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Craving and Withdrawal Symptoms During Smoking Cessation: Comparison of Pregnant and Non-Pregnant Smokers

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ABSTRACT

Although pregnant smokers are aware of the negative peri- and postnatal health consequences of smoking, the cessation rate in pregnancy is low, raising the question of why pregnant smokers have difficulty quitting. Reasons might be that pregnant smokers experience more intense craving and withdrawal symptoms than non-pregnant smokers. We compared craving and withdrawal in 306 pregnant smokers versus 93 non-pregnant women using data from two smoking cessation trials. Complete data were analyzed using pre-quit and post-quit (2 weeks after quit date) craving and withdrawal measured by the 12-item French Tobacco Craving Questionnaire (FTCQ-12) and French Minnesota Nicotine Withdrawal Scale (FMNWS). Pregnant smokers started smoking and smoked regularly earlier and succeeded far less at quitting smoking by week 2 than the general population of smokers (11% *versus* 43%). Post-quit date FTCQ-12 general score was higher in pregnant smokers compared to comparison groups, and was driven by elevated *emotionality* and *expectancy*. FMNWS decreased significantly less among pregnant smokers than among non-pregnant smokers. Insufficient reduction of craving and withdrawal symptoms in response to a quit attempt may partially explain why pregnant smokers may have more difficulty quitting than non-pregnant smokers. Because this was a historical comparison, findings are preliminary; however, they might foster further investigation of differences in craving and withdrawal symptoms in pregnant versus non-pregnant smokers.

1. Introduction

Maternal smoking during pregnancy is associated with (a) increased risk of perinatal negative health outcomes such as miscarriage, preterm birth, low birth weight, infant mortality, and birth defects (Centers for Disease Control and Prevention, 2010; Räisänen, Gissler, Saari, Kramer, & Heinonen, 2013; Schneider, Huy, Schütz, & Diehl, 2010); (b) postnatal health disorders such as attention-deficit/hyperactivity disorder (ADHD) in children (Surgeon General, 2014; Zhu et al., 2014); (c) the development of allergic disease (Burke et al., 2012; Thacher et al., 2014), rheumatoid arthritis, and other inflammatory and autoimmune conditions (Jaakkola & Gissler, 2005); (d) psychiatric morbidity and increased mortality in childhood, adolescence, and young adulthood (Ekblad, Gissler, Lehtonen, & Korkeila, 2010); and (e) nicotine dependence (Buka, Shenassa, & Niaura, 2003). Despite the gravity of these consequences, on average only 1 in 5 pregnant smokers quits smoking and remains abstinent at 6 month follow-up (Heil, Higgins, Mongeon, Badger, & Bernstein, 2006).

Several socio-demographic and smoking-related characteristics associated with smoking during pregnancy have been identified: being White, less education, unemployment, lower socioeconomic status, few financial resources, and emotional problems (DiClemente, Dolan-Mullen, & Windsor, 2000; Flemming, Graham, Heirs, Fox, & Sowden, 2013; Hartmann-Boyce, Stead, Cahill, & Lancaster, 2014; Schneider et al., 2010). These studies also reported that high rates of tobacco consumption, high expired air carbon monoxide (CO) concentration, and years of smoking are predictors of continued smoking. Pregnant women are well aware of the health risks of smoking during pregnancy, yet such knowledge seems insufficient in motivating all of them to quit (Ingall & Cropley, 2010; Schneider & Schütz, 2008). In fact, according to a representative data of US pregnant smokers, among women who smoked at conception only 23% self-reported having quit smoking (Kim, England, Kendrick, Dietz, & Callaghan, 2009) and among those who smoked 3 months before pregnancy (N = 3559), 42% (N = 1490) quit and 58% (N = 2069) smoked by the 3rd trimester in 2009–2010 (Kapaya, Tong, & Ding, 2015). According to 2010 data from France, and despite strong tobacco control campaigns targeting pregnant smokers, 17.1% of pregnant women self-reported smoking at the 3rd trimester (Blondel & Kemarrec, 2011). Among them 72% smoked 1 to 9 cigarettes per day and 18% smoked ≥10 cigarettes per day.

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The major correlates of smoking relapse are craving, withdrawal symptoms, slips and lapses (Allen, Bade, Hatsukami, & Center, 2008; Piper et al., 2008; Shiffman, West, Gilbert, & SRNT Work Group on the Assessment of Craving and Withdrawal in Clinical Trials, 2004). Craving is most prominent during the first 2 weeks of quitting (Shiffman & Ferguson, 2008). Surprisingly, studies of craving, withdrawal and the process of smoking cessation during pregnancy are rare. However, some authors have noted that there might be something inherent about pregnancy that worsens withdrawal. Heil et al. (2006) characterized craving and withdrawal in pregnant smokers using the Minnesota Nicotine Withdrawal Scale (MNWS; Hughes & Hatsukami, 1986). Pregnant smokers who abstained or smoked at very low levels (below baseline) during the first 5 days of a cessation attempt had greater difficulty concentrating and were more frustrated, angry, irritable, restless, and impatient compared to pregnant smokers who continued to smoke at or above smoking levels reported at baseline. Craving (viz., desire to smoke), anxiety and nervousness, anger, irritability, frustration, impatience, and restlessness also declined significantly over the 5-day assessment period, independent of smoking status. Other research (Oncken et al., 2009) also found that pregnant smokers have elevated levels of withdrawal prior to smoking cessation, but the authors noted that some withdrawal symptoms (e.g., insomnia, weight gain, and irritability) also occurred during pregnancy. In the absence of a comparison group of non-pregnant smokers, findings may have been largely affected by the condition of pregnancy, rather than the process of smoking cessation itself.

Ussher, Etter, Giatras, and Coleman (2012) examined abstinent pregnant and non-pregnant smokers, including a "smoking as usual" group to demonstrate that abstinence increased withdrawal symptoms (MNWS-Revised and additional withdrawal items) and the intensity of urge to smoke. After adjusting for baseline cigarette consumption and withdrawal scores, pregnant women had lower scores than non-pregnant women for MNWS-Revised scores and for the three individual MNWS withdrawal symptoms, angry, anxious, and impatient after 24-hour abstinence. Despite differences in the patterns of individual items, findings indicated that pregnant abstinent smokers endorsed withdrawal symptoms in a manner similar to non-pregnant abstinent smokers, although their symptoms were less severe.

Although the Ussher et al. (2012) data contradict the assumption that pregnancy worsens withdrawal, the analysis was conducted exclusively among those in the abstinent group. Abstinence ordinarily increases tobacco craving, yet craving is also influenced by ongoing smoking and is itself a strong predictor of smoking satisfaction and smoking (Baker, Breslau, Covey, & Shiffman, 2012). Without a comparison group of non-abstinent smokers, it is impossible to determine whether pregnant smokers are substantively different than their non-pregnant counterparts.

A clinical trial of smoking cessation in the general population of male and female smokers using French versions of the brief Tobacco Craving Questionnaire (FTCQ-12) and Minnesota Nicotine Withdrawal Scale (FMNWS) (Berlin, Singleton, & Heishman, 2010) found that abstinent smokers had significantly lower craving scores than non-abstinent smokers and the total withdrawal score decreased in abstainers, but did not change in non-abstainers (Berlin et al., 2011). A recent meta-analysis demonstrated that withdrawal symptoms improve among abstinent versus continuing smokers in the general population of smokers and in smokers with psychiatric disorders (Taylor et al., 2014). The fact that pregnant smokers continue to smoke during pregnancy despite knowledge of its major negative health effects suggest that patterns of craving and withdrawal symptoms may be different compared with non-pregnant smokers and males. We therefore compared craving and withdrawal symptoms in pregnant versus non-pregnant smokers using data of two previously published clinical trials (Berlin, Grangé, Jacob, & Tanguy, 2014; Berlin et al., 2011). We addressed the research question: Are there differences between pregnant smokers and non-pregnant smokers for FTCQ-12 craving and FMNWS withdrawal at baseline and after quit date at the end of the critical 2-week period? Findings could facilitate planning for future research aimed at improving health and substance use treatment in pregnant women as well as the unborn child.

2. Material and methods

2.1. Participants

We analyzed data from smokers who participated in the Study of Nicotine Patch in Pregnancy (SNIPP; Identifier: ClinicalTrials.gov NCT00507975) and the Adjustment of DOses of NIcotine in Smoking (ADONIS; ClinicalTrials.gov Identifier: NCT00235313) clinical trials of smoking cessation. The SNIPP trial was a randomized, double blind, placebo controlled, parallel group, multicenter study assessing the efficacy of 16-hr nicotine patches with doses individually adjusted according to saliva cotinine concentration and could range from 10 to 30 mg/day. Pregnant smokers older than 18 years, between 12 to 20 weeks of gestation who smoked at least five cigarettes per day and scored ≥ 5 on a scale of motivation to quit (ranging 0 to10) were enrolled. The ADONIS trial enrolled a general population of smokers attending smoking cessation clinics in France. This study compared nicotine replacement therapy (NRT) efficacy when the NRT daily dose was determined by progressive dose adaptation, based on saliva cotinine concentration, to obtain 100% substitution versus the standard monthly decreasing dose of NRT without saliva cotinine determination. We included only data from female smokers. Women were included if they were 18 years old or older, smoked ≥ 10 cigarettes per day, intended to stop smoking in the coming weeks, and scored ≥ 5 on a scale of motivation to quit (ranging 0 to 10), used an effective contraceptive method (hormonal contraception or intrauterine device), or were menopausal. Breastfeeding and pregnant women were excluded.

In both studies, socio-demographic and smoking-related variables were collected at baseline. Craving and withdrawal were assessed simultaneously at baseline and 2 weeks after the quit date. Self-reported smoking status (*abstinent* = 0, *smoking* = 1) was verified by expired air CO (abstinent if CO ≤ 8 ppm; Smokelyzer; Bedfont Scientific Ltd, Rochester, Kent, UK). For the pregnant vs. non-pregnant comparisons, the combined sample consisted of complete data on 399 smokers (ADONIS: n = 93 non-pregnant women vs. SNIPP: n = 306 pregnant women). All participants provided written informed consent prior to the study. Research protocols for both studies were approved by the Ethics Committee of the Pitié-Salpêtrière Hospital, Paris, France. Full details of the ADONIS and SNIPP studies have been published (Berlin et al., 2011, 2014).

2.2. Measures

2.2.1. French Tobacco Craving Questionnaire

Multidimensional craving was assessed by the brief version of the French Tobacco Craving Questionnaire (FTCQ-12; Berlin et al., 2010). The FTCQ-12 is a valid and reliable 12-item self-report instrument that assesses the same four dimensions [factors 1–4; respectively: *emotionnalité* (*emotionality*), *attente* (*expectancy*), *compulsion* (*compulsivity*), and *anticipation* (*purposefulness*)] as the standard version of the FTCQ (Berlin et al., 2005) and the brief and standard English versions of the Tobacco Craving Questionnaire (Heishman, Singleton, & Moolchan, 2003; Heishman, Singleton, & Pickworth, 2008). Items were rated on an interval scale (1 to 7, *strongly disagree* to *strongly agree*). Four items were reverse-keyed to reduce acquiescence. During data analysis, raw scores on the reverse-keyed items were inverted. Factor scores were calculated by summing item scores for each factor, then dividing by the number of items for each respective factor. The FTCQ-12 general craving score was derived by summing the four factor scores then dividing by the total number of items. In the initial validation study (Berlin et al., 2010), Cronbach's alpha coefficients and average interitem correlations (in parentheses)