Predictors of Postpartum Relapse to Smoking

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Abstract

Postpartum relapse is common among women who stop smoking during pregnancy. We examined predictors of postpartum relapse in 87 women who quit smoking during pregnancy, 48% of whom relapsed by six months postpartum. We also explored the circumstances surrounding their first postpartum cigarette. Multivariate analyses revealed that having more friends/family members who smoke, smoking more heavily pre-pregnancy, and having higher depression scores and less concern about weight at the end of pregnancy were associated with increased risk of relapse postpartum. Most women's first postpartum cigarettes were unplanned, in the presence of another smoker, and while experiencing negative affect. The findings suggest targets for interventions to reduce postpartum relapse.

Keywords

Cigarette smoking; postpartum; relapse

1. Introduction

Pregnancy often triggers efforts to stop smoking. Between 11%-28% of less affluent, publicly-insured pregnant smokers and between 40%-65% of more affluent, privately-insured pregnant smokers stop smoking on their own shortly after becoming pregnant (Solomon and Quinn, 2004). Additionally, between 5%-17% of pregnant women still smoking at their first prenatal visit subsequently stop during pregnancy (Mullen, 1999;Windsor et al., 1998). Unfortunately, nearly 60% who successfully quit at any point during pregnancy return to smoking by six months postpartum (Colman and Joyce, 2003; Lelong et al., 2001;Ma et al., 2005;Mullen et al., 1997).

Several studies have identified variables associated with postpartum relapse. Certain demographic characteristics, such as younger age, less education, and being on Medicaid

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confer higher relapse risk (Colman and Joyce, 2003). These variables are not easily amenable to change. Other predictors of postpartum relapse include behavioral and environmental characteristics for which interventions could be developed. These predictors of relapse include quitting smoking later in pregnancy (Ma et al., 2005;Polanska et al., 2005), having greater nicotine dependence prior to quitting (Coleman and Joyce, 2003;Polanska et al., 2005), having lower confidence to remain abstinent postpartum (Mullen et al., 1997;Van't Hof et al., 2000), taking puffs late in pregnancy (Mullen et al., 1997), experiencing greater weight gain, more stressful life events, and later prenatal care (Carmichael and Ahluwalia, 2000), and, most consistently, having exposure to other smokers (Ma et al., 2005;McBride and Pirie, 1990;Mullen et al., 1997;Severson et al., 1995;Van't Hof et al., 2000).

Although these variables have been associated with postpartum relapse in retrospective and prospective studies, little is known about the actual circumstance in which the first post-delivery cigarette is smoked. Within the context of ongoing smoking cessation and relapse prevention studies with pregnant women, we examined variables associated with postpartum relapse in women who successfully quit smoking during pregnancy, and also explored situational characteristics that accompanied their first cigarette post-delivery in order to add further clarity to this postpartum relapse problem.

2. Method

2.1. Participants

Data were obtained from 87 women enrolled in one of several smoking pilot studies examining the effects of contingent vouchers on cessation during pregnancy and relapse prevention postpartum. Pilot study participants were recruited from four obstetric practices in the Burlington, VT area. Inclusion criteria for the pilot studies were report of smoking at conception, English-speaking, living within Chittenden County, not planning to move for 6 months, not incarcerated, and not having been in the study previously. Women in the pilot studies were randomized to one of two conditions: (a) contingent vouchers, in which they received monetary vouchers worth escalating value across the pregnancy contingent upon producing urines with cotinine readings <80 ng/ml to confirm abstinence; or (b) non-contingent vouchers, in which women received monetary vouchers of fixed value each time they produced a requested urine sample regardless of the cotinine value. Counseling time and counseling content were the same in the two conditions and did not contain content designed to influence emotional functioning (e.g., mood management or relaxation training). For details about the treatment conditions, see Higgins et al., 2004.

Women completed assessments at baseline (before 26 weeks of pregnancy), near the end of pregnancy (after 28 weeks), and at 2 weeks, 4 weeks, 8 weeks, 3 months, and 6 months postpartum. From 312 pregnant women enrolled in the pilot studies, 87 met the following additional criteria in order to be in the current study: (a) had stopped smoking during pregnancy and had a urine cotinine reading of <80 mg/ml near the end of pregnancy to confirm abstinence (205 excluded); and (b) had completed assessments through 6 months postpartum (20 excluded). These 87 women were selected because we wanted to examine variables that predicted postpartum relapse in women who successfully stopped smoking during pregnancy. This study was approved by the University of Vermont Institutional Review Board.

2.2. Measures

Assessments were conducted at baseline (before 26 weeks pregnant), near end of pregnancy (after 28 weeks), and at 2 weeks, 4 weeks, 8 weeks, 3 months, and 6 months postpartum. For this study, we used the following data collected during pregnancy: (a) demographic and smoking information collected at baseline (e.g., age, race and ethnicity, education, weeks

pregnant, gravida, marital status, health insurance coverage, cigarettes per day pre-pregnancy and currently); (b) confirmation of abstinence near the end of pregnancy (e.g., urine cotinine of <80 ng/ml to confirm abstinence for inclusion in the study); (c) smoking exposure and psychosocial variables collected near the end of pregnancy (e.g., number of smokers in the household, home smoking policy, number of friends/family members who smoke, number of days in the past 7 near others smoking, plans to smoke postpartum from 1 = definitely not to 5 = definitely, Brief Symptom Inventory Global Score (Derogatis, 1993), Beck Depression Inventory (Beck et al., 1961), stress rating from 0 = not at all stressed to 10 = very stressed, and weight concern rating from 0 = not at all concerned to 10 = very concerned).

At each postpartum assessment, we collected a urine sample to determine smoking status. When a woman first reported smoking during a routine postpartum assessment, she completed a questionnaire about the circumstances surrounding her first post-delivery cigarette. This questionnaire assessed the following variables: (a) whether she remembered the circumstances of that first postpartum cigarette (if not, then no further questions were asked); (b) number of days post-delivery she smoked the first cigarette; (c) whether that first cigarette was planned or unplanned; (d) when the cigarette was smoked (morning, afternoon, or evening); (e) whether she was breastfeeding in the days around that first cigarette; (f) her mood just prior to smoking that cigarette using a 4-category classification of affect: high positive affect (happy, upbeat, cheerful, energetic), high negative (stressed, anxious, angry, frustrated), low positive (calm, peaceful, content, relaxed), or low negative affect (sad, lonely, bored, depressed) (Krukowski et al., 2005); (g) whether someone was smoking around her when she had that first cigarette; (h) her fatigue level at the time of the first cigarette (from 0 = not tired at all to 10 = extremely tired); and (i) whether she was drinking anything when she smoked that first postpartum cigarette, and if so, what kind of beverage (alcohol, caffeine, other).

2.3. Statistical analyses

The initial set of analyses compared abstinent participants with those who had relapsed by 6 months on demographic, smoking history, and psychosocial variables using analyses of covariance and Mantel-Haenszel chi square tests. Because women were randomized to one of two treatment conditions (contingent versus non-contingent vouchers), these analyses were adjusted for potential treatment effects by using treatment condition as a covariate or stratification variable. For multivariate analyses, stepwise logistic regression was performed to determine the best set of predictors associated with postpartum relapse. An explanatory variable representing treatment condition was forced into the model prior to the stepwise process. Significance for variable entry into the regression model was set at alpha = .05, which was based on a Wald chi-square test. The derived model was compared to the intercept-only model based on a likelihood ratio chi square test. Analyses were performed using SAS statistical software (SAS Institute Inc., 2000).

3. Results

3.1. Differences between women who relapsed and remained abstinent postpartum

By 6 months postpartum, 42 of the 87 women (48%) who had stopped smoking during pregnancy had relapsed. Table 1 presents the demographic, smoking history, and psychosocial variables for those who remained abstinent and those who had relapsed. Because 98% of the participants were non-Hispanic Caucasians, race/ethnicity is not presented in the table. Women who relapsed were younger (p = .04), less likely to be married (p = .05), less likely to have private insurance (p = .02), smoked more cigarettes per day pre-pregnancy (p = .001), were less likely to have already quit when they came in for their first prenatal visit (p = .02), and had more friends and family who smoked (p = .004). Additionally, women who relapsed scored

higher than abstinent women on the Beck Depression Inventory (p = .02) and on a stress rating (p = .02) at the end of pregnancy.

To better understand the association between participant characteristics and risk of relapse, stepwise logistic regression was used to determine the best set of predictors while accounting for the correlation among potential explanatory variables. The derived model predicted relapse significantly better than the intercept-only model (X^2 = 29.7, df = 5, p <.001). Increased risk of relapse was associated with smoking more cigarettes per day pre-pregnancy [OR = 1.66 per 5 cigarette increase, 95% CI: 1.14, 2.43, p = .009], higher scores on the Beck Depression Inventory at the end of pregnancy [OR = 1.21; 95% CI: 1.06, 1.38, p = .004], and having more friends and family members who smoke [OR = 3.24 (some/most vs. none/few), 95% CI: 1.13, 9.27, p = .03]. Greater concern about one's weight was associated with decreased odds of relapse [OR = 0.76 per unit increase on 0-10 point scale; 95% CI: 0.62, 0.93, p = .008]. Treatment condition was not a significant predictor of relapse [OR = 1.51 for non-contingent versus contingent; 95% CI: 0.50, 4.62, p = .47].

3.2. Circumstances of first postpartum cigarette

Of the 42 women who relapsed, 36 (86%) completed a questionnaire assessing the circumstances of their first postpartum cigarette. Of the six missing data, three were missing in error and three could not remember their first post-delivery cigarette circumstance.

Of those who relapsed, 31% relapsed within the first 30 days after delivery; 39% relapsed between one and three months; 30% relapsed between three and six months after delivery. Eighty-six percent reported they had not planned to return to smoking, and 45% were still breastfeeding when they smoked their first postpartum cigarette. Nearly half (47%) had their first cigarette in the evening; 37% smoked in the afternoon; 16% smoked in the morning. Results revealed that 64% of the women were around someone else who was smoking at the time of their first cigarette. Their mean fatigue rating on a 0-10 point scale was 5.3 (SD = 3.7). At the time of first cigarette, 67% were experiencing a high energy, negative emotion (e.g., stressed, anxious, angry, frustrated); 17% were feeling a high energy, positive emotion (e.g., happy, upbeat, cheerful, energetic); 9%, a low energy, negative emotion (e.g., sad, lonely, bored, depressed); and 6%, a low energy, positive emotion (e.g., calm, peaceful, contented, relaxed). Twenty-three percent of the women were consuming alcohol when they relapsed; 13% were drinking a caffeinated beverage.

4. Discussion

Our results reinforce findings from prior research. Consistent with previous studies (Ma et al., 2005;McBride and Pirie 1990;Mullen et al., 1997;Severson et al., 1995;Van't Hof et al., 2000), women embedded within a smoking environment are more likely to relapse postpartum than women who have few friends or family members who smoke. Given this relationship, it is not surprising that 64% of the first cigarette post-delivery occurrences were in the presence of another person smoking. Smoking by others provides ready access to cigarettes and cues a behavior previously enjoyed. This environmental risk appears to be the most serious threat to maintenance of abstinence postpartum and requires either assistance with or policies to reduce exposure to others smoking and/or well-rehearsed cognitive/behavioral processes that reduce the desirability of cigarettes.

Pre-pregnancy smoking level predicted postpartum relapse, a finding consistent with prior observations (Colman and Joyce, 2003). Greater pre-pregnancy smoking may encompass a broader or denser network of smoking cues, increasing the chances that women might be exposed to smoking-related triggers postpartum; however, this explanation is speculative and requires further investigation.

Higher depression scores at the end of pregnancy also increased risk of postpartum relapse, and the prevailing affect at the time of 67% of the first postpartum cigarette occurrences was a high energy, negative emotion, with another 9% during a low-energy, negative emotion. Combined, these findings support those with non-pregnant smokers suggesting that negative affect is associated with risk of relapse (Brandon, 1994;Hall et al., 1993) and that many smoking lapses are preceded by increases in negative affect (Shiffman, 2005). Because hormonal changes, disrupted sleep, and the stress of a new infant can contribute to emotional lability during the postpartum period, this is a particularly vulnerable time for smoking resumption.

Finally, our data indicate that women expressing greater concern about their weight at the end of pregnancy were less likely to relapse postpartum. Initially, this may seem counter-intuitive; however, a review of the literature on weight concern in relation to smoking relapse suggests no consistent relationship (French and Jeffery, 1995). In the case of pregnant women, a general concern about weight at the end of pregnancy may reflect a broader health consciousness that strengthens resilience against postpartum relapse.

Several limitations should be noted. Our sample size was small, raising the possibility that we failed to observe other correlations that do exist. Additionally, because of the timing of our postpartum assessments, women's retrospective recall of the specific circumstances surrounding their first postpartum cigarette could be faulty. Use of ecological momentary assessment methodology could correct this problem (Shiffman et al., 2002).

In summary, our findings reveal that most postpartum relapses are unplanned, distributed fairly evenly across the 6-month postpartum period, occur most frequently in the evening in the presence of another person smoking and when experiencing a negative emotion. Women at particular risk of relapsing are those who smoked more heavily pre-pregnancy, who are living within a smoking culture, and who show more depressive affect and less concern about their weight at the end of pregnancy. These findings can help direct the development of focused interventions for women at greatest risk.

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Table 1

Predictors of 6-Month Postpartum Smoking Status in Women Abstinent at End of Pregnancy.

	Abstinent at 6 Months (n = 45)	Relapsed by 6 Months (n = 42)	p-value[a]
Demographics			
Age (years)	26.6 ± 5.1	24.2 ± 5.2	.04
Education (years)	13.8 ± 2.0	12.9 ± 2.8	.10
Weeks pregnant at baseline	10.0 ± 4.0	10.5 ± 4.6	.71
% primagravida (n)	64 (29)	67 (28)	.85
% married (n)	44 (20)	24 (10)	.05
% with private insurance (n)	60 (27)	33 (14)	.02
Smoking History			
Cigarettes per day pre-pregnancy	10.1 ± 6.2	15.2 ± 7.8	.001
% abstinent at baseline (n)	69 (31)	43 (18)	.02
Cigarettes per day at baseline (smokers only)	6.5 ± 7.6	5.5 ± 5.9	.63
Variables Assessed at End of Pregnancy			
% living with another smoker (n)	58 (26)	60 (25)	.90
% with no smoking allowed in home (n)	82 (37)	76 (32)	.52
% with some or most friends/family who smoke (n)	38 (17)	69 (29)	.004
Days in past 7 near others smoking	2.2 ± 2.4	3.1 ± 2.9	.14
Plans to smoke postpartum rating[b]	1.2 ± 0.5	1.5 ± 0.8	.06
Brief Symptom Inventory Global Score	18.0 ± 16.4	25.9 ± 21.7	.06
Beck Depression Inventory Score	6.0 ± 4.5	8.9 ± 6.3	.02
Stress rating[c]	3.8 ± 2.3	5.2 ± 2.9	.02
Weight concern rating[c]	3.9 ± 2.5	2.9 ± 3.4	.15

Note: Tabled values are Mean ± SD unless otherwise indicated.

[a] Determined based on analyses of covariance for continuous variables and Mantel-Haenzsel chi square tests for categorical variables which adjust for random treatment assignment.

[b] Ratings on a 5-point scale with 1 = definitely not; 5 = definitely planning to smoke postpartum

[c] Ratings on an 11-point scale with 0 = not at all stressed/concerned; 10 = very stressed/concerned