

Maternal smoking and smoking in the household during pregnancy and postpartum: findings from an Indigenous cohort in the Northern Territory

Vanessa Johnston, David P Thomas, Joseph McDonnell and Ross M Andrews

Smoking during pregnancy is three times more prevalent among Indigenous Australian women than non-Indigenous Australian women (52% v 16%).¹ There is a similar increased risk of indoor exposure to tobacco smoke for Indigenous children aged 0–14 years compared with non-Indigenous children (28% v 9%).¹

Tobacco use during pregnancy is associated with low birthweight and adverse perinatal health outcomes.^{2,3} In children, exposure to second-hand smoke (SHS) from tobacco contributes to lower respiratory tract illness, otitis media and chronic middle ear effusion,^{4,5} and is associated with an increased risk of childhood asthma.^{6,7}

For many women, pregnancy acts as a significant prompt to quit smoking.^{8,9} Around one in five pregnant smokers quit by the time of their first antenatal visit.^{10,11} Those who experience social disadvantage, and those who are heavy smokers, less educated, or exposed to SHS in the home are less likely to quit.^{12,13}

Pregnancy may be less of a stimulus to quit smoking for Indigenous Australian women.¹⁴ The extent to which smoking is regarded as normal in some Indigenous communities, and high rates of multiple life stressors, teenage pregnancy and single motherhood act to reinforce smoking behaviour in this population.^{15–18} However, findings from one qualitative study suggested that Indigenous mothers are attentive to actions that protect newborns and young infants from exposure to SHS (eg, establishing smoke-free homes).¹⁵

Here, we describe the trends in maternal smoking and smoking in the household among pregnant Indigenous women in the Northern Territory who were prospectively followed from their last trimester of pregnancy to 7 months postpartum, as part of a maternal vaccine trial.

METHODS

Study participants were a cohort of pregnant Indigenous women from two urban and four remote communities in the NT (68% from Darwin) who were enrolled in a randomised controlled trial of a maternal vaccine between

ABSTRACT

Objective: To describe the trends in maternal smoking and smoking in the household for a cohort of Indigenous women followed from late pregnancy to 7 months postpartum.

Design and setting: Prospective cohort study embedded within a randomised controlled trial (RCT) performed in the Northern Territory involving participants recruited between 30 June 2006 and 4 May 2010.

Participants: 215 Indigenous women aged 17–39 years who had been recruited into the RCT, 162 of whom had completed their last study visit at 7 months postpartum by 1 June 2010.

Main outcome measures: Smoking status of women, and smoking within their households, in their third trimester, and at 1 month, 2 months and 7 months postpartum.

Results: There were complete data on women's smoking status for 121 participants. Among these, the self-reported smoking rate was 45% (95% CI, 36%–55%) during pregnancy, increasing to 63% (95% CI, 54%–71%) at 7 months postpartum. Of the 66 women who were non-smokers at the antenatal visit, 23 (35%; 95% CI, 23%–47%) were smoking by the time their baby reached 7 months of age. Thirty-one per cent (95% CI, 23%–39%) of households included people who smoked inside during the antepartum period, whereas 16% (95% CI, 10%–23%) included people who smoked inside at 7 months postpartum.

Conclusions: While an apparent reduction in indoor exposure to tobacco smoke during the postpartum period is encouraging, this is offset by an increase in the proportion of antenatal non-smokers who subsequently reported smoking after the birth of their child. More health care service delivery and research attention needs to be directed to smoking during pregnancy and to postpartum relapse in this population.

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30 June 2006 and 4 May 2010. The randomised controlled trial has been described elsewhere.¹⁹ Eligible participants for the vaccine trial, and consequently for this study, were Indigenous women aged 17–39 years who:

- were having a singleton uncomplicated pregnancy (eg, not complicated by significant pre-eclampsia with hypertension, proteinuria and oedema);
- lived in one of the two urban and four remote participating communities;
- had not received the 23-valent pneumococcal polysaccharide vaccine within the previous 3 years;
- intended to live in the study area during the follow-up period; and
- were not HIV positive, and had no history of severe allergy, uncontrolled asthma or splenectomy.

The vaccine trial involved scheduled contact visits at 30–37 weeks' gestation and at

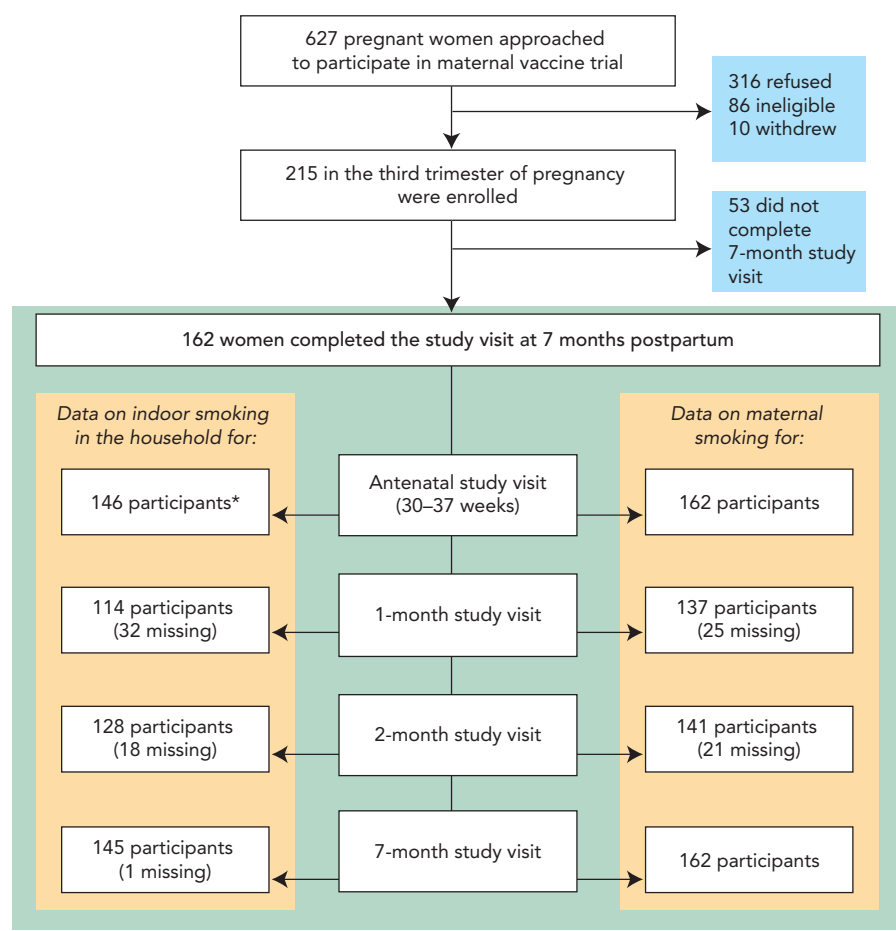
1, 2 and 7 months postpartum, during which self-reported data on maternal and household smoking behaviours (potential confounding factors) were routinely collected by a trained research assistant and entered into a centralised database.

Participants reported on their own smoking behaviour (with current smokers defined as women who smoked one or more cigarettes per day) and on how many people in the household smoked and how many of these smoked inside.

Statistical analysis

Analyses were performed using Stata, version 11 (StataCorp, College Station, Tex, USA). Depending on their distribution, numerical data are described using mean and SD or median and interquartile range (IQR). The median number of smokers in the household was compared between

1 Flowchart showing recruitment and involvement of study participants



* Limited to participants who lived in a household with at least one smoker at any time point.

women who were smokers and non-smokers during pregnancy using a Mann–Whitney *U* test. We used a random-effects logistic model to examine changes in smoking status among women over time, incorporating age, education and community (urban v remote) as covariates.

Ethics approval

All appropriate approvals were obtained for the ethical conduct of the study from the Human Research Ethics Committee of the Northern Territory Department of Health and the Menzies School of Health Research.

RESULTS

By 1 June 2010, 162 of the 215 women recruited into the vaccine trial had completed their last study visit at 7 months postpartum (Box 1). Demographic characteristics of the 215 participants are shown and compared with those of reference populations in Box 2.

Mother's smoking status

Overall, 99 of the 215 women (46%) reported smoking during pregnancy, with a median of seven cigarettes per day (IQR, 3–15). Most

smokers (70/99; 71%) indicated that they smoked 10 or fewer cigarettes per day. Those who smoked during pregnancy lived with a median of two household smokers, whereas non-smokers lived with a median of one household smoker ($P < 0.001$).

Maternal smoking trends postpartum: There were 121 participants with complete data on smoking status at each time point. Of these: 55 (45%; 95% CI, 36%–55%) smoked during pregnancy; 64 (53%; 95% CI, 44%–62%) smoked 2 months postpartum; and 76 (63%; 95% CI, 54%–71%) smoked at 7 months postpartum.

Of the 66 women who were non-smokers at the antenatal visit, 16 (24%; 95% CI, 14%–35%) reported smoking at 2 months postpartum, and 23 (35%; 95% CI, 23%–47%) were smokers by the time their baby reached 7 months of age (Box 3). Of the 55 women who were smokers at the antenatal visit, 10 (18%; 95% CI, 7.6%–29%) had quit at 1 month postpartum but only two (3.6%; 95% CI, –1.5%–8.7%) were not smoking by the time of the 7-month visit.

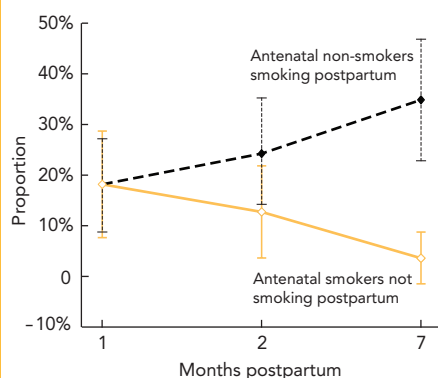
Two random-effects logistic regression models that allowed for dependence between observations within subjects, adjusted for age, education and community location (urban v remote), were also performed. In one model, the missing data were excluded while in the other model, missing data were replaced by the last-known smoking status. Both models confirmed the trends seen in Box 3 (results available from the authors). Mothers with a higher level of education were less likely to smoke ($P = 0.003$).

2 Demographic characteristics of the 215 study participants at their antenatal visit, compared with reference populations

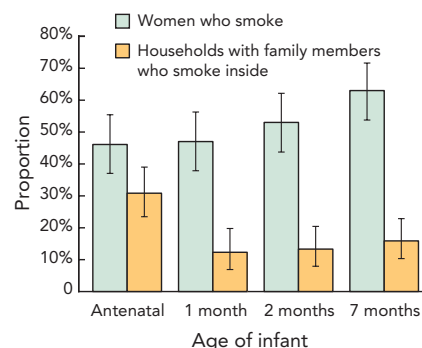
Characteristic	Study participants	Reference population
Median age	24 years	24 years*
Resident in urban centre	152 (71%)	—
Completed Year 10 or above [†]	177 (84%)	66% [‡]
Primiparous women	74 (34%)	31% [§]
Median number of people in the household (25th, 75th percentiles)	4 (3, 6)	—
Living in households with children aged < 5 years	125 (58%)	—
Baby born at low birthweight of < 2500 g	14 (6.5%)	9.4%

* Average age of Aboriginal and Torres Strait Islander mothers, Northern Territory, 2009.²⁰ † 212 participants responded to this question. ‡ Proportion of Indigenous women aged 15 years and over in the NT who completed Year 10 or above in 2008.²¹ § Average annual proportion of primiparous Indigenous women in the NT, 2001–2005.²² || Proportion of Indigenous low-birthweight babies in the NT in 2008.²¹

3 Trends in the postpartum smoking behaviour of 121 women



4 Comparison of trends in smoking behaviours of women and their households over time



Household smoking

Antenatally, 78% of participants (166/214) had smokers living in their households (median of two smokers at home). When limited to 146 households with exposure to cigarette smokers over time (ie, participants who completed a 7-month visit and had at least one smoker in the household at any time point), 69% (101/146) reported being smoke-free antenatally.

Household smoking trends postpartum: The prevalence of exposure to smoking in participants' households was: 31% (95% CI, 23%–39%; 45/146 households) at the antenatal visit; 12% (95% CI, 6.9%–20%; 14/114 households) at the 1-month visit; and 16% (95% CI, 10%–23%; 23/145 households) at the 7-month visit. The denominator differential over these visits reflects missing data at the study visit time points (Box 1).

Box 4 contrasts the trend in the proportion of women smokers with the proportion of households which allowed family members to smoke inside during the postpartum period.

DISCUSSION

In this report, we describe important trends in maternal smoking among Indigenous women and exposure of infants to SHS in the postnatal period to 7 months. Among Indigenous women who did smoke during pregnancy, most were light smokers but tended to live with a higher number of other household smokers than did women who did not smoke during pregnancy. Our findings are consistent with those of other researchers who found that, while Indigenous women who smoke during pregnancy have low to medium nicotine dependency,^{16,23} the number of smokers in the household is significantly associated with smoking among pregnant Indigenous women.²⁴

Our results also highlight that the early months of an infant's life are a period in which ex-smoker mothers and perhaps some non-smoker mothers will restart or start smoking. We cannot determine whether the increased number of smokers postpartum represents the addition of new smokers or relapsing smokers, but we expect that most were relapsing smokers who quit before or during their pregnancy. In other settings, 65%–80% of smokers who were abstinent during pregnancy started smoking again before their baby was a year old.¹¹ Relapse postpartum is predicted by similar determinants as smoking in pregnancy; in particular, poor education and being exposed to social cues to smoke in the home,^{10,11} both common scenarios in Australian Indigenous populations. In our sample, mothers with a higher level of education were less likely to smoke postpartum.

Additionally, our findings suggest that, while most Indigenous households include smokers,²¹ most pregnant Indigenous women and new Indigenous mothers report smoke-free homes, reflecting recent estimates from the NT.²¹ It appears that the birth of a child does spur some households to change their smoking behaviours, as the proportion of households that allowed family members to smoke inside decreased notably after the birth. This supports qualitative research among pregnant Indigenous women in Western Australia, where there was greater awareness and more actions relating to the effects of smoking on a baby than there was in relation to smoking in pregnancy.¹⁵

Our study was a non-random sample, so the extent to which our results can be generalised is uncertain. Participants were generally more educated than the NT Indi-

genous female population,²¹ which suggests that the true prevalence of smoking during pregnancy and of household exposure to SHS may well be higher in the NT Indigenous community. We also relied on self-report of smoking status, and this has been shown to underestimate numbers of pregnant smokers.²⁵ Our data on smoking behaviours of mothers and household members were limited — we did not collect data on pregnant women's smoking history or on previous quit attempts. Finally, our study was powered to test for other primary outcomes, and not the analyses reported here, so there were wide confidence intervals around some of our estimates.

Despite these limitations, we believe the findings support the need for more attention to smoking in pregnancy and postpartum relapse in this population. At a health care service level, a "continuum of care" model of smoking cessation and relapse prevention is required, that starts before conception or in early pregnancy and continues through to the postnatal period. Health care providers need to prioritise smoking-cessation support to Indigenous women around the time of conception, especially as interventions can reduce smoking in pregnancy by 6%, and reduce low birthweight (risk ratio, 0.83; 95% CI, 0.73–0.95).⁸ In the Indigenous context, interventions should focus on counselling and support strategies to address smoking dependence, barriers to quit, and relapse triggers.²³ Ideally, such strategies would involve families and households, and would address sources of stress within the immediate environment, as well as provide alternative coping strategies and ongoing support to better manage personal circumstances.²⁶ More rigorous research is required to evaluate intensive, theoretically sound interventions to prevent relapse among recent quitters in the postnatal period, and to protect the newborn and any other children living in the household against the harms of SHS.²⁷

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COMPETING INTERESTS

None identified.

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