BRIEF REPORT

Families at Risk: Home and Car Smoking Among Pregnant Women Attending a Low-Income, Urban Prenatal Clinic

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ABSTRACT

Introduction: Secondhand smoke exposure (SHSe) has been identified as a distinct risk factor for adverse obstetric and gynecological outcomes. This study examined the prevalence of SHSe reduction practices (i.e., home and car smoking bans) among pregnant women in a large U.S. prenatal clinic serving low-income women.

Methods: Pregnant women ($N = 820$) attending a university-based, urban prenatal clinic in Houston, Texas, completed a prenatal questionnaire assessing bans on household and car smoking and a qualitative urine cotinine test as part of usual care. Data were collected from April 2011 to August 2012.

Results: Nearly one-third ($n = 257$) of the sample reported at least 1 smoker living in the home. About a quarter of the women in the full sample did not have a total smoking ban in their home and car. Within smoking households, 44% of the pregnant women reported smoking, 56% reported smoking by another household member, and in 26% of smoking households both the pregnant woman and at least one other person were smoking. Only 43% of women with a household smoker reported a total ban on smoking, with higher rates among Hispanic women. Smoking bans were less common when the pregnant women smoked, when more than 1 smoker resided in the home, and when pregnant with her first child.

Conclusions: SHSe among low-income pregnant women is high, and interventions to raise awareness and increase the establishment of smoking bans in homes and cars are warranted.

INTRODUCTION

Secondhand smoke exposure (SHSe) is attracting attention as a distinct risk factor for adverse obstetric and gynecological (e.g., Ward, Berenson, & Breitkopf, 2011) outcomes. Recent data suggest SHSe in nonsmoking pregnant women is associated with an increased risk for low birth weight (<2,500 g) and an overall 33–60 g reduction in mean infant birth weight (Leonardi-Bee, Smyth, Britton, & Coleman, 2008; Perera et al., 2005). SHSe during pregnancy has also been associated with higher risk of congenital anomalies and trends toward smaller head circumferences (Leonardi-Bee et al., 2008; Perera et al., 2005; Salmasi, Grady, Jones, & McDonald, 2010). Although findings are mixed, studies have also found an association between SHSe and higher preterm birth (Fantuzzi et al., 2007; Windham, Hopkins, Fenster, & Swan, 2000). A recent report from Belgium documented significant drops in risk of preterm

birth following successive population interventions to reduce SHSe, that is, bans on smoking in public places (Cox, Martens, Nemery, Vangronsveld, & Nawrot, 2013).

Further, tobacco smoke contains 40 known carcinogens, which permeate the placenta and are passed to the fetus (Florek et al., 2011; Milunsky, Carmella, Ye, & Hecht, 2000). For example, one of the *N*-nitrosamines in tobacco smoke, nicotine-derived nitrosamine ketone (NNK), is a cause of lung cancer. NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol), a metabolite of NNK, has been found at elevated levels in newborns of mothers who smoke and also in newborns of nonsmoking mothers exposed to SHS (Milunsky et al., 2000). Florek et al. (2011) reported that more than 50% of infants with nonsmoking mothers who reported exposure to SHS during pregnancy had detectable levels of NNAL in their urine at birth.

Despite recent attention toward obstetric risks and public health policies aimed at reducing SHSe, little is known about

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common SHSe reduction practices among pregnant women. Although prenatal smoking rates have been well studied and assessed to be around 14% in the United States. (Tong, Dietz, Farr, D'Angelo, & England, 2013), household smoking rates as well as practices to reduce SHSe remain undocumented. Pregnant women who smoke or live with other smokers are at especially high risk of tobacco-related birth and neonatal complications. Comprehensive intervention addressing both smoking and SHSe may be needed to fully reduce the impact of tobacco smoke in prenatal populations.

This study was designed to estimate the rates of home and car smoking bans among pregnant women in a large, urban, prenatal clinic serving low-income women. Variations in smoking ban rates by race and other household characteristics have not been previously reported in pregnancy and therefore were explored. To our knowledge, this is the first study to evaluate the prevalence of SHSe via home and car smoking bans in low-income pregnant women, potentially identifying additional intervention targets to protect the unborn fetus as well as other children.

MATERIALS AND METHODS

Participants and Procedures

A sample of 820 consecutive pregnant women attending a university-based urban prenatal clinic completed an author-constructed, self-report prenatal screening questionnaire and a qualitative urine cotinine test (partial sample) as part of usual care, during their first visit to the clinic. The screening questionnaire captured self-reported age, race and ethnicity, number of living children, participant smoking status, household smokers, and home and car smoking bans.

Data were collected for 16 months. The clinic population is primarily minority with approximately 98% of women subscribed to Medicaid insurance.

Materials

The presence of a home smoking ban was determined by asking, "How is cigarette smoking handled in your home?" Several response options were provided, including "only special guests could smoke," or smoking is "only allowed in certain rooms/places." Only women who chose the response indicating that no one was allowed to smoke anywhere in the home were designated as having a home smoking ban (Ding et al., 2011). The presence of a car smoking ban was determined separately with a similar question. Such multiple choice formats have been found to improve the accuracy of self-report in pregnant smoker samples (Mullen, Carbonari, Tabak, & Glenday, 1991). Participants who did not own or rarely travelled by car were asked to respond based on the car they rode in most often; participants who never travelled by car were treated as having a car smoking ban. Participants reporting both a home and car ban were considered to have a total smoking ban.

In an effort to improve the detection of smokers, the qualitative Accutest® Urine Cotinine Test (cassette format; 200ng/ml threshold), used to identify smokers in previous studies (e.g., Schepis et al., 2008), was added approximately half-way through the screening period ($n = 432$). Smoking status (positive or negative) was verified on-site by the nurse via routine urine collection. Approximately 5% ($n = 22$) of those tested

who denied smoking had a positive urine cotinine result indicating current smoking. Therefore, approximately 5% of the 388 participants who were not tested could be misclassified as nonsmokers. The 22 women who denied any smoking but whose cotinine test was positive were considered smokers.

Statistical Analyses

Descriptive statistics were conducted to characterize the sample on demographic and smoking variables, as well as car, home, and total smoking ban status. For women who reported at least one smoker living in the home ($n = 257$), three separate multiple logistic regression analyses (for each type of ban: car, home, total) were performed (Proc LOGISTIC; SAS v. 9.3). Each regression model provided odds ratios for having a smoking ban by race/ethnicity (Black, non-Hispanic White, Hispanic), number of household smokers (1 or >1), smoking status of the pregnant woman (yes/no), woman's age (years), gestational age (weeks) at the time of the visit, and number of living children (0 or ≥ 1).

RESULTS

The overall sample was 59.8% Black, 28.9% Hispanic, 9.4% White, and 2% Asian or Other—with a mean age of 26 years ($SD = 5.9$). Mean gestational age was 16 weeks ($SD = 8.8$). The median number of living children was one (range = 0–9). Sixteen percent of the pregnant participants reported current smoking or tested positive for cotinine.

Prevalence of Household Smoking and Home, Car, and Total Smoking Bans

Nearly one third ($n = 257$) of the sample reported at least one smoker living in the home. Within smoking households, 44% of pregnant women reported smoking and 56% reported someone other than themselves was the smoker. Also, 58% had one smoker, 29.2% had two smokers, and 12.8% had three or more smokers in the home.

Self-reported prevalence of car, home, and total smoking bans for the entire sample as well for households with and without a smoker are depicted in Figure 1. Overall, about a quarter of the women in the full sample did not have a total smoking ban in their homes and cars. In households with a smoker, more than half of the women reported no bans on smoking in their homes and cars.

Smoking Ban Status in Smoking Households by Household Characteristics

Significant associations among smoking ban status and other characteristics are reported in Table 1.

Home Smoking Ban

Women from homes with more than one smoker and who were having their first child had significantly lower odds of reporting a home ban. Approximately 60% of women with only one smoker had a home smoking ban compared to 46% for women reporting two or more smokers. Similarly, women with existing children were more likely to report a home ban, compared to women having their first child. Home smoking bans were

Figure 1. Percentage of women reporting a home, car, and total smoking ban in the full sample and in the subsamples of women with and without a smoker in the home. A total ban was defined as not allowing indoor home and car smoking.
Note. Data were collected from April 2011 to August 2012 in Houston, TX.

less common for Black and White women and for women who smoked but differences failed to reach significance.

Car Smoking Ban

Odds of a self-reported car ban were significantly lower for Black and White women, compared to Hispanic women. About 63% of Black and 53% of White women reported car bans compared to 83% of Hispanic women. Households with more than one smoker (compared to homes with one smoker) and homes where the pregnant participant was a smoker were less likely to have a car ban. Number of children was not significantly related to car ban status.

Total Smoking Ban (Both Car and Home)

Participant's smoking status was the only statistically significant predictor of having a total smoking ban. For women who smoked, 33% reported a total ban was in place compared to 51% of nonsmoking women. Although not significant, total ban status was lower for Black and non-Hispanic White women (compared to Hispanic women), for homes with more than one smoker, and for homes with no previous children.

DISCUSSION

Prenatal SHSe has been associated with a number of adverse consequences including reduced birth weight, risk of preterm birth, and newborn neurobehavioral deficits (Law et al., 2003). Longer ranging consequences of prenatal SHSe are also beginning to be studied. For example Braun et al. (2010) found that fetal SHSe was associated with increased risk of early childhood overweight body mass index. Unfortunately, this study found SHSe among low-income pregnant women to be relatively common. Almost one third of pregnant women surveyed in a large, urban prenatal clinic had at least one smoker residing in her household. Further, within smoking households, the majority of women reported no established home and car smoking ban to protect the developing fetus as well as existing children. Smoking bans were even less common when the pregnant women smoked or when more than one smoker resided in the house. Similar to findings reported in other studies (Gonzales,

Malcoe, Kegler, & Espinoza, 2006), women who classified themselves as Hispanic were much more likely to report having a total smoking ban than either non-Hispanic Whites or Blacks. On a positive note, women with existing children were more likely to report smoking bans in their homes, although not cars. Overall, these data are critical in revealing an important source of tobacco-related health disparities.

The establishment of smoking bans in public places and heightened awareness of the dangers of SHSe has been associated with a significant decrease in SHSe among the non-smoking U.S. population (Cox et al., 2013; Pirkle, Bernert, Caudill, Sosnoff, & Pechacek, 2006). Serum cotinine analyses of nonsmokers from 1988–2002 via the National Health and Nutrition Examination Survey demonstrated a substantial (70%) decline in cotinine levels over this time (Pirkle et al., 2006). However, children and Blacks had consistently higher serum cotinine concentrations than did other segments of the population. SHSe in homes and cars remains the major source of exposure in young children.

Bans on smoking in the home and car are critical to reducing infant and child SHSe. Home smoking bans, in addition to potentially reducing SHSe among nonsmoking adults and children, have additional benefits. Farkas, Gilpin, Distefan, and Pierce (1999) found that smokers who lived under a total smoking ban were more likely to report a quit attempt in the previous year. Among those who made a quit attempt, the presence of a ban was associated with the likelihood of being quit for six months. Thus, establishing SHSe reduction practices may be the first step toward quitting and may be an important addition to pregnancy smoking cessation interventions.

To our knowledge, only one intervention study has been conducted addressing SHSe in pregnancy. El-Mohandes, Kiely, Blake, Gantz, & El-Khorazaty (2010) tested a SHSe intervention with pregnant women that included education about the risks of SHSe, behavioral skills training, and the encouragement of household smoking bans. Randomization to the intervention group was associated with lower SHSe prior to birth and also reduced the likelihood of both very low birth weight and very preterm birth. These data are promising and support further SHSe intervention efforts for women in prenatal care.

There were limitations to the study. Although the sample size was relatively large, the sample came from one

Table 1. Multivariate Adjusted Odds Ratios for Household Characteristics by Car, Home, and Total Smoking Ban Status in Smoking Households

Variable	<i>n</i>	Car ban			Home ban			Total ban		
		Ban % (<i>n</i>)	<i>AOR</i> (95% CI)	χ^2	Ban % (<i>n</i>)	<i>AOR</i> (95% CI)	χ^2	Ban % (<i>n</i>)	<i>AOR</i> (95% CI)	χ^2
Race/ethnicity				5.8, $p = .05$			5.4, $p = .07$			4.6, $p = .10$
Black	164	62.8% (96)	0.36 (0.15–0.85)		49.7% (81)	0.59 (0.29–1.19)		39.5% (60)	0.47 (0.23–0.95)	
White	38	52.6% (20)	0.33 (0.12–0.95)		60.5% (23)	1.32 (0.51–3.43)		39.5% (15)	0.65 (0.25–1.64)	
Hispanic (ref)	48	82.6% (38)			66.0% (31)			60.0% (27)		
Number of smokers				6.1, $p < .05$			5.3, $p < .05$			2.5, $p = .12$
>1	108	51.5% (51)	0.47 (0.26–0.86)		46.3% (50)	0.52 (0.30–0.91)		35.4% (35)	0.63 (0.35–1.12)	
1 (ref)	149	73.8% (107)			60.5% (89)			49.0% (70)		
PPT smoking				7.6, $p < .01$			3.2, $p = .07$			4.1, $p < .05$
Yes	112	49.0% (51)	0.43 (0.23–0.78)		46.9% (52)	0.60 (0.34–1.06)		33.0% (34)	0.54 (0.30–0.98)	
No (ref)	141	76.5% (104)			60.7% (85)			51.1% (69)		
Number of living kids				0.1, $p = .81$			6.1, $p < .05$			2.9, $p = .09$
≥1	171	63.9% (101)	0.93 (0.49–1.73)		59.2% (100)	2.10 (1.17–3.77)		46.8% (73)	1.67 (0.92–3.04)	
0 (ref)	81	66.7% (54)			46.9% (38)			38.3% (31)		

Note. *AOR* = adjusted odds ratio; PPT = participant; ref = reference group. “Ban %” indicates the percent of women who reported a smoking ban in their home, car, or both. A total ban was defined as not allowing indoor home and car smoking. Asian and other races were excluded due to low sample sizes. Sample sizes for each ban type varied slightly due to a small number of missing questionnaire responses.

low-income, urban clinic. We would likely expect less SHSe in clinics serving higher income/educated women. However, rural clinics are likely to see similarly high if not higher SHSe rates due to the higher smoking rates documented in these areas. Also, urine cotinine testing was conducted for only half of the sample; approximately 5% of the untested subgroup are likely to be current smokers. Finally, the brief questionnaire did not capture in depth demographics, pregnancy history, or birth outcome data, which need pursuit in future research.

Tobacco smoke—even when exposure is passive—has harmful effects on the developing fetus, introduces known carcinogens, and is associated with poor birth outcomes. Once born, SHSe in the home and car is related to further potential hazards for the neonate (e.g., sudden infant death syndrome, respiratory). SHSe rates among pregnant women are high, and efforts to raise awareness and increase the establishment of smoking bans in homes and cars are warranted, particularly among low-income women. Comprehensive interventions targeting smoking cessation and SHS protection practices are needed to fully realize a reduction in adverse birth and neonatal consequences related to tobacco smoke, and to ultimately reduce tobacco-related health disparities.

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DECLARATION OF INTERESTS

None declared.

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