Unhealthy behaviors during pregnancy: who continues to smoke and consume alcohol, and is treatment of anxiety and depressive symptoms effective?

Beijers, Chantal

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2014

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Copyrights
Copyrights

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Download date: 20-09-2019
CHAPTER 4

Adverse pregnancy and delivery outcomes associated with postpartum smoking: a prospective cohort study

Chantal Beijers
Johan Ormel
Claudi L.H. Bockting
Judith L. Meijer
Maria G. van Pampus
Huibert Burger

Submitted
Abstract

**Aim:** many women who quit smoking during pregnancy relapse postpartum. Postpartum smoking has been identified as a way of coping with stressful situations. We investigated the associations of adverse pregnancy and delivery outcomes (APDO), e.g. emergency cesarean section and preterm delivery, and transfer from planned home-delivery to hospital-delivery (transfer) with postpartum smoking.

**Method:** data from a prospective population-based cohort study among pregnant women (n=2,477) from midwifery practices and hospitals were used. We selected participants who reported smoking prior to but not during the current pregnancy (n=923). Postpartum smoking was defined as a self-report of smoking at six months postpartum. We used multiple imputation because of a high proportion of missing data (up to 44%).

**Findings:** there were 130 (14%) postpartum smokers. The experience of at least one APDO was associated with over a two-fold increased odds of postpartum smoking (odds ratio 2.1, 95% confidence interval 1.3 to 3.5). With each APDO category that applied, the odds of postpartum smoking increased by approximately 60% (1.2 to 2.2). Similarly, transfer increased the odds of postpartum smoking (2.0, 1.2 to 3.3), but not independent from APDO. These associations were not affected by smoking intensity and duration prior to the current pregnancy.

**Conclusions:** the experience of APDO was associated with a doubled odds of postpartum smoking and the odds increased with increasing exposure to APDO. The high proportion of missing data necessitates cautious interpretation. The experience of APDO should be considered in targeting anti-smoking strategies that focus on continued abstinence after pregnancy.
Postpartum smoking relapse

Introduction

Pregnancy is considered an important motivator to quit smoking [1]. Unfortunately, between 24% and 60% of women who quit smoking during pregnancy relapse within six months after childbirth [2-5]. Smoking after pregnancy not only exposes the newborn to the health risks of environmental tobacco smoke [6,7], it also increases the risk of adverse health outcomes in the mother and other household members [8]. In addition, there is evidence that women who remain abstinent are more likely to breastfeed for a longer duration [9].

Smoking has been identified as a way of coping with feelings of negative affect and stressful situations, also in the postpartum period [10,11]. We hypothesized that because adverse pregnancy and delivery outcomes (APDO) and transfer from planned home-delivery to hospital-delivery may induce psychological stress, they may trigger postpartum smoking. For example, emergency cesarean section and instrumental vaginal delivery are experienced as more stressful compared to a normal vaginal delivery [12,13] and may even initiate posttraumatic stress reactions [14]. In addition, pregnancies complicated by preeclampsia, preterm delivery or low birth weight have been shown to be stressful for the mother [15,16]. Also, negative birth experiences have been linked to transfer from planned home-delivery to hospital-delivery [17,18]. A possible explanation of the association of these events with postpartum smoking may lie in postpartum depressive symptoms, which are known to be related to both APDO and postpartum smoking [19,20].

The present study investigated the associations of APDO and transfer from planned home-delivery to hospital-delivery with smoking within six months postpartum. In addition, we explored if these associations could be explained by postpartum depressive symptoms or smoking intensity and duration prior to the current pregnancy. To our knowledge, these associations have not been studied to date.

Methods

Setting and participants

The present analysis was carried out using data from the ongoing Pregnancy Anxiety and Depression (PAD) study [21]. This population-based, prospective cohort study examines psychological, medical and social factors during and after pregnancy. Women in their first trimester of pregnancy are invited to participate when visiting one of the collaborating primary midwifery practices (n=109) or obstetric and gynecology departments of hospitals (n=7).
throughout The Netherlands. Women who provide written informed consent and master the Dutch language enter the study. Written informed consent includes permission to retrieve medical birth records. Participants are asked to complete online questionnaires at several occasions both during and after pregnancy. Data collected between May 2010 and June 2013 were used for the present analysis. Of the 3,426 women who agreed to participate in the PAD study 2,477 (72%) completed the follow-up questionnaires at six months postpartum and formed the eligible study population. Out of these, women who reported smoking prior to but not during the current pregnancy, were selected for the present analysis. The PAD study was approved by the medical ethical review board of the University Medical Center Groningen.

Smoking status
Smoking status prior to and during pregnancy was ascertained by self-report at 19 and 36 weeks estimated gestational age (EGA) using the following two questions: 1) ‘Are you a former smoker?’ (yes/no) and 2) ‘Are you currently smoking cigarettes?’ (yes/no). Question 2 was repeated at six months after childbirth. Our study population consisted of women who reported at both the 19 and 36 weeks EGA assessment ‘yes’ to question 1 and ‘no’ to question 2. Postpartum smoking and smoking abstinence was defined as reporting ‘yes’ and ‘no’ to question 2 six months postpartum, respectively. Furthermore, we measured smoking intensity and duration prior to the current pregnancy as these variables likely predict postpartum smoking and may be associated with APDO. Therefore they may act as confounders. Measuring smoking intensity and duration prior to pregnancy was done by assessing the average amount of cigarettes per day (1-5; 6-10; 11-15; 16-20; 21 or more), and the number of years (1-5; 6-10; more than 10) a participant had been smoking. Smoking intensity and duration were multiplied to arrive at a crude measure of total smoking exposure (intensity X duration). The average amount of cigarettes smoked per day by postpartum smokers was assessed in the same categories as smoking intensity prior to pregnancy.

Adverse pregnancy and delivery outcomes
APDO, as registered in medical birth records, were provided by midwives and gynecologists, and included four categories: 1) adverse antenatal conditions (hypertension: diastolic >90 mm/Hg and preeclampsia or HELLP syndrome), 2) adverse delivery outcomes (emergency cesarean section and instrumental birth: forceps delivery and vacuum extraction), 3) adverse afterbirth outcomes (postpartum blood loss >1 liter and manual placenta removal), 4) adverse neonatal outcomes (meconium-stained fluid, preterm delivery (<37 weeks), low birth weight (<2500g) adjusted for gestation, low Apgar score (first minute <7), perinatal death, and the presence of a congenital defect). For the analyses, we created a variable ‘any APDO’ indicating the
presence of at least one APDO. Furthermore, we created a variable indicating the number of APDO categories that applied. In addition to APDO, we registered ‘transfer’ if a participant had to transfer from home-delivery to hospital-delivery.

**Depressive symptoms**
Depressive symptoms were assessed six weeks postpartum using the Dutch version of the validated 10-item Edinburgh Postnatal Depression Scale [22].

**Other variables**
Socio-demographic variables included age, educational level, and parity. Educational level was assessed in the following categories: elementary education, lower tracts of secondary education, higher tracts of secondary education, higher vocational education, and university education. Parity was assessed as primiparae or multiparae.

**Multiple imputation of missing data**
The percentage missing values for the questionnaire variables ranged from 0% (smoking status at six months postpartum) to 29% (parity). As for medical birth records, data from 1096 (44%) participants were not available because they were either not provided by midwives/gynecologists, or participants did not give permission to retrieve their medical birth record. To avoid the risk of bias and loss of statistical power, we imputed missing data using multiple imputation under the assumption that data were missing completely at random or missing at random (MAR) [23]. Multiple imputation is considered an appropriate method to deal with missing data, even when rates of missing data are relatively high [24,25]. We used the Multivariate Imputation by Chained Equations (MICE) algorithm and imputed 20 datasets following recommendations by Graham given the high percentages of missing data [24]. We compared observed and imputed data following the recommendations made by Sterne et al. for occasions in which large proportions of data are missing [23]. Differences between observed and imputed values ranged from 0% to 5.9%. The imputation model included all variables that were either considered predictive of the missing values or predictive of missingness of a variable [23]. Consequently, the imputation model included age, parity, level of education, APDO, transfer, depressive symptoms at six weeks postpartum, smoking intensity and duration, smoking status before, during and six months after pregnancy. Datasets were pooled using Rubin’s rules [26]. Using multivariable logistic regression models, we studied the missing data mechanism by predicting the probability of a value being missing for each variable of main interest. In these models the independent variables were those variables that were also included in the imputation models. These analyses showed explained variances ranging
from 22.0% to 30.0% (Nagelkerke’s $R^2$). This implied that data were likely missing at random to some extent but data being missing not at random cannot be excluded. Consequently, as a sensitivity analysis, we performed complete case analyses (CCA) and compared the results with those obtained using MICE. Missing data analysis and multiple imputation was performed in the total eligible study population.

**Data analysis**

After imputation, 1,068 out of 2,477 women (43%) reported smoking prior to the current pregnancy. One hundred and forty-nine women reported smoking during pregnancy, and were excluded for the analyses. Postpartum smokers and abstainers were compared on socio-demographic variables using independent samples t-tests, Mann-Whitney tests or Pearson Chi-Square tests where appropriate. Logistic regression was used to investigate the associations of postpartum smoking with ‘any APDO’, the individual APDO categories, or ‘transfer’ entered as independent dichotomous variables. To investigate a possible trend, we additionally entered ‘number of APDO categories that applied’ as a continuous independent variable. Because only 3.8% and 0.2% of women had three or four APDO, respectively, we first categorized ‘number of APDO categories that applied’ in 0, 1, and 2 or more APDO. In addition, we studied the mutual independence of APDO categories, as well as the independent contributions of ‘transfer’ and ‘any APDO’ to the risk of postpartum smoking, by entering the respective variables simultaneously in two multivariable regression models. Before exploring the explanation of the associations by depressive symptoms, we first investigated whether these symptoms were associated with APDO, transfer, and postpartum smoking. If so, depressive symptoms were added as an independent variable to the models in which the association of APDO or transfer with postpartum smoking were statistically significant. Subsequent relative changes in the beta coefficient for APDO or transfer were considered measures of explanation with an arbitrary percentage larger than 10 being regarded as substantial. Age and parity were considered as potential confounders [27]. In the total sample including never smokers (n=2,477), APDO was not associated with smoking intensity (OR=1.0, p=0.72) nor with duration (OR=1.0, p=0.93), nor with intensity X duration (OR=1.0, p=0.88) prior to pregnancy. Similar findings were obtained for the associations with transfer. Based on these findings we did not include smoking intensity, duration, and intensity X duration prior to pregnancy as confounders. Instead, we explored these variables as effect modifiers. We stratified the analyses according to these variables, in which category 3, 4, and 5 of smoking intensity were combined into one, and values of intensity X duration were arbitrarily categorized into three categories based on their distribution. Differences between subgroups were statistically tested by adding interaction terms to the regression models. The level of statistical significance was set at 0.05, two-sided. All analyses were performed using IBM SPSS Statistics version 20.0.
Results

Descriptives
Table 1 presents the characteristics of the study population, and shows that 130 (14%) women reported postpartum smoking and 793 (86%) women abstained. These numbers do not add up to the total number of 1068 former smokers minus 149 pregnancy smokers due to the pooling of datasets in the imputation process. Postpartum smokers were slightly younger (p=0.03), reported at least one APDO more often (p<0.01), and had adverse neonatal outcomes as well as a transfer to a hospital-delivery more often (p<0.01), compared to abstainers. Further, postpartum smokers reported higher smoking intensity (p=0.03) and duration (p<0.01) prior to the current pregnancy. As for the average amount of cigarettes smoked per day among postpartum smokers, 71 (54.6%) participants smoked 1-5, 40 (30.8%) smoked 6-10, 12 (9.2%) smoked 11-15, and 8 (6.2%) smoked 16-20.
Table 1: Characteristics of study participants (n=923) according to smoking status (pooled)

<table>
<thead>
<tr>
<th></th>
<th>Postpartum smokers (n=130)</th>
<th>Abstainers (n=793)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, mean (SD)</td>
<td>31.6 (4.4)</td>
<td>32.6 (4.1)</td>
<td>0.03</td>
</tr>
<tr>
<td>Education, n (%)</td>
<td></td>
<td></td>
<td>0.23</td>
</tr>
<tr>
<td>Elementary education</td>
<td>1 (0.8)</td>
<td>1 (0.1)</td>
<td></td>
</tr>
<tr>
<td>Lower tracts of secondary education</td>
<td>14 (10.8)</td>
<td>78 (9.8)</td>
<td></td>
</tr>
<tr>
<td>Higher tracts of secondary education</td>
<td>53 (40.8)</td>
<td>277 (34.9)</td>
<td></td>
</tr>
<tr>
<td>Higher vocational education</td>
<td>48 (36.9)</td>
<td>318 (40.1)</td>
<td></td>
</tr>
<tr>
<td>University education</td>
<td>14 (10.8)</td>
<td>122 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Multiparous, n (%)</td>
<td>74 (56.9)</td>
<td>493 (62.2)</td>
<td>0.28</td>
</tr>
<tr>
<td>Any APDO, n (%)</td>
<td>89 (68.5)</td>
<td>398 (50.2)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Adverse antenatal outcomes</td>
<td>14 (10.8)</td>
<td>64 (8.1)</td>
<td>0.43</td>
</tr>
<tr>
<td>Adverse delivery outcomes</td>
<td>37 (28.5)</td>
<td>167 (21.1)</td>
<td>0.17</td>
</tr>
<tr>
<td>Adverse afterbirth outcomes</td>
<td>36 (27.7)</td>
<td>158 (20.0)</td>
<td>0.12</td>
</tr>
<tr>
<td>Adverse neonatal outcomes</td>
<td>51 (39.2)</td>
<td>206 (26.0)</td>
<td>0.03</td>
</tr>
<tr>
<td>Number of APDO categories that applied, n (%)</td>
<td></td>
<td></td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>0 APDO</td>
<td>38 (29.2)</td>
<td>376 (47.4)</td>
<td></td>
</tr>
<tr>
<td>1 APDO</td>
<td>52 (40.0)</td>
<td>270 (34.0)</td>
<td></td>
</tr>
<tr>
<td>≥ 2 APDO</td>
<td>40 (30.8)</td>
<td>147 (18.5)</td>
<td></td>
</tr>
<tr>
<td>Transfer, n (%)</td>
<td>55 (42.3)</td>
<td>212 (26.7)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>EPDS-score at 6 weeks postpartum, median (IQR)</td>
<td>4.2 (5.1)</td>
<td>4.0 (4.0)</td>
<td>0.49</td>
</tr>
<tr>
<td>Smoking intensity prior to pregnancy, number of daily cigarettes, n (%)</td>
<td></td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>1-5</td>
<td>36 (27.7)</td>
<td>331 (41.7)</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>37 (28.5)</td>
<td>193 (24.3)</td>
<td></td>
</tr>
<tr>
<td>11-15</td>
<td>33 (25.4)</td>
<td>135 (17.0)</td>
<td></td>
</tr>
<tr>
<td>16-20</td>
<td>18 (13.8)</td>
<td>104 (13.1)</td>
<td></td>
</tr>
<tr>
<td>21 or more</td>
<td>7 (5.4)</td>
<td>30 (3.8)</td>
<td></td>
</tr>
<tr>
<td>Smoking duration prior to pregnancy, number of years, n (%)</td>
<td></td>
<td></td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>1-5</td>
<td>22 (16.9)</td>
<td>342 (43.1)</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>51 (39.2)</td>
<td>273 (34.4)</td>
<td></td>
</tr>
<tr>
<td>More than 10</td>
<td>57 (43.8)</td>
<td>178 (22.4)</td>
<td></td>
</tr>
</tbody>
</table>

Imputed data set. Unimputed data included 119 postpartum smokers and 722 abstainers
Due to rounding numbers may not add up to the total
APDO= Adverse Pregnancy and Delivery Outcomes
EPDS= Edinburgh Postnatal Depression Scale

74
Postpartum smoking

In an unadjusted analysis, ‘any APDO’ and ‘transfer’ were both associated with an approximately two-fold increased odds of postpartum smoking (table 2). Adjusted for each other, ‘any APDO’ was still independently associated with postpartum smoking (OR=1.9, 95%CI 1.1;3.2) but ‘transfer’ no longer showed a statistically significant association (OR=1.9, 95%CI 1.0;3.2). With each APDO category that applied, the odds of postpartum smoking increased by approximately 60%. Each individual APDO category showed an odds ratio above 1.0, but the association was statistically significant for ‘adverse neonatal outcomes’ only, and remained unaltered when adjusted for the other APDO categories (OR=1.8, 95%CI 1.0;3.2). Adjustment for age and parity did not notably change the associations (table 2). The CCA showed that the unadjusted estimates in general attenuated when compared to the results using MICE, and that the association of ‘adverse neonatal outcomes’ with postpartum smoking was no longer statistically significant. The CCA further showed that after adjustment for age and parity, most associations lost their statistical significance. Stratified analyses according to prior smoking intensity and duration showed that the magnitude of the associations were not substantially different and none of the interaction terms were statistically significant.

Explanation by depressive symptoms

Depressive symptoms were not associated with postpartum smoking (table 1), therefore we refrained from our analyses on their explanatory potential.
### Table 2: Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (95%CI) for the associations of APDO and ‘transfer’ with postpartum smoking

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted OR (95%CI)</th>
<th>Adjusted† OR (95%CI) MICE</th>
<th>Adjusted‡ OR (95%CI) MICE</th>
<th>Unadjusted OR (95%CI) CCA</th>
<th>Adjusted† OR (95%CI) CCA</th>
<th>Adjusted‡ OR (95%CI) CCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any APDO</td>
<td>2.1** (1.3;3.5)</td>
<td>2.2** (1.3;3.6)</td>
<td>2.2** (1.3;3.6)</td>
<td>1.8* (1.0;3.0)</td>
<td>1.6 [0.9;2.8]</td>
<td>1.8 [0.9;3.4]</td>
</tr>
<tr>
<td>Adverse antenatal outcomes</td>
<td>1.3 (0.5;3.3)</td>
<td>1.3 (0.5;3.3)</td>
<td>1.3 (0.5;3.3)</td>
<td>1.2 (0.4;3.2)</td>
<td>0.9 (0.3;2.7)</td>
<td>1.0 (0.3;3.9)</td>
</tr>
<tr>
<td>Adverse delivery outcomes</td>
<td>1.5 (0.8;2.7)</td>
<td>1.5 (0.8;2.6)</td>
<td>1.5 (0.8;2.7)</td>
<td>1.2 (0.6;3.3)</td>
<td>1.3 (0.7;2.5)</td>
<td>1.3 (0.6;3.0)</td>
</tr>
<tr>
<td>Adverse afterbirth outcomes</td>
<td>1.6 (0.9;2.7)</td>
<td>1.6 (0.9;2.8)</td>
<td>1.6 (0.9;2.8)</td>
<td>1.4 (0.7;2.7)</td>
<td>1.5 (0.7;2.9)</td>
<td>1.4 (0.6;3.3)</td>
</tr>
<tr>
<td>Adverse neonatal outcomes</td>
<td>1.8* (1.0;3.2)</td>
<td>1.9* (1.1;3.4)</td>
<td>1.9* (1.1;3.4)</td>
<td>1.6 (0.9;2.9)</td>
<td>1.5 (0.8;2.8)</td>
<td>1.4 (0.7;2.8)</td>
</tr>
<tr>
<td>Number of APDO categories that applied</td>
<td>1.6** (1.2;3.2)</td>
<td>1.6** (1.2;2.2)</td>
<td>1.7** (1.2;2.3)</td>
<td>1.6* (1.1;2.3)</td>
<td>1.6* (1.0;2.3)</td>
<td>1.5 (0.9;2.5)</td>
</tr>
<tr>
<td>Transfer</td>
<td>2.0** (1.2;3.3)</td>
<td>1.9** (1.2;3.2)</td>
<td>1.9** (1.2;3.2)</td>
<td>1.8* (1.0;3.1)</td>
<td>1.6 (0.9;2.9)</td>
<td>1.4 (0.7;2.8)</td>
</tr>
</tbody>
</table>

Note: each variable was entered in a univariable regression model
APDO= Adverse Pregnancy and Delivery Outcomes
MICE= Multivariate Imputation by Chained Equations
CCA= Complete Case Analysis
* p<0.05
** p<0.01
† adjusted for age
‡ adjusted for age and parity
Discussion

To our knowledge, this is the first study that investigated the associations of postpartum smoking with APDO and transfer from planned home-delivery to hospital-delivery. Our findings showed that women who had at least one APDO have a more than two-fold increased odds of postpartum smoking. Transfer increased the odds of postpartum smoking as well, although not independent from APDO. Furthermore, ‘adverse neonatal outcomes’ showed a positive association with postpartum smoking. We also found a trend of increasing ‘number of APDO categories that applied’ with increasing odds of postpartum smoking. Depressive symptoms could not explain the associations, nor could smoking intensity and duration prior to pregnancy.

Strengths and limitations

Strengths of the present study include the prospective cohort design, which has limited the potential for recall bias, and a favorable follow-up rate. Data were mainly collected in primary obstetric care throughout The Netherlands, which may warrant generalizability of our results to pregnant women from the general population, although highly educated women were somewhat overrepresented. Study limitations should be mentioned. First, a major limitation is the relatively large proportion of missing data from medical birth records. Still, the use of data from medical birth records is preferred over self-report data, as it has been shown that parental recall of birth outcomes lacks precision [28]. We aimed to tackle the limitations caused by missing data by using multiple imputation, which is a preferred method [23]. However, our results should be interpreted with some caution. Second, despite the large total sample, the sample size of women who smoked postpartum was relatively small. This may partly explain the differences in statistical significance between results of the analyses using MICE and results of the CCA. Third, we did not measure smoking behavior by the partner, which could have been a confounder [29]. Finally, smoking status was measured using self-report questionnaires and thus may have been underreported. Although it cannot be excluded that women who experienced APDO feel guilty and are less likely to report their true postpartum smoking status, we assume that possible underreporting at six months postpartum is largely independent of APDO.

Comparison with previous studies and explanation of findings

The present study provides new insights into predictors of postpartum smoking, and adds to existing literature showing that having to cope with stressful situations is a major risk factor for postpartum smoking [11]. Our findings suggest that although APDO may trigger postpartum
smoking, not necessarily all categories of APDO are associated with postpartum smoking. The association between adverse neonatal outcomes and postpartum smoking connects to previous research on psychological stress. For example, parents of low birth weight infants are concerned about the health of the newborn [30]. In addition, the consequences of having a newborn in the neonatal intensive care unit, i.e. having poor sleep quality and the physical separation, may be important factors in the development of psychological stress [31,32]. No association with postpartum smoking was found for other APDO categories. However, previous research showed that adverse delivery outcomes are associated with postpartum psychological problems. Women who had an unplanned cesarean section or instrumental delivery showed a higher risk of exhibiting posttraumatic stress symptoms [13,33]. It is also suggested that specifically in individuals with posttraumatic stress symptoms, smoking is considered as a way of coping with negative affect [34]. Nevertheless, our data could not provide evidence for a direct association between adverse delivery outcomes and postpartum smoking. Our finding that ‘transfer’ may increase the risk of postpartum smoking connects to our main finding that APDO is related to postpartum smoking; when presenting with APDO, a hospital setting will most likely be required. Consequently, when adjusting for the experience of APDO, the association for ‘transfer’ attenuated.

The rate of postpartum smoking in the present study was 14%, which seems low in comparison to rates reported by others [2,3,5]. We defined prior smoking as smoking before pregnancy irrespective of a time period, whereas others defined prior smoking as smoking status three or twelve months before pregnancy [2,3]. Consequently, our study included a larger proportion of former smokers, including women who may have quit long before pregnancy, which may have led to a lower rate of postpartum smoking. Nevertheless, we regard it as plausible that a large proportion of participants reporting postpartum smoking were probably also smoking in the period close to the beginning of pregnancy.

Implications of study findings
Our findings could have serious implications, given that taking up smoking again after childbirth has multiple detrimental health effects not only on the mother, but also on the child and other household members [8]. In addition, postpartum smoking may cause women to quit breastfeeding earlier [9]. If women can abstain for a longer period after pregnancy they are more likely to meet WHO breast feeding guidelines and thus promote the health of their newborn [36]. In turn, breastfeeding has been suggested as a facilitator for maintaining postpartum smoking abstinence [37].
Furthermore, the present study may be of important clinical relevance. Women presenting with APDO will most likely spend some time in the hospital, thus providing nurses with the opportunity to address the psychological impact of the experience of APDO. Interestingly, it has been shown that an anti-smoking intervention in a hospital setting, including enhanced support for the mother-infant bonding during a newborn’s hospitalization after childbirth, can be effective [38]. Women who had the intervention were more likely to be smoke free and breast feeding at eight weeks postpartum, compared to those who did not receive additional support [38]. Our findings suggest that it may be most efficient to target suchlike anti-smoking interventions specifically at women with APDO.

Conclusion
This study demonstrated that APDO increase the risk of postpartum smoking, and this risk increases in a graded way with the number of APDO. The experience of APDO should be considered in targeting anti-smoking strategies that focus on continued abstinence after pregnancy. In addition, women who experience APDO may be supported psychologically in handling the resulting stress. Future studies, preferably including larger samples and lower rates of missing data, may confirm our findings and could explore the underlying mechanism behind the associations found in our study.
Reference list


