



Short Communication

Tobacco withdrawal symptoms and urges to smoke in pregnant versus non-pregnant smokers

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HIGHLIGHTS

- We compared tobacco withdrawal in pregnant and non-pregnant smokers.
- Pregnant women had significantly lower overall withdrawal than non-pregnant women.
- We did not detect any withdrawal symptoms that were distinctive to pregnant women.

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ABSTRACT

We compared tobacco withdrawal in pregnant and non-pregnant smokers abstaining from smoking for 24 h. Female smokers completed an internet-based questionnaire, including the Minnesota Nicotine Withdrawal Scale—Revised (MNWS). They also rated additional withdrawal items and strength of urge to smoke. Consenting women were randomized to either: (i) abstain from smoking for 24 h or (ii) smoke as usual. After 24 h they rated their withdrawal again. We included a 'smoking as usual' group as we wished to establish that smoking abstinence increased withdrawal symptoms. Two-hundred and seventy-five women completed both the initial and the 24 h questionnaire and reported abstaining ($n = 115$, 17% pregnant) or smoking ($n = 160$, 21% pregnant) as requested. Exclusively among abstinent smokers, we compared symptoms for the pregnant and non-pregnant groups. After 24 h pregnant women had significantly lower scores than non-pregnant women for the mean MNWS ($p = 0.004$) and for three individual MNWS symptoms (angry, $p = 0.010$; anxious, $p = 0.048$; impatient, $p = 0.011$), with adjustments for baseline cigarette consumption and baseline withdrawal scores. Overall, on the first day of smoking abstinence, pregnant women are likely to report less severe tobacco withdrawal than non-pregnant women.

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1. Introduction

Pregnancy is a window of opportunity for smoking cessation as women are motivated to protect their baby's health (McBride, Emmons, & Lipkus, 2003) and some women develop an aversion to smoking (Grangé et al., 2006; Pletsch & Kratz, 2004). Hence, up to 45% of pregnant smokers quit early in pregnancy (Quinn, Mullen, & Ershoff, 1991; Woodby, Windsor, Snyder, Kohler, & Diclemente, 1999). Other women report increased smoking and temptations to smoke during pregnancy (McCurry, Thompson, Parahoo, O'Doherty, & Doherty, 2002; Ruggiero, Tsoh, Everett, Fava, & Guise, 2000), making quitting harder (Ripley-Moffitt et al., 2008). As for smokers in general, pregnant smokers frequently report tobacco withdrawal as a barrier to quitting (Grangé et

al., 2006; Ripley-Moffitt et al., 2008; Tong, England, Dietz, & Asare, 2008). Consequently, cessation aids focus on reducing withdrawal (Shiffman, Ferguson, Gwaltney, Balabanis, & Shadel, 2006) and are informed by knowledge of patterns of withdrawal symptoms (Hughes, 2006).

Anecdotal reports suggest that pregnancy-specific withdrawal-symptoms exist and that craving and withdrawal increase during pregnancy. There are reasons why pregnancy might exacerbate withdrawal; depressed mood is common in pregnancy (Gaynes et al., 2005) and women experiencing depression may suffer mood-related withdrawal (Copeland, Kulesza, & Hecht, 2009). Also, acceleration of nicotine clearance during pregnancy may increase cravings (Dempsey, Jacob, & Benowitz, 2002). Conversely, progesterone has been shown to reduce smoking urges (Lynch & Sofuoglu, 2010) and raised progesterone levels during pregnancy (Chabbert Buffet, Djakoure, Maitre, & Bouchard, 1998) may attenuate cigarette cravings.

We identified three studies investigating tobacco withdrawal during pregnancy. First, in a retrospective study, 94% of pregnant adolescents

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reported at least one withdrawal symptom, craving being most common (Albrecht et al., 1999). The second study (Heil, Higgins, Mongeon, Badger, & Bernstein, 2006) showed that, compared with pregnant women smoking, those in the first days of a quitting had higher mean withdrawal (seven-item Minnesota Nicotine-Withdrawal-Scale (MNWS)) and more impatience and difficulty concentrating. However, a non-pregnant abstinent-group was not included for comparison; therefore, it was not possible to determine whether the lack of effects for most symptoms was due to pregnancy. Lastly, among women attempting to quit, Buja et al. (2011) observed no difference in tobacco cravings between pregnant and non-pregnant women. However, not all the women were abstinent and few symptoms were assessed.

Research is needed to compare tobacco withdrawal in pregnant and non-pregnant smokers. If pregnancy causes increased and distinctive symptoms, pregnant smokers need to be informed of this and scales need to include pregnancy-specific symptoms. Conversely, if withdrawal symptoms are reduced during pregnancy women need to be reassured of this. We compared withdrawal symptoms in pregnant and non-pregnant smokers asked to abstain for 24 h.

2. Methods

2.1. Design and procedures

Female smokers were invited to complete a questionnaire, in English, on the website stop-tabac.ch (March 2006–April 2010). The survey was linked to websites addressing smoking cessation, pregnancy or women's health. To balance age ranges between pregnant and non-pregnant smokers, we included women aged 18–42. After questionnaire completion, consenting respondents recorded as daily smokers (“Do you usually smoke on a daily basis?”: YES and “On approximately how many days have you smoked in the last 30 days?”: 30 days) were randomly assigned by computer to be instructed “Please do not smoke a single puff of a cigarette for 24 hrs” or “Please continue to smoke at your usual level for 24 hrs”. An email indicated their group allocation and explained that in 24 h they would be asked to complete a further questionnaire. A 24 h follow-up was chosen as common withdrawal symptoms emerge within this period (West, Ussher, Evans, & Rashid, 2006; West & Ussher, 2010). Local ethical approval was obtained and the participants were not paid.

2.2. Measures

The baseline questionnaire covered demographics, smoking characteristics and the revised 15-item MNWS (Hughes & Hatsukami, 1986, see Table 2), which has good psychometric properties (Etter & Hughes, 2006; West, Ussher, Evans, & Rashid, 2006). To explore cigarette withdrawal during pregnancy, we conducted 30 minute, semi-structured interviews with 10 pregnant smokers trying to quit (mean (SD): age = 32.7 (5.4), gestation = 16.5 (6.3) weeks, cigarettes per day = 10.5 (6.30)), and with six pregnancy and smoking advisors. Emerging themes related to withdrawal were extracted from the interview transcripts (Braun & Clarke, 2006). Based on these themes, we added five putative symptoms thought to be specific to pregnancy: fatigue, drowsiness, backache, pain in limbs and sweating. Three less prevalent withdrawal symptoms were also added, as these have not been previously investigated during pregnancy: mouth ulcers, tremor and headache (Hatsukami, Hughes, & Pickens, 1985; Ussher, West, Steptoe, & McEwen, 2003; Ward, Swan, & Jack, 2001). For all symptoms we used MNWS ratings: 0 = none to 4 = severe. Participants rated time with urges to smoke (1 = not at all to 6 = all the time) and strength of urges (1 = no urges to 6 = extremely strong urges) (West & Russell, 1985). All ratings were for the previous 24 h. Following recommendations for the MNWS, and consistent with DSM-IV criteria (American Psychiatric Association, 2000), we calculated a mean MNWS-score using the first eight items (see Table 2).

2.3. Analyses

We included a comparison group who was asked to smoke as usual as first we wished to establish that abstinence increased withdrawal symptoms. We randomly assigned smokers to smoking or abstaining to ensure that the baseline characteristics were comparable for the two groups. However, we do not report the findings as for a randomized controlled trial as we did not compare outcomes for the two whole groups that were randomized, rather we focus on comparing outcomes for pregnant versus non-pregnant smokers solely in the abstinent group. To check whether abstinence had the intended effect, we used multiple linear regression to compare withdrawal symptoms at 24 h follow-up, controlling for withdrawal at baseline, for those who reported abstaining at 24 h follow-up versus those reporting smoking as usual. This analysis was conducted separately for pregnant and non-pregnant groups.

Our main analysis focused on the group who confirmed having abstained from smoking for 24 h. As little is known about withdrawal during pregnancy, the analysis was exploratory and sample-size estimations were not conducted. We used multiple linear regression to compare withdrawal scores at 24 h follow-up for pregnant versus non-pregnant smokers. We controlled for baseline withdrawal scores and baseline differences between the groups.

The primary outcomes were scores for mean MNWS, desire/craving to smoke and strength of urges to smoke as these measures have consistently been shown to be sensitive to smoking abstinence. The withdrawal items had skewed residuals, therefore logarithmic transformation was applied throughout. We used SPSS version-18 and a significance level of $p < 0.05$.

3. Results

3.1. Participants

The baseline questionnaire was completed by 4555 women. We excluded 2733 ineligible women (47 without smoking status, 51 never-smokers, 1324 ex-smokers, 495 non-daily smokers, 135 without pregnancy status, 674 aged < 18 or > 42, seven without age). The remaining 1822 were offered randomization and 280 (15%) reported being pregnant.

3.2. Randomization and compliance

Thirty-percent (539/1822) were randomized, 277 to 24 h of smoking abstinence ($n = 50$ pregnant) and 262 to usual smoking ($n = 49$ pregnant). A significantly greater proportion of pregnant women, compared with non-pregnant women, agreed to be randomized (chi-squared $\chi = 5.3$, $p = 0.023$). Fifty-one percent (275/539) complied (i.e., reported abstinence for at least 24 h or smoking within the previous 24 h, as requested) and were retained in the analysis. Table 1 presents the characteristics of these women. After 24 h the reported mean hours since the last cigarette for pregnant women were: abstinent group = 30.0 (SD = 10.7), smoking group = 3.6 (SD = 5.7); and for non-pregnant women: abstinent = 28.0 (SD = 13.2), smoking = 2.5 (SD = 4.2).

The mean number of hours between baseline and 24 h ratings for pregnant women was: abstinent = 29.4 (SD = 7.6), smoking = 30.7 (SD = 7.6); and for non-pregnant women: abstinent = 30.2 (SD = 8.0), smoking = 29.9 (SD = 7.5). There were no significant differences between pregnant and non-pregnant smokers in compliance, in the hours since the last cigarette or in the hours between baseline and 24 h ratings.

3.3. Manipulation check

First, we checked whether those abstinent, relative to continuing smokers, displayed increased withdrawal symptoms; we examined changes in symptoms separately within the pregnant and non-pregnant groups. Among women continuing to smoke, almost all symptoms

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