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Factors that influence changes in smoking behaviour during pregnancy

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Abstract

Aims This study explored characteristics of women who continue to smoke beyond the first trimester of pregnancy.

Methods A cohort of 1283 pregnant women were surveyed at the time they registered with a maternity care provider, using a postal questionnaire. Women who reported they were ex-smokers were asked when they had stopped smoking. Data were analysed using logistic regression to identify socio-demographic variables associated with smoking and with stopping smoking.

Results 829 (69.2%) women responded to the questionnaire. 183 (22.2%) reported smoking when they became pregnant. Forty nine (26.8%) of the women smoking at conception reported giving up in the first trimester. Factors significantly associated with stopping smoking in the first trimester were current employment (OR 2.37, 95% CI 1.16–4.85), first pregnancy (OR 2.18, 95% CI 1.11–4.28), and experiencing nausea during the pregnancy (OR 2.59, 95% CI 1.11–6.04). Women who held a community services card (OR 0.41, 95% CI 0.19–0.86), Maori women (OR 0.38, 95% CI 0.15–0.98) and women whose partners smoked (OR 0.35, 95% CI 0.17–0.70) were significantly less likely to have stopped smoking.

Conclusions Socioeconomically deprived women were more likely to continue to smoke beyond the first trimester of pregnancy and this needs to be taken into account in the provision of smoking cessation support.

Peri-pregnancy health can be improved by a reduction in smoking rates during pregnancy. Maternal smoking is strongly associated with higher rates of spontaneous abortion, prematurity, stillbirth,[1] and lower birth weight.[2,3] Children of parents who smoke have higher rates of sudden infant death syndrome (SIDS),[4,5] otitis media,[6] respiratory infections and asthma.[7] Smoking is also associated with a decreased duration of breastfeeding.[8,9]

In New Zealand, smoking rates for women of child-bearing age are as high as 33% for 20–24 year olds,[10] and in Christchurch 31% of a sample of pregnant women smoked.[11] A higher proportion of Maori women smoke than non-Maori, and death rates from smoking-related causes are significantly higher in Maori.[12] Although rates of smoking in pregnancy have decreased slightly in the last decade, smoking during pregnancy is still an important and modifiable public health problem.[13]

Pregnancy is a time when many women try to stop smoking. In addition, smoking cessation interventions during pregnancy can result in significant reduction in smoking. A meta-analysis of trials of smoking cessation interventions in pregnancy by the Cochrane Pregnancy and Childbirth Group showed an absolute reduction of 6.4% in the number of women continuing to smoke.[14]

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In the Wellington and Kapiti areas of New Zealand, 95% of primary maternity care is provided by the maternity care provider Matpro.[15] Matpro providers include midwives, general practitioners and obstetricians. Matpro providers identified the need to develop a programme to support smoking cessation for women registered with them for maternity care and, as part of the development process, a cohort of women were surveyed to explore factors associated with continuation of smoking in pregnancy.

Methods

Study population Data included in this paper were sourced from responses to the first questionnaire of a prospective study of a cohort of 1283 pregnant women registered with the maternity care provider Matpro for their antenatal care.

Data collection All 1283 women who had registered with Matpro, over a seven-month period, by the time they were 24 weeks pregnant, were sent a questionnaire at registration. A freepost, addressed envelope was included for replies and women were assured of anonymity. Non-responders were sent one reminder letter and a further copy of the questionnaire. The questionnaire elicited information on demographic data, smoking behaviour, frequency of alcohol consumption and intention to breastfeed.

Outcome variable The outcome variable of interest was reported smoking cessation in the first trimester of the current pregnancy. Smoking status data were collected by asking women whether they currently described themselves as tobacco smokers, ex-smokers or non-smokers. Women who described themselves as ex-smokers were asked when they had stopped smoking and why.

Explanatory variables Socio-demographic variables were collected using questions consistent with either the New Zealand Census or the Department of Statistics Household Health Survey. Ethnicity data were collected using the ethnicity question from the 1996 New Zealand Census that asked people to tick as many boxes as necessary to show the ethnic group(s) to which they belonged. In the analysis, Maori were defined as women identifying either as solely Maori or Maori plus any other ethnic group. Other variables included partner's smoking status, tertiary education (defined as any post-secondary-school diploma, degree or other qualification), community services card (CSC) status (a healthcare subsidy for low-income earners), income support benefits, current employment status, whether the pregnancy was planned, whether it was the woman's first pregnancy, whether nausea had been experienced during the pregnancy, and on how many days in the previous seven alcohol had been consumed.

Analysis Data were entered into a Microsoft Access database. Ten per cent of data entered were manually checked against questionnaires. Data were transferred to SAS and odds ratios (OR) and 95% confidence intervals (CI) calculated. Logistic regression was used to estimate the effect of each of the explanatory variables on the outcome measures. Selection of variables to find the model that best predicted the outcome of interest was performed using stepwise regression.

At the 5% level of significance, a difference in rates of cessation of 17% could be detected, with 80% power, for variables with a prevalence of 10%, and a difference of 20% for variables with a prevalence of 50%.

Ethics approval This research was approved by the Wellington Ethics Committee, accredited by the Health Research Council of New Zealand.

Results

Response rate The questionnaire was sent to 1283 women. Eighty five women were ineligible to reply because they were no longer registered with Matpro, either because they had moved from the study localities or miscarried. Completed questionnaires were returned by 829 women, a response rate of 69.2%.

Was the cohort representative? Grouped demographic data about a subset of women who did not respond to the questionnaire were available from the Wellington Hospital Perinatal Information Monitoring System (PIMS). When compared to responders, non-responders included a higher proportion of women who were not married or in a defacto relationship (11% vs 24%; $\chi^2 = 17.8$, $p = 0.001$); women who

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smoked (14% vs 26%; χ^2 = 18.9, p = 0.001); had no tertiary education (35% vs 49%; χ^2 = 10.8, p = 0.001); or were receiving a benefit (8% vs 19%; χ^2 = 14.9, p = 0.001). The mean age of non-responding women (29.9 years) was slightly lower than that of responding women (31.9 years) (χ^2 = 18.6, p = 0.001). It is possible that some of these differences reflect the characteristics of the subgroup of women delivering at Wellington Hospital for whom PIMS data were available. Data were not available for women delivering at other hospitals in the region and these hospitals, although smaller, served localities with a higher proportion of socioeconomically deprived women. There were no differences between responders and non-responders in alcohol consumption data recorded on PIMS, weeks' gestation, obstetric history, baby's birthweight or Apgar score.

Smoking status 183 (22.2%) of the 825 women who responded to the question about current smoking status reported smoking when they became pregnant. Forty nine (26.8%) of the women smoking at conception reported giving up in the first trimester of this pregnancy and 123 (67.2%) continued to smoke beyond the first trimester. Eleven women (6.0%) did not answer this question.

Table 1. Women who reported smoking tobacco at the time their baby was conceived

		Number in cohort	Women who reported smoking		Odds ratios	95% CI
		n	n	%		
Factors associated with increased risk						
Partner smoker at 20–24 weeks	Yes	163	93	57.1	**9.70**	**6.56–14.33**
	No	639	77	12.1		
Maori	Yes	77	42	54.6	**5.17**	**3.18–8.39**
	No	748	35	18.9		
CSC holder*	Yes	153	70	45.8	**4.33**	**2.96–6.33**
	No	656	107	16.3		
Receives income support	Yes	144	63	43.8	**3.95**	**2.68–5.82**
	No	650	107	16.5		
Protective factors						
Planned pregnancy	Yes	589	88	14.9	**0.26**	**0.18–0.36**
	No	229	93	40.6		
Has tertiary education	Yes	464	62	13.4	**0.30**	**0.21–0.42**
	No	315	108	34.3		
Plans to fully breastfeed	Yes	610	120	19.7	**0.60**	**0.42–0.85**
	No	213	62	29.1		
Current employment	Yes	497	92	18.5	**0.65**	**0.46–0.91**
	No	296	77	26.0		
Other factors						
Consumed alcohol in the last seven days	Yes	218	218	18.4	0.73	0.49–1.08
	No	598	598	23.6		
First pregnancy	Yes	328	76	23.2	1.10	0.79–1.54
	No	497	107	21.5		

*community services card held or applied for (income level for a couple with 1 child <$NZ32 000 pa)
NB: figures in bold are significant, p =0.05

Socio-demographic factors associated with smoking at conception are shown in Table 1. Smoking rates were significantly higher for Maori women (OR = 5.17, 95% CI

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3.18–8.39). Fifty five per cent of Maori women in the study reported smoking at the time their babies were conceived. When all variables were combined using stepwise regression, the strongest predictors of smoking at conception were having a partner who smoked (OR = 7.68, 95% CI 4.91–12.02) and Maori ethnicity (OR = 2.90, 95% CI 1.51–5.58). Women with tertiary education (OR = 0.40, 95% CI 0.26–0.62) and women with planned pregnancies (OR = 0.42, 95% CI 0.27–0.66) were less likely to have smoked at conception.

Women who smoked were also significantly less likely to report planning to fully breastfeed their babies (OR= 0.60, 95% CI 0.42–0.85). This effect remained significant after controlling for education and first pregnancy (OR = 0.65, 95% CI 0.45–0.96).

Socio-demographic factors associated with giving up smoking are shown in Table 2. When all variables were combined using stepwise regression, the strongest predictors of giving up were first pregnancy (OR = 5.03, 95% CI 1.90–13.27), any alcohol consumption in the previous seven days (OR = 3.41, 95% CI 1.16–10.05), or experiencing nausea during the pregnancy (OR = 5.71, 95% CI 1.73–18.85). Women who held a CSC (OR = 0.31, 95% CI 0.10–0.95) and women whose partners smoked (OR = 0.22, 95% CI 0.09–0.55) were less likely to have stopped smoking.

Table 2. Women who stopped smoking in the first trimester of their pregnancy

		Number smoking at conception n	Women who stopped smoking		Odds ratios	95% CI
			n†	%		
Factors associated with stopping smoking						
Experienced nausea during pregnancy	Yes	122	41	33.6	**2.59**	**1.11–6.04**
	No	49	8	16.3		
Current employment	Yes	86	32	37.2	**2.37**	**1.16–4.85**
	No	75	15	20.0		
First pregnancy	Yes	68	26	38.2	**2.18**	**1.11–4.28**
	No	104	23	22.1		
Factors associated with continuing to smoke						
Partner smoker at 20–24 weeks	Yes	89	18	20.2	**0.35**	**0.17–0.70**
	No	71	30	42.3		
Maori	Yes	39	6	15.4	**0.38**	**0.15–0.98**
	No	133	43	32.3		
CSC holder*	Yes	65	12	18.5	**0.41**	**0.19–0.86**
	No	101	36	35.6		
Other factors						
Receives income support	Yes	59	12	20.3	0.50	0.23–1.05
	No	103	35	34.0		
Planned pregnancy	Yes	82	25	30.5	1.24	0.64–2.42
	No	88	23	26.1		
Has tertiary education	Yes	58	20	34.5	1.64	0.81–3.32
	No	103	25	24.3		
Consumed alcohol in the last seven days	Yes	38	15	39.5	2.04	0.95–4.37
	No	132	32	24.2		

*community services card held or applied for (income level for a couple with 1 child <$NZ32 000 pa)
†not all women provided complete responses to socio-demographic questions
NB: figures in bold are significant, p =0.05

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The reasons most frequently given by women for stopping smoking were related to the health of their baby or their pregnancy (Table 3).

Table 3. Reasons given by women for giving up smoking in the first trimester of pregnancy

Reason for giving up smoking	Number*
Baby's health 'Because I want my baby to be healthy and strong.' 'The baby deserves the best possible start in life.' 'I didn't want to harm baby.' 'I didn't want my baby to smell of smoke or inhale smoke.'	21
Focused on pregnancy 'Because I was pregnant.' 'I gave up on the day I found out I was pregnant.'	17
Sickness or aggravation of morning sickness 'I often felt ill at the smell of smoke.'	11
Own (mother's) health	3
General health benefits	3
Didn't feel like smoking	2
Other health reasons 'To eliminate risk factors for miscarriage.'	1
Other reasons 'Only smoked socially between pregnancies.' 'Filthy habit.' 'Husband has quit so no temptation…'	4
Pressure from others 'Other people's nagging made me feel guilty.'	1
No reason provided	2
Total number of responses	**63**
Total number of women*	**49**

*women were able to give more than one reason

None of the women who stopped smoking in the first trimester reported participating in a structured, smoking cessation programme during this pregnancy.

Discussion

This study has explored the socio-demographic characteristics associated with continuing to smoke while pregnant, with the intention of developing a smoking cessation programme to be delivered by primary maternity care providers.

Data were collected by postal questionnaire. While the response rate of 69% was adequate, the information available with which to compare responders and non-responders suggests that socioeconomically deprived women, single women and those who smoked were slightly less likely to respond. Therefore, rates of smoking may be underestimated and rates of stopping smoking slightly overestimated. Smoking data in this study were self-reported and not validated biochemically. However, the questionnaire was an anonymous postal survey and smoking data were being collected with a range of other data. Studies of non-disclosure of smoking in questionnaire surveys have found non-disclosure to be as low as 5% compared to non-

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disclosure in other situations.[16] Women who did not want to disclose their smoking status had the option of not responding to the questionnaire.

Smoking at conception in the cohort studied was associated with socioeconomic deprivation, lower educational levels, partners who smoked, unplanned pregnancy and Maori ethnicity, as documented in studies of non-pregnant smokers.[10] Pregnancy motivated approximately one quarter of the women who smoked at conception to stop smoking in the first trimester, but three quarters continued to smoke. Women pregnant for the first time were more likely to stop smoking. Midwives have commented that women pregnant with their first child might be more concerned about their child's health than women who have already smoked through one pregnancy and delivered an apparently healthy baby.

Although pregnancy motivates women to stop smoking, there is a high rate of relapse after the baby is born.[17,18] Data from a qualitative study by Edwards suggested that women who temporarily stop smoking during pregnancy require assistance to shift their reasons for stopping from the baby to themselves.[19] In our study, many women gave reasons for stopping related to the baby's health or their pregnancy. Women who experienced nausea and vomiting during pregnancy were also more likely stop smoking. Edwards stated that the experience of morning sickness reduced the desire or craving for cigarettes thus making it easier to stop.[19] It is likely that this group of women is vulnerable to relapse. It is important that women who have spontaneously quit during their current pregnancy are identified by their maternity carer and included in any programme of smoking cessation education.

The decision to stop smoking was also associated with reported alcohol consumption in the previous seven days. As an earlier analysis of data on alcohol consumption for this cohort found an association between alcohol consumption and socioeconomic advantage,[20] it is likely that the association between stopping smoking and alcohol consumption in the current study reflects the association between alcohol consumption and socioeconomic advantage.

In this study, women who continued to smoke were more likely to be Maori, socioeconomically deprived and to have a partner who smoked. Smoking cessation programmes must be designed to meet the needs of the women for whom they are intended. Educational levels must be taken into account when developing resource material to support smoking cessation. Women whose partners smoked were more likely to have reported smoking at conception and less likely to have stopped smoking by 20–24 weeks. A recent Cochrane review of a small number of studies was unable to show an effect of interventions to enhance partner support for smokers in cessation programmes.[21] In contrast, in qualitative studies women have described the difficulty of stopping smoking or remaining a non-smoker when their partners smoke.[19] Authors of the Cochrane review have highlighted the need for more systematic interventions to involve partners.

Programmes tailored to pregnancy and to particular ethnic groups are more likely to succeed in those groups.[22] Higher rates of smoking and lower rates of quitting amongst Maori women suggest that current smoking cessation interventions are not adequately meeting the needs of Maori women, particularly those who are pregnant.

A New Zealand-wide survey of antenatal care providers suggested that providers need support and training to provide smoking cessation and pregnancy-specific referral

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services.[23] Smoking cessation programmes delivered during pregnancy have been demonstrated to be effective, yet in this sample none of the women who did stop, and few women who continued to smoke, had attended programmes. Integration of structured smoking cessation with antenatal care has the advantage that antenatal care providers develop an ongoing, trusting relationship with both women and their partners. Opportunity exists to fully integrate smoking cessation with the established programme of antenatal care in New Zealand. Maternity care providers who provide care for women with low incomes may need additional support and/or resources to provide cessation support and this may require targeted economic incentives. Addressing smoking cessation at population level, with continuation of initiatives such as Quitline and national advertising campaigns aimed at pregnant women, also has the potential to facilitate lower rates of smoking during pregnancy.

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