews, passive smoking status was monitored and additional follow-up visits were arranged to increase the knowledge regarding perinatal risks of passive smoking, including intrauterine growth restriction and low birth weight. The authors aimed to increase the woman's motivation to avoid second-hand tobacco smoke exposure. *Results:* The demographic and clinical findings of the study groups were found considerably similar, in this context, and the authors found positive and strong correlations between the gestational age and neonatal birth weight ($r = 0.80$ and $r = 0.76$, respectively; $p < 0.05$). *Conclusions:* During antenatal care of women, regular counseling against second-hand smoke exposure may prevent negative effect of passive smoking on neonatal birth weight according to gestational age. This promising finding needs to be supported by further studies with larger sample size considering covariates relevant to passive smoking.

Key words: Passive smoking, pregnancy; Antenatal care; Neonatal birth weight.

Introduction

Smoking during pregnancy is one of the leading preventable causes of adverse maternal and perinatal outcomes. Maternal cigarette smoking during pregnancy is associated with many perinatal complications such as congenital anomalies, placental abruption, placenta previa, preterm birth, and even infant mortality [1-4]. Smoking during pregnancy is accepted as an important risk factor for low birth weight (LBW) [5]. Exposure to environmental tobacco smoke also causes similar adverse maternal and perinatal consequences [6].

In a recent review evaluated the association of passive smoking and neonatal birth weight, the authors summarized the findings of pertinent literature and concluded that maternal exposure to environmental smoke decreases the neonatal birth weight in addition to its several other adverse effects [2]. In a study investigating the independent effects of maternal exposure to second-hand smoke and maternal body mass index on the anthropometric measurements of term infants and on the prevalence of macrosomia and low birth weight, the authors found an increased risk of low birth weight and decreased risk of macrosomia in women who were exposed to second-hand smoke in the same body mass index category [7]. There are several previous studies that provided comparable findings consistent with those findings [8-12].

Similar to other reproductive health problems, there is paucity of information regarding the magnitude of passive smoking during pregnancy on the aspect of its short- and long-term impacts, and about interventions to reduce its negative influences on general health of pediatric population. According to the present authors' knowledge, there is no study investigating the effect of antenatal counseling related to prevention of environmental tobacco smoke exposure to improve birth weight for gestational age. In this context, they attempted behavioral counseling against exposure to environmental cigarette smoke, including increasing awareness of the dangers of exposure to cigarette smoke, motivating the mother to avoid from the environment cigarette smoke and to ensure that she recognized and understood the reasons to change her living conditions. The aim of this study was to evaluate the effect of antenatal counseling against exposure to environmental cigarette smoke on the prevention of reduced neonatal birth weight according to gestational age.

Materials and Methods

A cross-sectional study was conducted in pregnant women, with 77 passive smokers and 88 non-smokers. Pregnant women admitted to the present outpatient service, who satisfied the inclusion and exclusion criteria, were consecutively included in the study. After the approval of Human Ethics Committee and obtaining

Revised manuscript accepted for publication September 24, 2014

Table 1. — *Selected demographic and clinical data of the study population.*

		Non-smoking (n=88)	Passive smoking (n=77)
Demographic data			
Age, years		27.2±5.6	27.1±5.0
Maternal weight, kg			
Prenatal		62.7±13.0	63.9±11.8
Natal		74.8±13.7	78.4±11.3
Occupation			
Employed		13 (15%)	1 (1%)
Unemployed		75 (85%)	76 (99%)[a]
Education			
High school		74 (84%)	76 (99%)[b]
University		14 (16%)	1 (1%)
Socioeconomic status			
Low		15 (17%)	14 (18%)
Average		73 (83%)	63 (82%)
Obstetrical history			
Gravidity		2 (1-10)	3 (1-5)
Parity		2 (1-6)	2 (1-5)[c]
Miscarriage		0 (0-5)	0 (0-2)
Stillbirth			
Yes	8 (9%)	13 (17%)	
No	80 (91%)	64 (83%)	
Live child		2 (1-5)	2 (1-5)
Diabetes mellitus			
Yes	7 (8%)	3 (4%)	
No	81 (92%)	65 (96%)	
Hypertension			
Yes	14 (16%)	10 (13%)	
No	74 (84%)	67 (87%)	
Consanguinity			
Yes	4 (5%)	12 (15%)[d]	
No	84 (95%)	65 (85%)	
Fetal malformation			
Yes	0	3 (4%)	
No	88 (100%)	74 (96%)	

		Non-smoking (n=88)	Passive smoking (n=77)
Last pregnancy			
Gestational age, weeks		37.8±2.7	37.5±2.5
Number of antenatal visits		9 (0-20)	9 (0-20)
History of			
Gestational diabetes mellitus			
Yes		6 (7%)	8 (10%)
No		82 (93%)	69 (90%)
Preeclampsia			
Yes		13 (15%)	8 (10%)
No		75 (85%)	69 (90%)
Premature rupture of membrane			
Yes		2 (2%)	6 (8%)
No		86 (98%)	71 (92%)
Complications			
Threatened abortion	Yes	8 (9%)	2 (3%)
	No	80 (91%)	75 (97%)
Antenatal bleeding	Yes	4 (5%)	2 (3%)
	No	84 (95%)	75 (97%)
Fetal distress	Yes	5 (6%)	6 (8%)
	No	83 (94%)	71 (92%)
Neonatal variables			
Newborn weight, g		3069±758	3110±788
Apgar scores, minutes			
1		8.2±1.8	8.1±1.3
5		9.3±1.8	9.4±1.0
Need for respiratory support at birth			
Yes		2 (2%)	2 (3%)
No		82 (98%)	75 (97%)
Need for neonatal intensive care unit			
Yes		9 (10%)	8 (10%)
No		79 (90%)	69 (90%)
Respiratory distress syndrome			
Yes		2 (2%)	4 (5%)
No		86 (98%)	73 (95%)
Congenital malformations			
Yes		2 (2%)	1 (1%)
No		86 (98%)	76 (99%)

[a,b,c,d] $p < 0.05$ *vs*. no smoking group. Data are expressed as mean ± SD, median (min-max), or percentage as appropriate.

written informed consents from patients, data was collected during a period of 12 months, from August 2012 to August 2013 with personal interviews with the mothers. A person was accepted to be a passive smoker if a family member or colleague had regularly smoked cigarettes in their presence for more than one year [13]. The method of smoking cessation education recommended by American Collage of Obstetricians and Gynecologists [14] was used to develop an education program against passive smoking for the patients. In brief, during motivational interviews, passive smoking status was monitored and additional follow-up visits were arranged to increase the knowledge regarding the perinatal risks of passive smoking, including intrauterine growth restriction and low birth weight in about 20% of cases, and its long-term effects during postnatal life. The authors focused on the pregnant woman's motivation to avoid second-hand smoke exposure.

The inclusion criteria were women aged 18-40 years, with 30-41 weeks of gestation, and with a BMI of 19-25. The exclusion criteria were the pregnancies with obstetrical conditions including genetic abnormalities, congenital anomalies, multiple gestation, infection, preeclampsia, placental abruption, fetal growth restriction, low pre-pregnancy maternal weight, or poor weight gain during pregnancy, pregnancy after use of assisted reproductive technologies, toxic exposure to warfarin, anticonvulsants, antineoplastic agents, folic acid antagonists, antihypertensive drugs, uterine malformations, and chronic maternal diseases including diabetes, hypertension, renal insufficiency, collagen vascular dis-

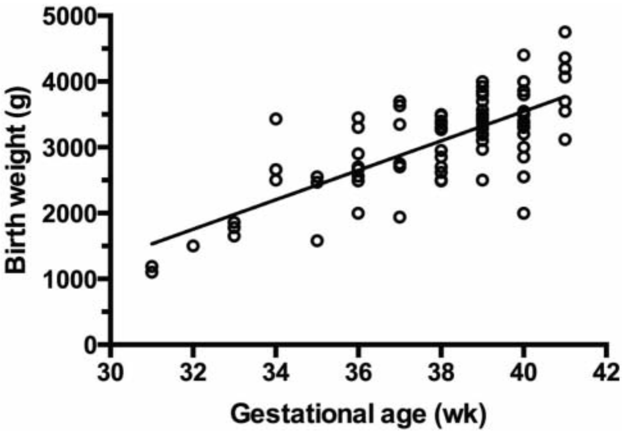

Figure 1. — Correlation of gestational age and neonatal birth weight in no smoking group (r = 0.76; $p < 0.05$ with Pearson correlation analysis).

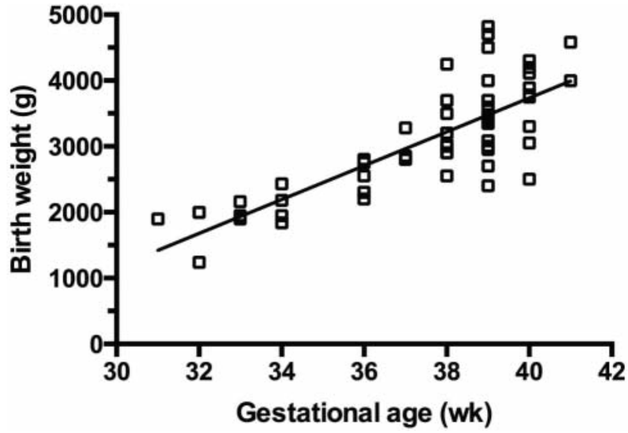

Figure 2. — Correlation of gestational age and neonatal birth weight in passive smoking group (r = 0.80; $p < 0.05$ with Pearson correlation analysis).

ease, antiphospholipid syndrome, pulmonary disease, cyanotic heart disease, or severe anemia.

Collected data included information about demographic, obstetrical history, last pregnancy, complications, and neonatal variables of patients. Demographic data included age, maternal weight before pregnancy and during delivery, occupation, education, and socioeconomic status. The socioeconomic status was classified according to the minimum wage in the present country. Obstetrical history data included gravidity, parity, miscarriage, stillbirth, live child, diabetes mellitus, hypertension, consanguinity, and fetal malformation. Last pregnancy data included gestational age, number of antenatal visits, and history of gestational diabetes mellitus, preeclampsia, and premature rupture of membrane. Complication data included threatened abortion, antenatal bleeding, and fetal distress. Neonatal variables were newborn weight, Apgar scores at one and five minutes, and the rates of need for respiratory support at birth, need for neonatal intensive care unit, respiratory distress syndrome, and congenital malformations.

Statistical analysis

Data are presented as mean ± SD, median (min-max), or percentage as appropriate. For the analysis of parametric data, *t*-test was used. For the analysis of non-parametric data, Mann-Whitney U test was used. For the analysis of categorical data, chi-square test was used. Association of gestational age and neonatal weight was examined with Pearson correlation test. A p value of less than 0.05 was accepted as significant.

Results

Table 1 presents the selected demographic and clinical data including obstetrical history, last pregnancy, complications, and neonatal variables of the study population.

After the analyses of demographic data, the age, maternal weights, and socioeconomic status of the study groups were found to be similar ($p > 0.05$). The rates of unemployment and high school education in the passive smoking group were significantly higher than those of the nonsmoking group ($p < 0.05$).

After the analyses of obstetrical history, the study groups were comparable with regards to gravidity, miscarriage, history of stillbirth, and number of live children ($p > 0.05$). The parity in the passive smoking group was lower than that of the non-smoking group ($p < 0.05$). While the rates of maternal diabetes mellitus, hypertension, and history of fetal malformation were comparable in the study groups ($p > 0.05$), the rate of consanguinity in the passive smoking group was higher than that of the non-smoking group ($p < 0.05$).

After the analyses of clinical data during last pregnancy, the study groups were comparable with regards to the gestational age, number of the antenatal visits, and history of gestational diabetes mellitus, preeclampsia, and premature rupture of membranes ($p > 0.05$).

After the analyses of complications, the study groups were comparable with regards to the threatened abortion, antenatal bleeding, and fetal distress ($p > 0.05$).

After the analyses of neonatal variables, the study groups were comparable with regards to the newborn weight, Apgar scores at one and five minutes, and the rates of need for respiratory support at birth, need for neonatal intensive care unit, respiratory distress syndrome, and congenital malformations ($p > 0.05$).

After the correlation analyses of gestational age and neonatal birth weight in the passive smoking and nonsmoking groups, the authors found positive and strong correlations between the gestational age and neonatal birth weight (r = 0.80 and r =0.76, respectively; $p < 0.05$) (Figures 1 and 2).

Discussion

In the current study, the authors aimed to determine the effect of antenatal counseling against exposure to environmental cigarette smoke on the prevention of reduced neonatal birth weight according to gestational age in 77 passive smoking women. The higher rates of unemployment and high school education were in accordance with the status of exposure to environmental cigarette smoking. The lower number of parity and higher rate of consanguinity may be related to the exposure to environmental cigarette smoke; however, it is not appropriate to draw a conclusion because of the small sample size of this study. The fact that the values of other demographic, obstetrical history, last pregnancy, complication, and neonatal data are comparable supports the similarity of study groups to enhance the importance of the association of gestational age and neonatal birth weight. The authors found that the correlation coefficients of the association of gestational age and neonatal birth weight in the non-smoking and passive smoking groups were considerably similar. In addition, overall, this is important for revealing the success of intervention to decrease the negative impact of passive smoking on neonatal birth weight according to gestational age. According to the present authors' knowledge, in this country, this is the first study demonstrating the importance of antenatal counseling against passive smoking to improve fetal and neonatal health.

Quitting smoking and prevention of passive smoking are among the main interventional measures to improve perinatal health of mother and fetus. Counseling about smoking habits and environmental smoke exposure must be a requirement of routine antenatal care [15]. Clinicians need to offer effective interventions against smoking and environmental smoke exposure during the first antenatal visit and the following visits during pregnancy [16]. The obstetrician needs to keep this in mind because smoking during pregnancy is not socially accepted as an appropriate behavior, and in general, pregnant women did not mention their smoking status or level of environmental smoke exposure [17].

Overall, smoking during pregnancy can cause several health problems in women and in their fetuses and neonates. It increases the rate of many pregnancy complications, including preterm birth, low birth weight, and sudden infant death syndrome [3, 14, 18]. Ko *et al.* [5] investigated the association of low birth weight with the amount of parental smoking during the different pregnancy periods. They found that maternal smoking caused meaningful decrease in birth weight. Compared with the non-smoking groups, all the smoking mothers had higher incidences of low birth weight, especially when the mothers smoked more than 20 cigarettes per day. The association of paternal smoking with LBW, SGA, and preterm birth infants was insignificant. They concluded that pregnant women should be advised to stop or decrease smoking to reduce neonate morbidities.

One of the important abnormalities related to passive smoking during pregnancy is low birth weight seen in about 20% of cases [10, 19]. During second-hand smoke exposure, several chemicals including nicotine, carcinogens, and toxic substances found in tobacco smoke are inhaled [20]. They affect many aspects of fetal development, from conception to birth. It is important to inform pregnant women about the absence of any safe level of exposure to second-hand smoke [21]. There are studies evaluated the relationship between prenatal passive smoking and neonatal intensive care unit admission; they demonstrated that the rate of neonatal intensive care unit admission increased meaningfully. The passive-smoking pregnant women had two to four times more risk of perinatal complications compared to non-smoking mothers [17]. In a recent study by Wahabi *et al.* [11], the authors assessed the impact of second-hand smoke on the neonatal birth weight of term infants. They found that the prevalence of exposure of their study population to second-hand smoke is high at 31% and this has an important contribution to the reduced neonatal birth weight.

There are some inherent limitations of this study. The authors preferred to exclude several obstetric conditions with a potential to reduce neonatal birth weight. Because of this, during the study period, they enrolled 88 non-smoker and 77 passive smoker women into the study. No interaction of selected demographic and clinical parameters with the association of gestational age and neonatal birth weight may be related to the small sample size of the study groups. In this study, the exposure to second-hand smoke was based on information given by pregnant women without the use of biomarker to verify cigarette smoke exposure. In addition, the exposure to second-hand smoke was not measured according to the number of hours the mother was exposed. Another limitation of this study was that there was no study group exposed to second-hand smoke but received standard antenatal care in the setting of the present obstetric unit.

In conclusion, during antenatal care of women, regular counseling against passive smoking may prevent negative effects of passive smoking on neonatal birth weight according to gestational age. This promising information is important for women, their families, and healthcare professionals, and reinforces the continued need for programs to increase awareness on prevention of passive smoking to improve perinatal health.

References

[1] Brown H.L., Graves C.R.: "Smoking and marijuana use in pregnancy". *Clin. Obstet. Gynecol.*, 2013, *56*, 107.

[2] Hawsawi A.M., Bryant L.O., Goodfellow L.T.: "Association between exposure to secondhand smoke during pregnancy and low birthweight: a narrative review". *Respir. Care*, 2014, Jul 8. pii: respcare.02798. [Epub ahead of print].

[3] Salmasi G., Grady R., Jones J., McDonald S.D., Knowledge Synthesis Group: "Environmental tobacco smoke exposure and perinatal outcomes: a systematic review and meta-analyses". *Acta Obstet. Gynecol. Scand.*, 2010, *89*, 423.

[4] Murin S., Rafii R., Bilello K.: "Smoking and smoking cessation in pregnancy". *Clin. Chest Med.*, 2011, *32*, 75. doi: 10.1016/j.ccm.2010.11.004.

[5] Ko T.J., Tsai L.Y., Chu L.C., Yeh S.J., Leung C., Chen C.Y., *et al.*: "Parental smoking during pregnancy and its association with low birth weight, small for gestational age, and preterm birth offspring: a birth cohort study". *Pediatr. Neonatol.*, 2014, *55*, 20.

[6] Yang L., Tong E.K., Mao Z., Hu T.W.: "Exposure to secondhand smoke and associated factors among non-smoking pregnant women with smoking husbands in Sichuan province, China". *Acta Obstet. Gynecol. Scand.*, 2010, *89*, 549.

[7] Wahabi H.A., Mandil A.A., Alzeidan R.A., Bahnassy A.A., Fayed A.A.: "The independent effects of second hand smoke exposure and maternal body mass index on the anthropometric measurements of the newborn". *BMC Public Health*, 2013, *13*, 1058.

[8] Crane J.M., Keough M., Murphy P., Burrage L., Hutchens D.: "Effects of environmental tobacco smoke on perinatal outcomes: a retrospective cohort study". *BJOG*, 2011, *118*, 865.

[9] Pogodina C., Brunner Huber L.R., Racine E.F., Platonova E.: "Smoke-free homes for smoke-free babies: the role of residential environmental tobacco smoke on low birth weight". *J. Community Health*, 2009, *34*, 376. doi: 10.1007/s10900-009-9169-1.

[10] Hegaard H.K., Kjaergaard H., Møller L.F., Wachmann H., Ottesen B.: "The effect of environmental tobacco smoke during pregnancy on birth weight". *Acta Obstet. Gynecol. Scand.*, 2006, *85*, 675.

[11] Wahabi H.A., Alzeidan R.A., Fayed A.A., Mandil A., Al-Shaikh G., Esmaeil S.A.: "Effects of secondhand smoke on the birth weight of term infants and the demographic profile of Saudi exposed women". *BMC Public Health,* 2013, *13*, 341.

[12] Lee N.L., Samet J.M., Yang G., Zhou M., Yang J., Correa A., Lees P.S.: "Prenatal secondhand smoke exposure and infant birth weight in China". *Int. J. Environ. Res. Public Health*, 2012, *9*, 3398.

[13] Bonita R., Duncan J., Truelsen T., Jackson R.T., Beaglehole R.: 'Passive smoking as well as active smoking increases the risk of acute stroke". *Tob. Control*, 1999, *8*, 156.

[14] Committee opinion no. 471: "Smoking cessation during pregnancy". *Obstet. Gynecol.*, 2010, *116*, 1241.

[15] U.S. Preventive Services Task Force: "Counseling and interventions to prevent tobacco use and tobacco-caused disease in adults and pregnant women: U.S. Preventive Services Task Force reaffirmation recommendation statement". *Ann. Intern. Med.*, 2009, *150*, 551.

[16] 2008 PHS Guideline Update Panel, Liaisons, and Staff: "Treating tobacco use and dependence: 2008 update U.S. Public Health Service Clinical Practice Guideline executive summary". *Respir. Care*, 2008, *53*, 1217.

[17] Ashford K.B., Hahn E., Hall L., Rayens M.K., Noland M., Ferguson J.E.: "The effects of prenatal secondhand smoke exposure on preterm birth and neonatal outcomes". *J. Obstet. Gynecol. Neonatal. Nurs.*, 2010, *39*, 525.

[18] Steyn K., de Wet T., Saloojee Y., Nel H., Yach D.: "The influence of maternal cigarette smoking, snuff use and passive smoking on pregnancy outcomes: the Birth To Ten Study". *Paediatr. Perinat. Epidemiol.*, 2006, *20*, 90.

[19] El-Mohandes A.A., Kiely M., Blake S.M., Gantz M.G., El-Khorazaty M.N.: "An intervention to reduce environmental tobacco smoke exposure improves pregnancy outcomes". *Pediatrics*, 2010, *125*, 721.

[20] IARC Working Group on the Evaluation of Carcinogenic Risks to Humans: "Tobacco smoke and involuntary smoking". *IARC Monogr. Eval. Carcinog. Risks Hum.*, 2004, *83*, 1.

[21] Office on Smoking and Health (US): "The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General". *Atlanta (GA): Centers for Disease Control and Prevention (US)*, 2006. *Publications and Reports of the Surgeon General.*

Address reprint requests to:
O.B. AKKAR, M.D.
Department of Obstetrics and Gynecology
Cumhuriyet University Faculty of Medicine
Yenisehir Street, 5446
58140 Sivas, Turkey
e-mail: dr.ozlemakkar@yahoo.com