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Perinatal Smoking and Depression in Women with Concurrent Substance Use

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Abstract

Objective—The purpose of this report was to examine the course of smoking among pregnant women with concurrent substance use, and to assess the impact of depression on smoking.

Methods—Data were gathered as part of a randomized controlled trial assessing the efficacy of substance abuse treatment in pregnant women. Women (n=176) were recruited before 28 completed weeks of pregnancy, and followed until 3 months postpartum. Depression was assessed using the Inventory of Depressive Symptomatology and the MINI Neuropsychiatric Interview. Our outcome was the average number of cigarettes smoked per day. Linear mixed effects regression was used to measure differential changes in smoking.

Results—66% of women smoked in the three months before pregnancy, 42% of pre-pregnancy smokers achieved abstinence before delivery and 60% of the baseline cohort smoked postpartum. Smoking did not differ significantly between depressed and non-depressed groups. After delivery both groups increased smoking at similar rates.

Conclusion—Smoking was common among our cohort of pregnant women with a history of substance use. Women were able to discontinue or decrease smoking during pregnancy, but were likely to resume or increase smoking postpartum. Having clinically significant depressive symptoms or a diagnosis of depression did not have an obvious effect on smoking behaviors.

1. INTRODUCTION

Pregnancy and the postpartum period present unique opportunities and challenges for the 17 million reproductive age female smokers in the US (Substance Abuse and Mental Health Services Administration, 2009). Close to half of women who were smokers prior to conception are able to quit smoking in pregnancy (Colman & Joyce, 2003), but nearly 80%

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of this group relapses within a year after delivery, designating pregnancy as a period of “suspended smoking” (DiClemente, Dolan-Mullen, & Windsor, 2000). Smoking in pregnancy is associated with poor pregnancy outcomes and increased infant morbidity and mortality (Centers for Disease Control and Prevention, 2000; Cnattingius, 2004). Understanding the factors that influence smoking in pregnancy and after delivery is important for the development of effective interventions. This is particularly important among substance-dependent women since rates of smoking in pregnancy are high in this population: 77% among women receiving substance abuse treatment (Haller, Knisely, Dawson, & Schnoll, 1993), and 88–99% among methadone-maintained women (Haller et al., 1993; Haug, Svikis, & Diclemente, 2004; Svikis et al., 1997). Moreover, evidence suggests that smoking may be more harmful to the developing fetus than the use of illicit drugs, and that the combination of both smoking and illicit drugs is associated with worse birth outcomes (Jacobson et al., 1994; Kennare, Heard, & Chan, 2005). Unfortunately, there is limited information on the course of smoking in pregnancy among substance abusing women and on the factors that influence smoking behavior in the perinatal period.

Depression is highly prevalent in among substance-dependent individuals (Nunes & Rounsaville, 2006), and some evidence suggests that depressive symptoms moderate smoking outcomes in non-substance abusing perinatal women. Pregnant smokers who quit during pregnancy are more likely to have lower levels of depressive symptoms than those who continue to smoke (Munafo, Heron, & Araya, 2008), and those with depressive symptoms are at higher risk of postpartum relapse to smoking (Park et al., 2009). However, very little is known about the role of depression among substance abusing pregnant smokers. Only one study has evaluated this relationship, and it found that methadone-maintained pregnant women who smoke are significantly more likely to meet criteria for current mood and anxiety disorders than those who do not smoke (Chisolm, Tuten, Brigham, Strain, & Jones, 2009). The paucity of information regarding the role of depression among substance abusing pregnant smokers is regrettable considering up to 40% of pregnant methadone-maintained women report clinically significant depressive symptoms (Haug, Stitzer, & Svikis, 2001), and depression is associated with worse substance abuse treatment outcomes (Nunes & Levin, 2004). Addressing depression may be an opportunity to enhance treatment in this population at high risk for adverse smoking related outcomes affecting both mother and infant. Hence, the association between smoking and mood in pregnant women with a concurrent substance use disorder merits further investigation.

The purpose of this prospective study was to understand the normal course of smoking and smoking cessation behaviors during and after pregnancy among women with substance misuse, and to examine the effect of depressive symptoms on smoking. This investigation examined the association between depression and smoking throughout various time points in pregnancy, as well as how depression impacts changes in smoking during the postpartum time period. We hypothesized that in this group, as in non-substance using women, smoking would decrease in pregnancy and increase again postpartum. Also we predicted that women with clinically significant depressive symptoms would reduce smoking less during pregnancy and smoke more postpartum compared to those without depressive symptoms.

2. METHODS

Between 2006 and 2009, pregnant women who presented for obstetrical care at two hospital-based reproductive health clinics were screened for misuse of substances of abuse. Data were gathered as part of a randomized controlled trial to assess the efficacy of motivational enhancement therapy (MET) coupled with cognitive behavioral therapy (CBT) administered by a nurse, compared to brief advice from an obstetrical provider, to reduce drug and alcohol use among pregnant substance users. Trained research assistants obtained verbal and written

informed consent prior to screening. The Yale School of Medicine and Bridgeport Hospital Human Subjects Boards approved study procedures.

2.1. Subjects

Women were eligible to participate if they had not yet completed their 28th week of pregnancy, spoke English or Spanish and were at least 16 years of age. Potential subjects must have reported use of alcohol or an illicit drug, other than solo use of opiates, during 28 days prior to screening or scored at least 3 on the TWEAK (Chang, Wilkins-Haug, Berman, & Goetz, 1999; Russell et al., 1996) that was modified to query about alcohol and other drugs. Women were ineligible if they intended to terminate their pregnancy, were planning to move out of the area, were in imminent danger to themselves or their fetus, required emergent medical or psychiatric inpatient treatment or were engaged in outpatient substance abuse treatment. While smoking was not an eligibility criterion for the study, smoking status and amount was assessed at intake and all subsequent study visits (see below). This report focuses only on subjects that endorsed cigarette smoking in addition to their primary drug of abuse.

2.2. Screening

Women were screened at a usual obstetrical appointment at either of the two prenatal care centers. A research assistant or nurse approached pregnant women, obtained consent to screen and asked them to complete a health questionnaire that included demographic information, plans for prenatal care, the Patient Health Questionnaire-2 (PHQ-2) (Kroenke, Spitzer, & Williams, 2003), the 4 P's (Chasnoff et al., 2005; Chasnoff, Wells, McGourty, & Bailey, 2007), the modified TWEAK (Chang et al., 1999; Russell et al., 1996), and yes/no probes about individual substances of abuse (cigarettes, alcohol, marijuana, cocaine, opiates and "other") within the previous 28 days. After this initial assessment, research staff explained the study to respondents who were potentially eligible and obtained written, informed consent to enroll in the study. Respondents who were interested in participation either underwent an immediate intake interview or completed an intake visit at the next prenatal visit.

2.3. Study intake visit and recruitment

The intake assessment was completed largely via computer through the use of audio assisted software whereby questions were read to the respondent while they also appeared on screen. The assessment included interview questions about current and past pregnancy events and complications, the Addictions Severity Index-Lite (ASI) (McLellan, Luborsky, Woody, & O'Brien, 1980), the Inventory of Depressive Symptomatology (IDS-SR) (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996) and questions from a diagnostic interview, the MINI Neuropsychiatric Interview (Sheehan et al., 1998). The Time Line Follow Back (TLFB) (Sobell, Brown, Leo, & Sobell, 1996), which collects daily information on substance use, was obtained by study personnel in a face-to-face manner.

Subjects were allocated to either: 1) behavioral therapy that combined MET and CBT for substance abuse or 2) brief advice. The MET-CBT was formatted into six sessions that could be delivered alongside prenatal and immediate postnatal care visits. Brief advice was a manualized version of standard interventions offered by obstetrical providers. An analysis of treatment efficacy showed very little difference between treatments at 3 months post the intervention trial (see Yonkers et al., 2012).

2.4. Data collection

Women were interviewed throughout pregnancy and postpartum at prenatal care visits. Study visits were of two types, treatment and assessment only. The number of treatment visits was unlimited in pregnancy and limited to 2 postpartum (3 and 6 weeks postpartum). Assessment only visits occurred at intake (T1), delivery (T2) and 3-months post-delivery (T3). On average women completed 8.57 visits. The following assessments were administered during all study visits: the TLFB, IDS-SR, and follow-up version of the ASI, which included information on psychosocial function and other significant events. The MINI Neuropsychiatric Interview was administered at T1, T2 and T3 only.

2.5. Statistical procedures

We used Fisher's exact test to estimate differences in demographics by smoking status in pregnancy, and by IDS score or diagnosis of depression at T1. Our main outcome was the mean number of daily cigarettes, which was combined from retrospective ASI data (for smoking prior to enrollment) and prospective TLFB data (for smoking subsequent to enrollment), to obtain a full spectrum of monthly data beginning 3 months before pregnancy to 3 months after pregnancy. For TLFB, days were aggregated into 28-day pregnancy lunar months relative to last menstrual period. Months with fewer than 14 days of data were considered missing. For each month cigarette use was also categorized into any use (greater than zero cigarettes) or no use (zero cigarettes). For simplicity we will refer to changes in smoking over time as the "time" factor. Similar variables for past month cigarette use were defined relative to the dates of T1, T2, and T3 to match up with the time period of depression instruments.

Our main exposure was depression, which we measured in two ways. The first was an IDS score with a cutoff of 24 or more being positive for clinically significant depressive symptoms (high IDS group). The second was a diagnosis of major depressive disorder (MDD) according to the MINI interview. We examined depression as high IDS group and MDD for two reasons. First, several studies have found positive relationship between depressive symptoms and smoking in community samples of pregnant women, but few prospective studies have examined the relationship between a diagnosis of major depression and smoking outcomes in pregnant women, and only one has done so in women with concurrent substance use. Second, many more women met positive criteria for IDS, representing a group of women with "mild" depressive symptoms.

We examined the relationship between smoking and depression from a number of different statistical angles. First, binary cigarette use was tabulated for each depression group for T1, T2 and T3 time points. Within each time point, we show binary cigarette use proportions and means for cigarette use for both IDS and MDD criteria for depression. Next, we examined postpartum smoking (proportion of women who smoked at all postpartum), specifically for smokers who quit during pregnancy. Abstinent smokers were defined as having smoked 3 months before pregnancy and being abstinent in the last month of pregnancy (month 10). IDS and MDD were assessed at delivery and comparisons between depression groups were made using Fisher's exact test.

Finally, to assess the impact of depression on changes in smoking during the postpartum period, postpartum smoking (mean number of daily cigarettes) was examined for all women and for abstinent women using linear mixed effects models. Time points for smoking included smoking at T1, T2, and T3. These mixed models account for missing data patterns and include covariates for treatment group. In all cases, we were looking for differences in postpartum relapse/increases in smoking between depressed and non-depressed women, as assessed at delivery. Similar logistic models for smoking proportion at each time point were

considered, but data were too sparse and these models did not converge. Subsequent changes in smoking during postpartum were also compared between depressed and non-depressed groups. For women abstinent at delivery, only changes in smoking subsequent to delivery were compared between groups, as these women were defined as nonsmokers in month 10. For depression, once again, both IDS and MDD were used.

3. RESULTS

As shown in Figure 1, we screened 2661 women for study eligibility. Of those screened, 1829 women did not meet criteria for drug use while 543 were ineligible for other reasons. Of the 289 eligible women, 91 (32%) declined. One hundred ninety six women consented, 184 women completed the enrollment process, and 176 women had sufficient data collected to be included in the analysis for pregnancy and 129 had sufficient follow up data for the postpartum period. There were no differences between the women that completed enrollment and those that had sufficient follow-up data. All women included in the analysis endorsed smoking during or in the six months before pregnancy.

3.1. Demographic and clinical characteristics

The demographic and clinical characteristics of the total sample of 176 participants, presented according to whether or not they smoked in pregnancy are shown in Table 1. We recruited slightly more women who were Black as compared to White or Hispanic; they were typically 21 years-old or older and had a high school education. Women who smoked in pregnancy had higher parity and gravidity and enrolled later in pregnancy, as compared to non-smokers, though these differences were not statistically significant. The most commonly used concurrent substances were alcohol followed by marijuana. A greater proportion of smokers, as compared to nonsmokers, also used cocaine (24% vs. 2%, $p<0.0001$). Fifty-three subjects (30%) had a mood or anxiety disorder at enrollment. Major depressive disorder was the most common non-substance comorbid disorder ($N=35$), followed by agoraphobia ($N=22$), generalized anxiety disorder (GAD) ($N=21$), and posttraumatic stress disorder (PTSD) ($N=21$). Smokers had higher rates of PTSD (16% vs. 4%; $p=0.02$), but similar rates of other affective disorders compared to nonsmokers. Of the 53 women with any comorbid mood or anxiety disorder, 47% had only one disorder during this time period, 17% had 2 disorders and the remaining 36% had 3 or more disorders. More smokers had comorbid disorders than nonsmokers.

We also evaluated demographic and clinical characteristics according to IDS score (high = 100; low = 76) and MDD diagnosis (no MDD = 141; MDD = 35) at intake. As expected, all 35 women with a diagnosis of MDD had an IDS score greater than 24. Women with a high IDS score were more likely to meet full criteria for a substance use diagnosis (47% vs. 19%; $p<0.001$), use drugs other than alcohol, cocaine or marijuana (13% vs. 2%; $p=0.03$), and have one or more comorbid disorders (63% vs. 5%; $p<0.001$), compared to women in the low IDS group. Women with a diagnosis of MDD were older (89% vs. 72%; $p=0.05$) and nearly twice as likely to have a current diagnosis of substance abuse or dependence (51% vs. 26%; $p=0.01$), compared to women without MDD. All women with MDD had at least one comorbid diagnosis compared to only 13% of women without an MDD diagnosis. All other characteristics did not differ between groups (data not shown).

3.2. Perinatal smoking

Smoking was common in our sample of women; 66% of women smoked 3 months before pregnancy, and 62% of women smoked in pregnancy between enrollment and delivery. Cigarette consumption over time is shown in Figure 2. In general, the amount smoked decreased substantially during pregnancy and rebounded postpartum to similar or near pre-

pregnancy levels. The decrease during pregnancy was larger from 7.33 cigarettes per day pre-pregnancy to 1.87 cigarettes per day in month 9. By 3 months postpartum, use had returned to month 1 levels (4.10 cigarettes per day), which was still much less than pre-pregnancy, on average. In terms of proportion of smokers, there was a decrease from month 1 (58%) to month 6 (39%), an approximately level rate until month 10 (40%) and an increase postpartum to 60%. Overall, 42% of women with pre-pregnancy smoking achieved abstinence in the last month of pregnancy.

3.3. Smoking and depression in pregnancy

Cigarette consumption over time, based on diagnosis of major depression, at T1 is shown in Figure 2. Cross sectional analyses of cigarette use and depression are shown in Table 2. Cross sections during pregnancy, delivery, and postpartum were examined as time points. MDD and IDS diagnoses were examined as depression measures. Cigarette use and amount were examined as measures of smoking. None of these cross sectional comparisons showed a clear association between depression and smoking. For the pregnancy and delivery time points, all combinations showed virtually identical smoking between depressed and non-depressed groups. For postpartum MDD diagnosis, women with MDD had a slightly higher proportion of smokers, but on average, women without MDD smoked more cigarettes per day. For IDS, the amount of cigarettes smoked was also slightly higher for women in the high IDS group, but the proportion of smokers was similar between high and low IDS groups.

3.4. Smoking and depression postpartum

Postpartum smoking by MDD diagnosis is shown in Figure 3. Overall, there did not seem to be a substantial difference in postpartum smoking between women with MDD and women without MDD. The proportion of postpartum smokers was similar for women with MDD and women without (Fig 3, panel A). This was also true for the number of cigarettes smoked per day (Fig 3, panel B), despite a dip at 3 months postpartum for women with MDD. For women who did not smoke in month 10 (Fig. 3, panel C), the rebound was slightly less for women with MDD in terms of proportion of smokers. However, in terms of quantity (Fig. 3, panel D), the overall amount smoked was approximately equal for both groups. Analogous results were seen in postpartum smoking when evaluated by IDS score (results not shown).

For smokers who became abstinent in pregnancy, postpartum smoking by IDS group and MDD diagnosis are shown in Table 3. There was only a small number (N=26) of women in the cohort who smoked prior to pregnancy who did not smoke in month 10. Of these women, only 1 had MDD which was not sufficient to draw any meaningful conclusions. Nine of these women were in the high IDS group; however, cigarette use postpartum was not any greater in this group compared to the low IDS group.

To rule out whether any of these null associations between depression and postpartum smoking could be explained by treatment group, age or missing data patterns, we examined linear mixed-effect models for smoking amount. Conclusions were similar to those indicated by Figure 3, that is, there was no evidence of a greater smoking increase postpartum for women with depression at delivery. Smoking was similar at delivery between depression groups. In the models using all women, the increase postpartum was slightly higher for women without depression, though this difference was not statistically significant. In the models using women who did not smoke in month 10, changes in smoking postpartum were not substantially different between depressed and non-depressed groups.

4. DISCUSSION

To our knowledge, this is the first study to longitudinally evaluate the course of smoking among pregnant and postpartum women with a history of substance use, and the role of depression on their smoking behaviors. Smoking was common among our cohort of pregnant women, with 62% of women smoking at some point in pregnancy and 60% after delivery. As in previous research, some women were able to discontinue or decrease smoking during pregnancy, but were likely to resume or increase smoking postpartum. Contrary to our hypothesis, having clinically significant depressive symptoms or a diagnosis of major depression was not predictive of higher levels of smoking in pregnancy or lower levels of abstinence among women with co-occurring substance use.

Our findings are in contrast to some prior studies, which have shown that women with depression are more likely to smoke during pregnancy (Blalock, Robinson, Wetter, & Cinciripini, 2006; Flick et al., 2006; Goodwin, Keyes, & Simuro, 2007; Zhu & Valbo, 2002). These studies, however, were not longitudinal and included healthy women without other substance use, which likely contributes to the difference in our findings. Women with alcohol, cannabis and cocaine dependence are more likely to be smokers (Breslau, Kilbey, & Andreski, 1991). Therefore, our overall sample was likely to have higher rates of smoking at baseline. In addition, the two prospective studies that examined depression and smoking during pregnancy did not find a significant association between depressive symptoms and smoking cessation (Blalock et al., 2006; Ludman et al., 2000). One study followed 819 pregnant smokers through parturition and found that women who quit early in pregnancy had lower levels of stress and depressive symptoms, but this classification was not predictive of cessation later in pregnancy (Ludman et al., 2000). A smaller study of 81 pregnant smokers found that women with dysthymia smoked significantly more cigarettes than women with no depressive disorder, but did not find a significant effect for depressive disorder diagnosis as a predictor for abstinence (Blalock et al., 2006). Furthermore, a recent study evaluating the risk factors for smoking in pregnancy did not find an association between current depressive symptoms and continued smoking (Holtrop et al., 2010).

In our study, the presence of clinically significant depressive symptoms or a diagnosis of MDD was not associated with increased smoking in the postpartum period. This is in contrast to most studies that have shown an association between symptoms of depression and an increased risk of relapse in postpartum women (Allen, Prince, & Dietz, 2009; Munafo et al., 2008; Park et al., 2009; Solomon et al., 2007; Whitaker, Orzol, & Kahn, 2007). It is worth noting that our study did not specifically focus on postpartum abstinence and relapse as most prior work, and only 42% of women in our study achieved abstinence before delivery. Moreover, none of the prior studies evaluating the relationship between depression and postpartum smoking have looked at women who misuse other substances. In our sample, women who were depressed or had clinically significant depressive symptoms were twice more likely to have a substance use disorder than the non-depressed women. Therefore, it is possible that postpartum smoking was attenuated among women with depression due to relapse or use of other substances other than cigarettes. In addition, our findings were consistent with a recent study that evaluated smoking cessation in treatment-seeking substance abusers with a history of MDD and current depressive symptoms (Sonne et al., 2010). Sonne and colleagues (2010) found no effect of baseline depressive symptoms or history of MDD on smoking abstinence at follow-up.

There are further explanations for the inconsistency between our results and the studies that found associations between depression and smoking. Most prior studies that have shown a relationship between mood and postpartum relapse to smoking have evaluated depressive symptoms and not an actual diagnosis of MDD. Furthermore, the one prior study that found

a relationship between smoking and depression among substance-abusing pregnant women (Chisolm et al., 2009) was cross-sectional and involved women in substance abuse treatment who, as epidemiologic studies show, may be more severely impaired than other substance-abusing women. Therefore, they may not be typical of substance abusing women identified in the course of obstetric practice. The prospective nature of our study is yet another possible explanation for the difference in our results. In summary, the lack of association between depression and postpartum smoking in our study is likely due to multiple factors, but in large part may be related to our cohort of non-treatment seeking substance using smokers and the prospective nature of our study.

There are study limitations that should be noted. First, we relied on self-report to assess cigarette use. The lack of a biologic measure of tobacco use could have led to inaccuracies in the estimates of smoking status and cigarettes used per day. However, in a previous study of women screened for the current analysis, we found that the agreement between urine drug screens and self-report for marijuana and cocaine was 0.74 and 0.79, respectively, in the preceding 28 days (Yonkers, Howell, Gotman, & Rounsaville, 2011). Second, this study was not specifically designed to assess cigarette use, and therefore there is a potential for differential under-reporting. Women in the high IDS and MDD diagnosis groups could have under-reported cigarette use, given that prior research has found that pregnant smokers with a mood disorder are more likely to under-report cigarette use compared to those without a mood disorder (Blalock, Fouladi, Wetter, & Cinciripini, 2005). In addition, even non-differential under-reporting of relapse to smoking or cigarette use could bias our results toward the null. Finally, our sample was derived from an inner city hospital clinic, which may limit the generalization of our results to the pregnant population at large. However, our pool of potential participants was large (n=2661) and diverse.

5. Conclusions

This is the first study to longitudinally evaluate the course of smoking in the perinatal period among substance abusing women. As with substance abusing populations in general, smoking was common and abstinence rates were low. Similar to prior studies with pregnant and postpartum women, women in our study were able to decrease smoking during pregnancy, but were likely to increase use or relapse postpartum. Contrary to our hypothesis, clinically significant depressive symptoms or a diagnosis of major depression during the perinatal period did not confer an increased risk of smoking or relapse. Additional research is needed to further evaluate the impact of depression and other risk factors on smoking outcomes in pregnant substance abusing women. Nonetheless, it is clear from our results that this is a patient population that is in need of smoking cessation treatment given the high levels of smoking and low levels of abstinence, and the associated risk factors of smoking in the perinatal period.

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Highlights

- Smoking was common; 66% of women smoked at baseline and 60% smoked postpartum.
- 42% of pre-pregnancy smokers achieved abstinence before delivery.
- Smoking did not differ significantly between depressed and non-depressed groups.
- Women resumed/increased smoking postpartum independent of depression status.

Figure 1.
Participant flow diagram

Figure 2.

Mean number of daily cigarettes used during pregnancy and postpartum for entire cohort (All Subjects), women who met criteria for major depressive disorder (MDD Group), and women without major depressive disorder (No MDD Group), starting three months before pregnancy (baseline) through three months postpartum (PP)

Figure 3.

Postpartum smoking by MDD diagnosis for use (any smoking) (A) and quantity (number of cigarettes per day) (B) among women who continued to smoke throughout pregnancy; and for use (C) and quantity (D) among women who were abstinent at delivery

Table 1

Demographic and Clinical Characteristics by Smoking in Pregnancy

Characteristic	Total N=176	Did not smoke in pregnancy N=54	Smoked in Pregnancy N=122	P-value ^a
	N (%)	N (%)	N (%)	
Age greater than 21	124 (70%)	35 (65%)	89 (73%)	0.29
Race/Ethnicity				0.02
White	39 (22%)	7 (13%)	32 (26%)	
Black	94 (53%)	27 (50%)	67 (55%)	
Hispanic/Other	43 (24%)	20 (37%)	23 (19%)	
Education (years)				0.75
1–11	58 (33%)	19 (35%)	39 (32%)	
12	72 (41%)	23 (43%)	49 (40%)	
13+	46 (26%)	12 (22%)	34 (28%)	
Gestational age at intake				0.12
4–19	79 (45%)	30 (56%)	49 (40%)	
20–28	78 (44%)	21 (39%)	57 (47%)	
29–34	19 (11%)	3 (6%)	16 (13%)	
Gravidity				0.24
1	43 (24%)	16 (30%)	27 (22%)	
2	48 (27%)	17 (31%)	31 (25%)	
3+	85 (48%)	21 (39%)	64 (52%)	
Parity				0.11
0	71 (40%)	24 (44%)	47 (39%)	
1	54 (31%)	20 (37%)	34 (28%)	
2+	51 (29%)	10 (19%)	41 (34%)	
Primary Drug				<.0001
Alcohol	53 (30%)	30 (56%)	23 (19%)	
Cocaine	30 (17%)	1 (2%)	29 (24%)	
Marijuana	81 (46%)	23 (43%)	58 (48%)	
Other	12 (7%)	0 (0%)	12 (10%)	
Drug or Alcohol Abuse or Dependence	55 (31%)	16 (30%)	39 (32%)	0.86
MDD	35 (20%)	9 (17%)	26 (21%)	0.54
Dysthymia	9 (5%)	0 (0%)	9 (7%)	0.06
Panic Disorder	10 (6%)	1 (2%)	9 (7%)	0.29
Agoraphobia	22 (13%)	3 (6%)	19 (16%)	0.08
Social Phobia	7 (4%)	1 (2%)	6 (5%)	0.68
OCD	3 (2%)	0 (0%)	3 (2%)	0.55
GAD	21 (12%)	3 (6%)	18 (15%)	0.13
PTSD	21 (12%)	2 (4%)	19 (16%)	0.02
Comorbidity				0.11
0	123 (70%)	44 (81%)	79 (65%)	

Characteristic	Total N=176	Did not smoke in pregnancy N=54	Smoked in Pregnancy N=122	P-value ^a
	N (%)	N (%)	N (%)	
1	25 (14%)	6 (11%)	19 (16%)	
2	9 (5%)	2 (4%)	7 (6%)	
3+	19 (11%)	2 (4%)	17 (14%)	

^aFisher's exact test

Table 2

Unadjusted Cigarette Use Over Time – Total and by Depression and IDS Score

Depression group	Total	Any Cigarette Use (past month)		Mean number of cigarettes (past month)
		No	Yes	
	N	N (%) ^a	N (%) ^a	Mean ± SD
T1 (Intake)				
Total	175	88 (50%)	87 (50%)	3.00 ± 5.70
MDD				
Yes	35	17 (49%)	18 (51%)	2.93 ± 4.50
No	140	71 (51%)	69 (49%)	3.02 ± 5.98
IDS 24+				
Yes	76	36 (47%)	40 (53%)	2.69 ± 5.69
No	99	52 (53%)	47 (47%)	3.24 ± 5.73
T2 (Endpoint)				
Total	143	87 (61%)	56 (39%)	1.82 ± 4.12
MDD				
Yes	16	9 (56%)	7 (44%)	1.74 ± 5.04
No	127	78 (61%)	49 (39%)	1.83 ± 4.01
IDS 24+				
Yes	33	20 (61%)	13 (39%)	1.55 ± 4.14
No	110	67 (61%)	43 (39%)	1.90 ± 4.13
T3 (3 Month Follow-up)				
Total	135	55 (41%)	80 (59%)	4.17 ± 5.53
MDD				
Yes	11	3 (27%)	8 (73%)	3.36 ± 3.61
No	124	52 (42%)	72 (58%)	4.24 ± 5.67
IDS 24+				
Yes	15	6 (40%)	9 (60%)	3.69 ± 4.19
No	120	49 (41%)	71 (59%)	4.23 ± 5.69

^a Percents are row percents

Table 3

Continued Abstinence Postpartum Among Pre-pregnancy Smokers who Quit During Pregnancy – Total and by Depression At Delivery

Depression group	Any Cigarette Use Postpartum		P-value ^a
	No N(%) ^b	Yes N (%) ^b	
Total	13 (50)	13 (50)	
MDD			1.00
Yes	0 (0)	1 (100)	
No	13 (52)	12 (48)	
IDS 24+			0.41
Yes	6 (67)	3 (33)	
No	7 (41)	10 (59)	

^aP-value computed using Fisher's exact test

^bPercents are row percents