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Weight Concerns Affect Motivation to Remain Abstinent From Smoking Postpartum

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Abstract

Background—Although many women quit smoking during pregnancy, most resume smoking postpartum. One factor that may be important in postpartum relapse is a pregnant woman's motivation to remain abstinent after delivery.

Purpose—We assessed motivation for postpartum abstinence among pregnant women who had quit smoking and examined the relationship of weight concerns and mood to abstinence motivation.

Methods—Pregnant former smokers, recruited between February 2000 and November 2004, completed assessments of smoking, weight concerns, depressive symptoms, and perceived stress.

Results—Sixty-five percent were highly motivated to remain abstinent postpartum. Women who were and were not motivated were similar in age, race, and nicotine dependence. However, motivated women reported more stress, greater self-efficacy for weight management, less hunger, and less smoking for weight control than did less motivated women. After controlling for intention to breast-feed, nicotine dependence, years of smoking, partner smoking, and race, self-efficacy for weight control was related to motivation to maintain postpartum abstinence.

Conclusions—These data suggest that weight concerns are associated with motivation for postpartum smoking abstinence, and interventions designed to prevent postpartum smoking relapse may need to target eating, weight, and shape concerns.

INTRODUCTION

Although many women quit smoking during pregnancy, the majority resume smoking during the year following childbirth. By 4 months postpartum, approximately 50% of women have resumed smoking, and 60% to 70% of women have returned to smoking by 6 months postpartum (1-5). The health risks of maternal pre- and postnatal smoking for infants have been well documented and include sudden infant death syndrome, ear infections, respiratory illness, and asthma (6,7). Smoking also increases a woman's risk for cancer (8-11), respiratory symptoms (12), and reproductive complications (13).

Research on postpartum relapse has documented several correlates of a woman's return to smoking (14). One factor—having a partner who smokes—has received consistent support as a correlate of postpartum smoking (2,5,15-18). In addition, alcohol use (16), membership in a minority group (19), higher levels of nicotine dependence (5,15,19), and a lack of intention to remain quit after delivery (4) have been related to relapse. In contrast, support for another

frequently hypothesized risk factor—bottle- rather than breast-feeding—has been inconsistent (2,5,17,18), with some studies reporting a protective effect of breast-feeding (2,5,20) and others finding no effect of breast-feeding on postpartum smoking (17,18).

Several lines of research also suggest that the extent to which a pregnant woman is motivated to remain abstinent after delivery relates to the likelihood of a resumption of smoking postpartum. First, motivation for smoking cessation during pregnancy is affected by a woman's beliefs about the consequences of smoking and her ratings of the temptation to smoke. Pregnant smokers rate the negative consequences of smoking as less important and experience more habit-related temptations than do nonpregnant smokers (21). These differences in beliefs and temptations may affect a woman's motivation to sustain longer term cessation after the end of pregnancy.

Second, evidence suggests that the strategies used by women who quit smoking during pregnancy differ from those used by nonpregnant quitters. Specifically, regardless of the length of their cessation, pregnant quitters engage in fewer cognitive or experiential strategies, such as consciousness raising, self-reevaluation, or reevaluation of their environment, to modify their smoking behaviors than do nonpregnant female quitters (22). Presumably, pregnant quitters rely more on external factors associated with pregnancy, such as social stigma and the health of the developing child, to achieve cessation. Stotts, DiClemente, Carbonari, and Mullen (18) argued that because the coping strategies used to maintain cessation by pregnant women differ from those used by nonpregnant women, the resumption of smoking postpartum represents the end of a temporary suspension of smoking rather than a failure to maintain a long-term behavior change.

Finally, motivation for cessation during pregnancy predicts postpartum smoking. Curry, McBride, Grothaus, Lando, and Pirie (23) examined the relation between motivation to quit during pregnancy and postpartum relapse. They found that women who relapsed during the first 2 months postpartum were less intrinsically motivated (i.e., motivated by health) and more extrinsically motivated (i.e., motivated by social consequences) to quit smoking during pregnancy than were those who remained abstinent postpartum. Thus, motivation for the maintenance of smoking abstinence after childbirth may be an important, and potentially modifiable, predictor of women's ultimate relapse to smoking postpartum. However, relatively little is known about factors that affect pregnant women's motivation to remain abstinent postpartum.

Two factors that may affect women's motivation to remain abstinent during the postpartum period are changes in mood and concerns about body shape and weight. A considerable number of women report the use of smoking to control their body weight (24,25) or concerns about weight gain related to quitting smoking (26,27). Evidence suggests that shape and weight concerns increase during the postpartum period (28,29), and preliminary data indicate that concerns about weight (2,15) relate to postpartum smoking. Thus, for vulnerable women, such as those who have a tendency to easily lose control over food intake, the resumption of smoking postpartum may represent an effort at weight control.

Similarly, many women experience an increase in depressive symptoms toward the end of pregnancy (30-32), and depressive symptomatology is common in the postpartum period. Because mild levels of depressive symptomatology have been associated with a resumption of smoking, independent of nicotine dependence (33), depressive symptoms also may decrease a woman's motivation to remain abstinent postpartum. Thus, both changes in mood and concerns about body shape and weight may play a role in women's attitudes toward smoking during the postpartum period (34). However, the relation between these factors and a pregnant woman's motivation for postpartum abstinence is not known. This study is designed to

determine the proportion of pregnant women that are motivated to remain abstinent postpartum and examine the salience of shape, weight, and mood concerns on motivation to remain abstinent. We hypothesized that mood and weight concerns during the third trimester of pregnancy would be associated with motivation to maintain smoking abstinence postpartum and that this relationship will persist even after controlling for factors previously associated with postpartum smoking relapse.

METHODS

Participants

Participants ($N = 119$) were recruited to participate in a larger study concerning the predictors of smoking in the postpartum period between February 2000 and November 2004. Pregnant women were recruited through advertisements in community magazines geared toward pregnant women. Flyers and posters advertising the study also were distributed to outpatient obstetric and gynecologic clinics and agencies serving women and children. Women were eligible to participate if they (a) reported having smoked at least eight cigarettes per day for at least 1 month prior to becoming pregnant; (b) were currently not smoking, as verified by an expired air carbon monoxide reading of 8 parts per million (ppm) or less; (c) were older than 14 years of age; and (d) were at least 28 weeks pregnant. Women between the ages of 14 and 18 were required to obtain the consent of a parent or guardian to participate.

A total of 214 women were contacted or responded to advertisements about the study, of which 181 were pregnant. Of these, 47 were ineligible (17 were still smoking, and 30 reported having smoked less than eight cigarettes per day prior to quitting). Thus, 134 (74% of pregnant callers) were eligible to participate. Fifteen eligible women elected not to participate or were unable to be scheduled, yielding 119 (88.9% of those eligible) participants in the study. All women were in the third trimester of pregnancy ($M = 32.1$, $SD = 3.8$ weeks pregnant) and had been smokers for an average of 9.1 ($SD = 5.9$) years prior to this pregnancy. The sample was 44.4% ($n = 51$) African American and 1.7% ($n = 2$) American Indian; the remaining 53.9% ($n = 62$) was White.

Procedure

This study was conducted at a large, urban hospital in Pittsburgh, Pennsylvania, and was reviewed and approved by the Institutional Review Board of the hospital. Women who responded to advertisements about the study were contacted by telephone. During this phone call, a member of the study staff explained that we were interested in understanding what happens after giving birth for women who quit smoking during their pregnancy and asked women to complete questions to determine their eligibility to participate. Interested women who were not currently in the third trimester of pregnancy were scheduled to be called again in their third trimester to check eligibility criteria. Women who were currently at least 28 weeks pregnant, had quit smoking, and reported smoking for at least 1 month prior to quitting were scheduled for an assessment visit during the third trimester of pregnancy.

At this first assessment, women met with a member of the research team, provided informed consent, completed a brief interview about their previous smoking habits, and provided an expired air sample to measure carbon monoxide content. All women had carbon monoxide readings of less than 8 ppm at the time of assessment. Participants were compensated for completing assessments.

Assessments

Pregnancy-related information—Participants completed questions designed to assess the smoking status of others in the home, intention to breast-feed, and current alcohol use.

Information on whether the pregnancy was intentional and demographic information (e.g., age, ethnicity) also was collected.

Smoking behavior—Because women were required to be abstinent at the time of entry into the study, we asked women to “think back to the last time you smoked every day for at least 1 month” and complete the Fagerstrom Test of Nicotine Dependence (FTND). The FTND is a widely used, six-item self-report measure of nicotine dependence with good validity (35). Women also provided information on the number of cigarettes smoked prior to quitting, number of years they had been smoking, and when and how they quit smoking during the current pregnancy.

Motivation and confidence to remain abstinent—An investigator-designed questionnaire was used to assess motivation and confidence to remain abstinent after delivery. Women were asked, “How motivated do you feel to stay quit after your baby is born?” Answers were rated on a 4-point scale from 0 (*not at all*) to 3 (*a lot*). Using a similar scale, women also were asked, “How confident are you that you will stay quit after your baby is born?”

Weight concerns—Participants completed the Three-Factor Eating Questionnaire, which contains three empirically derived factors with good internal consistency in community samples (36). The restraint factor reflects conscious thoughts and purposeful behaviors to control food intake. The disinhibition factor reflects a tendency to relinquish control over food intake in response to environmental or emotional stimuli, and the hunger factor reflects the behavioral consequences of subjective hunger. Women also completed a six-item questionnaire designed to assess cessation specific weight concerns (25) and a six-item questionnaire assessing self-efficacy for weight management after quitting smoking (25). Finally, participants completed a three-item scale developed by Pomerleau et al. (24) to assess the use of smoking as a weight control strategy. This scale ranges from zero to 9, with a higher number indicative of greater use of smoking for weight control.

Mood—Both depressive symptoms and perceived stress were assessed. Participants completed the Center for Epidemiological Studies–Depression Scale (37) to assess current depressive symptomatology. The Center for Epidemiological Studies–Depression Scale was selected because it appears to be less sensitive than other depression scales to somatic symptoms that may be common during the postpartum period (38). Women also completed the Perceived Stress Scale (39), designed to assess the degree to which an individual appraises situations as stressful. The Perceived Stress Scale is a 14-item instrument with adequate reliability that has been used in other smoking cessation studies (40).

Data Analyses

The analytic strategy was designed to determine the proportion of pregnant women motivated to remain abstinent postpartum and test hypotheses about the association of mood and weight concerns to motivation to maintain smoking abstinence postpartum. First, we examined the distribution of responses to the 4-point ordinal motivation scale. Responses ranged from 0 to 3 but were not normally distributed (distribution of responses on the motivation scale was 0, $n = 4$; 1, $n = 1$; 2, $n = 24$; 3, $n = 78$). We, therefore, divided participants into two groups: a group who was highly motivated (motivation score = 3, $n = 78$) and a group who was less than highly motivated (motivation score = 0–2, $n = 41$). We then compared highly motivated to less motivated women on demographic, pregnancy-related, smoking, mood, and weight concern variables, using t tests for continuous and chi-square tests for categorical data. We also compared women at each of the four levels of motivation, and the pattern of means and frequency distributions were similar.

To test hypotheses about the concurrent predictors of motivation and the relative contributions of mood, weight concerns, and factors previously associated with postpartum smoking, we conducted a series of logistic regression equations. First, the mood and weight concerns variables that significantly distinguished high and low motivation groups in the univariate t and chi-square tests ($ps < .05$; see Table 1) were entered into a logistic regression equation to predict high versus low motivation to remain abstinent. Next, we added factors that have been associated with postpartum smoking in previous research to the model with the mood and weight variables. These variables included intention to breast-feed, prepregnancy nicotine dependence, years of smoking, partner's smoking status, and race. The likelihood ratio chi-square test was used to evaluate the significance of the overall multivariable model that included mood and weight variables plus the five variables suggested by previous studies. Wald's statistic and the associated chi-square values were used to determine which of the independent variables in the multivariate model were significant. Finally, the change in log likelihood and associated chi-square value were used to evaluate the significance of adding the variables from previous research (Table 3) to the model with the mood and weight variables (Table 2).

RESULTS

Smoking Cessation, Mood, and Weight Concerns During Pregnancy

Demographic, prepregnancy smoking characteristics, and information on postpartum motivation are listed in Table 1. On average, women were 24.2 ($SD = 5.9$) years of age and 32.1 ($SD = 3.8$) weeks pregnant. Most women (77.8%) reported quitting smoking at some point during their first trimester and indicated that they quit on their own, without the help of formal programs or materials (89.1%).

Motivation to Remain Abstinent

Overall, 65.6% ($n = 78$) of pregnant women were highly motivated to remain quit postpartum, and 74.0% ($n = 88$) felt confident in their ability to do so. Not surprisingly, motivation to stay quit was associated with confidence to remain quit postpartum, and, compared with less motivated women, a significantly greater proportion of highly motivated women felt very confident to stay quit (62.8% vs. 7.3%, $\chi^2 = 33.7$, $p < .0001$).

Women with a high level of motivation to stay quit did not differ from those without on age, race, or other demographic factors. However, as shown in Table 1, there were differences in perceived stress, weight self-efficacy, weight-control smoking, hunger, and intention to breast-feed. Specifically, women who were more motivated to remain abstinent reported more stress, greater weight self-efficacy, less smoking for weight control, and less hunger than those who were not motivated. Motivated women were also more likely to report an intention to breast-feed their infant.

Predictors of Postpartum Motivation

To further examine the role of mood and weight concerns during pregnancy on postpartum abstinence motivation, we included the mood and weight concern variables that were significantly associated with motivation ($ps < .05$; Table 1) in a model of motivation to remain abstinent after delivery. As shown in Table 2, greater feelings of self-control over weight without smoking ($\beta = .31$, $SE = .11$, $p = .004$) were associated with higher motivation for postpartum abstinence. Specifically, for every unit increase on weight-self efficacy, women were 1.4 times more likely to report high motivation to remain abstinent postpartum.

After controlling for breast-feeding, partner smoking, years of smoking, prepregnancy nicotine dependence, and race, weight self-efficacy ($\beta = .32$, $SE = .11$, $p = .004$) remained significantly

related to postpartum motivation (see Table 3). Moreover, although the overall model was significant, the addition of breast-feeding, partner smoking, years of smoking, prepregnancy nicotine dependence, and race did not improve the fit of the model with the mood and weight variables alone, $\chi^2(5, N = 119) = 6.9, p = .23$. Thus, self-efficacy for weight management is significantly associated with motivation to maintain abstinence postpartum even after controlling for mood and other variables that have been shown to relate to postpartum smoking.

DISCUSSION

Although quitting smoking during pregnancy is common, motivation to remain abstinent appears to wane postpartum, and most women resume smoking. Because factors that affect a woman's motivation to remain abstinent may also predict her vulnerability to relapse, understanding what motivates smoking abstinence during and after a pregnancy might help identify potentially modifiable targets for intervention. This study is the first to examine the relation of mood and weight variables to postpartum smoking motivation, and results suggest that weight concerns during pregnancy relate to motivation for continued smoking abstinence following childbirth. Specifically, pregnant women who are highly motivated to remain abstinent postpartum are more confident in their ability to control their weight and feel less hunger, and they may be less likely to use smoking as a weight control tool. Moreover, self-efficacy to control weight, assessed using the six-item questionnaire designed by Borrelli and Mermelstein (25), was associated with motivation to remain abstinent even after controlling for stress, hunger, and factors putatively related to postpartum smoking.

In addition, an intention to breast-feed relates to motivation to remain abstinent. This finding is consistent with some previous research in which breast-feeding is related to decreased likelihood of smoking relapse (2,5), although contrary findings also have been reported (17, 18). Because the women in this study were currently pregnant and not smoking, the correspondence between an intention to breast-feed and motivation to remain smoke free also may reflect a general motivation to engage in behaviors positively related to her child's health.

Previous research on postpartum relapse has not shown consistent relations between race, age, and nicotine dependence and the resumption of smoking (14). Similarly, in this study, race, age, and prepregnancy nicotine dependence were not related to a woman's motivation to remain abstinent. Moreover, contrary to our hypotheses, depressive symptoms during the third trimester of pregnancy were not predictive of lower motivation for postpartum abstinence. It is worth noting, however, that levels of depressive symptoms toward the end of pregnancy are often high (34,35), and the lack of an association between mood and postpartum abstinence motivation during pregnancy may reflect that both motivated and unmotivated women reported considerable depressive symptoms.

Partner's smoking status has been a consistent predictor of postpartum relapse (2,5,15) but was not associated with motivation to remain quit postpartum in this study. This discrepancy may reflect a difference between factors relevant to a pregnant woman's motivations prior to delivery and the factors that relate to an actual resumption of smoking. For example, her partner's smoking during the postpartum period may precipitate relapse even among a women who had been highly motivated during pregnancy despite her partner's smoking.

Although these cross-sectional data provide initial support of a relation between weight concerns and motivation to remain abstinent postpartum, there are several limitations. First, the questionnaire assessing motivation to remain abstinent consisted of one item. Moreover, the question assumed women felt some motivation and asked them to rate the degree to which they were motivated. As such, it may have pulled for a more socially desired answer of higher

levels of motivation. Additional data on motivation to remain abstinent using more thorough and validated assessments of motivation are needed.

A second limitation is that concerns about eating and weight may be different during pregnancy, and the nature of weight concerns may change during the postpartum period as a woman's body changes. Finally, information about motivation collected during a pregnancy may not accurately reflect a woman's intention about smoking during the postpartum. Prospective data are necessary to evaluate fully the relation among weight concerns, breast-feeding, nicotine dependence, and other factors on postpartum smoking relapse.

Nonetheless, this study suggests several modifiable targets for enhancing women's motivation. Specifically, weight concerns relate to women's motivation to remain abstinent after childbirth, and interventions designed to prevent postpartum smoking relapse may need to address women's concerns about eating and weight. Because weight concerns are likely to be salient during the postpartum period (28,29), helping women modify misconceptions about smoking and weight and increase shape and weight acceptance may minimize postpartum smoking relapse. Smoking cessation programs that target weight concerns have been developed (41, 42), and there is evidence that addressing women's concerns about weight gain, in the absence of weight modification information, improves long-term smoking cessation outcome (43). Programs such as these could be adapted to the specific concerns of mothers during the postpartum period.

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TABLE 1
Differences Between Pregnant Women With High and Low Motivation to Remain Abstinent Postpartum

Characteristic	High Motivation ^a		Low Motivation ^b		Test Statistic	p
	M	SD	M	SD		
Age (years)	24.4	5.8	23.7	6.1	.61	.54
Weeks pregnant	32.6	3.7	31.2	4.0	1.85	.07
Prepregnancy cigarettes/day	13.7	8.4	13.8	9.9	-.06	.94
Prepregnancy FTND (0–10)	3.5	2.1	4.0	2.4	-1.17	.24
Years of smoking	8.9	5.8	9.4	6.2	-.50	.62
Perceived stress	32.4	6.7	29.7	7.6	1.98	.05
CES-D	18.2	8.7	16.9	9.4	.76	.45
Weight concerns	4.1	2.0	4.7	2.3	-1.41	.16
Weight self-efficacy	6.6	2.2	5.1	2.0	3.75	.0003
Weight control smoking (0–9)	1.9	2.3	2.8	2.9	-1.94	.05
Restraint	6.3	3.7	5.2	3.0	1.76	.08
Disinhibition	5.7	2.9	5.5	3.0	.43	.67
Hunger	5.5	3.1	7.0	3.5	-2.40	.02

	High Motivation ^a		Low Motivation ^b		Test Statistic	p
	%	n	%	n		
Race						
% White	60.3	47	46.3	19	2.11	.15
% Black and other	39.7	31	53.7	22		
Intention to breast-feed						
% yes	75.6	59	51.2	21	7.30	.007
% no	24.4	19	48.8	20		
Pregnancy intentional						
% yes	37.2	29	26.8	11	1.30	.25
% no	62.8	49	73.2	30		
Alcohol use						
% any drinks	12.3	9	13.2	5	.02	.90
% no drinks	87.8	64	86.8	33		
Partner smoking						
% yes	60.3	47	48.8	20	1.44	.23
% no	39.7	31	51.2	21		

Note. FTND = Fagerstrom Test of Nicotine Dependence; CES-D = Center for Epidemiological Studies–Depression Scale.

^a n = 78.

^b n = 41.

TABLE 2
Model of Motivation for Postpartum Abstinence Including Perceived Stress and Weight Concerns Variables

Factor	β	SE (β)	Odds Ratio	95% CI	p
Weight control smoking	-.14	.09	.87	(0.73, 1.03)	.10
Hunger	-.12	.07	.88	(0.78, 1.01)	.07
Weight self-efficacy	.31	.11	1.36	(1.10, 1.67)	.004
PSS	.06	.03	1.06	(0.99, 1.14)	.09

Note. Overall, $\chi^2(4, N = 119) = 22.9, p < .001$. CI = confidence interval; PSS = Perceived Stress Scale.

TABLE 3
Multivariate Model of Motivation for Postpartum Abstinence

<i>Factor</i>	β	<i>SE</i> (β)	<i>Odds Ratio</i>	<i>95% CI</i>	<i>p</i>
Weight control smoking	-.14	.09	.87	(.73, 1.04)	.12
Hunger	-.12	.07	.89	(.77, 1.03)	.11
Weight self-efficacy	.32	.11	1.38	(.11, 1.72)	.004
PSS	.04	.04	.98	(.92, 1.06)	.28
Breast-feeding	.99	.52	2.70	(.98, 7.43)	.06
Race	.07	.51	1.08	(.40, 2.93)	.88
Prepregnancy FTND	-.03	.10	.97	(.80, 1.19)	.79
Partner smoking	.67	.47	1.96	(.77, 4.96)	.16
Years of smoking	-.02	.04	.98	(.92, 1.06)	.67

Note. Overall, $\chi^2(9, N = 119) = 29.8, p < .001$. CI = confidence interval; PSS = Perceived Stress Scale; FTND = Fagerstrom Test of Nicotine Dependence.