Original Article

Alcohol and tobacco consumption among 6–24-months post-partum New Zealand women

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Abstract

Maternal alcohol or tobacco consumption may negatively impact the fetus and breastfeeding infants. Maternal tobacco consumption is also known to negatively affect exposed young children. The current study therefore aimed to assess the prevalence of these lifestyle behaviours in a sample of 6–24-months post-partum women and to elucidate socio-demographic and maternal factors associated with these behaviours. A community-based cross-sectional survey was conducted on 6–24-months post-partum women ($n = 318$) in three cities in the South Island of New Zealand. Self-reported data on current alcohol and tobacco consumption were collected from these women using a self-administered questionnaire. The results showed that nearly 72% and 23% of these women consumed alcohol and tobacco, respectively. Being Caucasian, having a higher level of education and higher household income were significant factors for alcohol consumption, while being of younger age and of lower educational status were significant factors for tobacco consumption. Pregnancy was associated with lower odds for alcohol consumption (0.07; $P < 0.001$), but not with lower odds for tobacco consumption. In contrast, breastfeeding was not associated with lower odds of alcohol consumption (0.08; $P = 0.075$). In conclusion, younger women with lower levels of education and household income must be targeted for public health education on the negative effects of tobacco consumption on their own health and on the health of their children.

Keywords: alcohol, tobacco, pregnancy, breastfeeding.

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Introduction

Alcohol and tobacco consumption are common lifestyle behaviours in women of childbearing age living in the Western world, and New Zealand is no

exception. The New Zealand 1996–97 national health survey indicates that 78% and 29% of women in the age group of 15–44 years were regular consumers of alcohol and tobacco, respectively [Ministry of Health (MoH) 1999]. The challenge facing women of childbearing age is to abstain from these lifestyle behaviours during pregnancy, especially during the early stages of pregnancy, while breastfeeding, and with respect to smoking, throughout their lives.

Depending on the site of the study and the methodology adopted, national and international studies have reported differing prevalence rates for alcohol consumption in pregnancy. These prevalence rates range from 25% to 42% in New Zealand (Counsell *et al*. 1994; McLeod *et al*. 2002a), 36–56% in Australia (Kwok *et al*. 1983; Bell & Lumley 1989; Temple *et al*. 1992), 41–61% in the UK (Wright *et al*. 1983; Hamlyn *et al*. 2002) and 11% in the United States [Centres for Disease Control and Prevention (CDC) 2002]. With respect to smoking, 22–23% of New Zealand women reported to have smoked in pregnancy (Clissold *et al*. 1991; McLeod *et al*. 2003), 24% in Australia (Bell & Lumley 1989), 20% in the UK (Hamlyn *et al*. 2002) and 15% in the United States (Colman & Joyce 2003).

The fact that substantial numbers of women continue these lifestyle behaviours in pregnancy is of concern with respect to foetal well-being. Literature indicates that maternal alcohol consumption is associated with numerous negative foetal affronts, including lower birthweight (Streissguth *et al*. 1981; Kaminiski 1992; Sokol *et al*. 1999) and central nervous system disorders (Jacobson *et al*. 1993; Streissguth *et al*. 1994). However, there is a lack of consensus on the amount of absolute alcohol consumed during pregnancy that leads to measurable deleterious effects on the exposed child. Literature documents various deleterious foetal effects from maternal consumption of 1 standard drink (15 g of absolute alcohol) per week (Sood *et al*. 2001) to 7–14 standard drinks (105–210 g of absolute alcohol) per week (Goldschmidt *et al*. 1996; Kodituwakku *et al*. 2001). Other studies have not found any deleterious foetal effects with maternal consumption of less than 120 g of absolute alcohol per week (Ogston & Parry 1992). These differing results may be due to discrepancies in self-reporting of alcohol consumption in pregnancy and other methodological problems of the study. Whether any alcohol can be consumed in pregnancy is still very much a debatable issue. Consequently, there is no global consensus among medical practitioners, researchers and policymakers on the amount of alcohol that is safe in pregnancy. This is reflected in the varying recommendations for alcohol consumption in pregnancy prevalent in different countries, which ranges from total abstinence in the United States (US Surgeon General 1993) to 1 standard unit (8 g of absolute alcohol) per day by the UK Royal College of Obstetricians and Gynaecologists (RCOG 1999). The recommendation in New Zealand at the time of the current study was similar to the UK recommendation of not more than 1 standard drink of alcohol (10 g of absolute alcohol) per day (MoH 1997a).

Tobacco consumption in pregnancy has been associated with adverse pregnancy outcomes, such as spontaneous abortions, stillbirth, preterm birth and foetal growth restrictions [United States Department of Human Health Services (USDHHS) 2001]. Other studies have associated maternal tobacco consumption with neurodevelopmental disorders (Fergusson *et al*. 1998; Law *et al*. 2003; Gray *et al*. 2004), cancers (Schwartzbaum *et al*. 1991), increasing risk of sudden infant death syndrome (Chong *et al*. 2004) and asthma (Jaakkola & Gissler 2004) in exposed children. Contrary to alcohol consumption, there is a global consensus on abstinence from cigarette smoking being recommended in pregnancy (USDHHS 1990; MoH 1997a, 2005; British Medical Association 2004).

There is a scarcity of studies that have documented the prevalence of alcohol consumption and smoking specifically among breastfeeding women. A New Zealand study indicated that 54% of women resumed alcohol consumption at 6 weeks post-partum (McLeod *et al*. 2002a). In this cohort of pregnant women, alcohol consumption was not associated with their intention to breastfeed, while tobacco consumption was negatively associated with their intention to breastfeed (McLeod *et al*. 2002b). The study by Levine & Marcus (2004) indicate that the majority of women who quit smoking in pregnancy will resume it

during post-partum period, mainly because of concerns of weight gain.

Both maternal alcohol (Liston 1998) and tobacco consumption (Vio *et al*. 1991) have been shown to have a negative effect on lactational performance. Alcohol consumption may also have a negative impact on infant breastmilk consumption (Mennella & Beauchamp 1993), infant sleep pattern (Mennella & Gerrish 1998), infant development (Little *et al*. 1989) and infant response to alcohol (Mennella & Beauchamp 1998). Nicotine is also excreted at high levels in breastmilk (Dahlstrom *et al*. 1990), and urinary cotinine levels are 10-fold higher among the breastfed compared with bottle-fed infants of smoking mothers (Mascola *et al*. 1998). The recommendation for alcohol consumption for breastfeeding mothers in New Zealand is to avoid alcohol as much as possible especially, directly before breastfeeding (MoH 1997b). Abstinence from tobacco consumption by women during breastfeeding and by parents in the postnatal period is also strongly recommended (MoH 1997b).

Exposure of children to environmental tobacco smoke, especially during the first 2 years of life, is also a risk factor for increased respiratory infections (Dybing & Sanner 1999). The risk of developing asthma and allergies was found to be even higher among infants exposed to tobacco smoke through breastmilk and the environment than through the environment alone (Becker *et al*. 1999). Similarly, the previous analysis of other data from the current study found an association between secondary exposure to cigarette smoke and lower selenium concentrations in children (McLachlan *et al*. 2004). Surprisingly, given the potential negative impacts of these lifestyle behaviours on children under 2 years of age, there is a lack of published data on the prevalence of alcohol and tobacco consumption among post-partum women.

The purpose of the current study was therefore to assess the prevalence of alcohol and tobacco consumption among a sample of 6–24-months post-partum New Zealand women. The study also aimed to elucidate factors associated with these behaviours, which will result in a characterization of drinking and smoking women according to their socio-demographic and maternal status. Such data can be used to identify populations that must be reached in education campaigns.

Methods

The current study is part of a larger study that aimed to assess the status of various micronutrients in children aged 6–24 months and their caregivers. The main study was a community-based cross-sectional survey conducted on a representative sample of 323 children aged 6–24 months and their caregivers in three cities in the South Island of New Zealand between May 1998 and March 1999. The children were randomly selected using multistage sampling in each city. The number of child–caregiver pairs recruited in each city was in proportion to the predicted numbers living in each city of 6–24-month-old children from the 1996 census (Statistics NZ 1997). Efforts were made to ensure that proportionately equal numbers of child–caregiver pairs per city were recruited throughout the recruitment period to avoid an inter-city seasonal bias. However, only child–caregiver pairs from Christchurch ($n = 28$) were recruited in the final 2 months of the survey. Child–caregiver pairs were not recruited during the holiday season (from mid-December 1998 till mid-January 1999).

The sample size was selected based on a predicted prevalence rate of 50% for suboptimal status of various micronutrients. Detailed descriptions of the sampling procedures have been published elsewhere (Soh *et al*. 2001, 2004). Child–caregiver pairs were recruited from address start points that were randomly selected across census area units (CAUs) in each city after weighting each CAU for the number of households in it. Hence, the probability of having a start point selected per CAU was related to its population. At each start point ($n = 147$), the first household was selected by taking the house closest to a randomly selected geographic coordinate. From this starting house, 79 additional households were visited following a predetermined direction to identify all children eligible for the survey (i.e. 13% of the households were missed because no one was found at home). Of the total 532 eligible children identified, the caregivers of 323 children agreed to allow their

child and themselves to participate in the survey. Ninety-eight per cent of the caregivers of the recruited children were biological mothers ($n = 318$).

The current study presents data for only the biological mothers ($n = 318$) of children who participated in the study. Dietary, anthropometric and biochemical data were collected using standardized procedures from the child–mother pairs to assess their micronutrient status. Socio-demographic data and information on current maternal smoking and drinking practices were also collected via a pretested general questionnaire to allow characterization of the drinking and smoking practices of urban South Island New Zealand women who had a 6–24-month-old child. Ethical approval for the study was obtained from the Ethics Committee of the University of Otago, Dunedin, New Zealand.

The objective of the current study was achieved by analysing the questionnaire data collected from the biological mothers of this study sample. The questionnaire was missing for one woman, and hence analyses were carried out for 317 women. To ensure the accuracy of questionnaire data entry, 25% of entered data were checked manually against the questionnaires. However, it should be stated that information was not collected on different types of alcoholic beverages consumed, and the average number of drinks per week or per month was collected without specifically defining a standard drink. The relevant questions in the questionnaire were asked as follows.

Do you drink alcohol (beer, wine or spirits)? If yes, how many drinks on average do you drink per week **OR** per month?

Do you smoke cigarettes? If yes, what is the average number of cigarettes you smoke per day **OR** per week?

Descriptive statistics were used to depict the demographic and maternal characteristics of the study sample according to the reported consumption of alcohol and tobacco. Chi-squared analyses were conducted to investigate associations for both demographic variables and maternal status with the consumption of alcohol or tobacco. The three maternal status categories used in all analyses were women who were pregnant ($n = 34$), breastfeeding ($n = 79$) and neither pregnant nor breastfeeding ($n = 197$). Seven women in the sample were both pregnant and breastfeeding. Two logistic regression models were fitted to identify factors influencing either alcohol or tobacco consumption. Best fit models were identified using the backward selection likelihood ratio criterion for the stepwise regression procedure. Variables included in all these three models were age, income level, educational status, ethnicity, marital status and maternal status. Exploratory analysis found a non-significant quadratic effect for various age categories, and hence for the two regressions, the continuous age variable was used. In addition, tobacco consumption was included in the model for 'alcohol consumption', and alcohol consumption was included in the model for 'tobacco consumption' as the literature clearly indicates that alcohol consumption may influence tobacco use and vice versa (Anthony & Echeagaray-Wagner 2000). All analyses were executed using SPSS version 12.0.

Results

The study response rate was 61% of eligible child–caregiver pairs. The majority of women were aged 26–35 years (62%), were Caucasian (88.0%), were living in a permanent relationship (88.6%), and were neither pregnant nor breastfeeding (63.5%). The highest level of education achievement for most women was secondary school (55.2%), although 21.8% had a university degree. Most women (54.7%) lived in a middle-income household (Table 1).

Prevalence of alcohol and tobacco consumption

Overall, 71.6% (95% CI 66.3–76.5%; $n = 227$) of the study sample consumed alcohol, and 22.7% (95% CI 18.2–27.7%; $n = 72$) consumed tobacco. Based on the Centre for Disease Control and Prevention (CDC 1994) definition of light, moderate and heavy drinkers, of those who gave information on the number of drinks they had per month ($n = 218$), 95.9% (95% CI 92.3–98.1%; $n = 209$) were light drinkers (≤30 drinks per month), 3.5% (95% CI 1.6–7.1%; $n = 8$) were moderate drinkers (31–59 drinks per month), and one woman was a heavy drinker (≥60 drinks per month).

Table 1. The proportion of women who consumed alcohol or tobacco in each category of demographic and maternal characteristics ($n = 318$)[a].

	n	Alcohol consumption (Yes)[b] % (95% CI) *n*	Tobacco consumption (Yes)[c] % (95% CI) *n*
Age (years)[d]	314		
≤25	54	76 (62–86) 41	54 (40–67) 29[h]
26–35	196	69 (66–75) 135	20 (14–26) 39
>35	64	78 (66–87) 50	5 (1–13) 3
Ethnicity	317		
Caucasian	279	72 (67–78) 202	22 (17–27) 60
Non-Caucasian	38	66 (49–80) 25	32 (17–49) 12
Household income[e]	276		
Low (1–20 000)	40	60 (43–75) 24	35 (21–52) 14[h]
Middle (20 001–50 000)	151	66 (68–73) 100	23 (16–30) 34
High (50 0001+)	85	85 (75–92) 72[h]	8 (3–16) 7
Education	317		
University	69	80 (68–88) 55[h]	3 (0–10) 2[i]
Polytechnic	73	84 (73–91) 61	19 (11–30) 14
Secondary school	175	63 (56–71) 111	32 (25–40) 56
Marital status[f]	316		
Permanent	280	73 (67–78) 203	21 (16–26) 58
Non-permanent	36	64 (46–79) 23	39 (23–56) 14[i]
Maternal status[g]	310		
Neither pregnant nor breastfeeding	197	80 (74–85) 158[h]	27 (21–34) 53
Pregnant	34	38 (22–56) 13	27 (13–44) 9
Breastfeeding	79	66 (54–76) 52	13 (6–22) 10[i]
All	317[a]	72 (66–76) 227	23 (18–28) 72

[a]Data missing for one woman. [b]Includes women who smoked and otherwise. [c]Includes women who drank alcohol and otherwise. [d]Three women did not state their age. [e]Data missing for four women; 20 women stated 'Don't know', and 17 women did not want to reveal their income status. [f]Data missing for one woman. [g]Seven women who were both pregnant and breastfeeding were not included. [h]Chi-squared analysis; significantly higher than the other categories within the same alcohol or tobacco groups; $P \leq 0.05$. [i]Chi-squared analysis; significantly lower than the other groups within the same alcohol or tobacco groups; $P \leq 0.05$.

Similarly based on the classification adopted by Colman & Joyce (2003), of tobacco consumers who gave information on the number of cigarettes consumed per day ($n = 69$), 56.5% (95% CI 44.0–68.4%; $n = 39$) smoked 10 or less cigarettes per day, and 43.5% (95% CI 31.6–56.0%; $n = 30$) smoked 11 or more cigarettes per day.

Characteristics of women who consumed alcohol and tobacco

Proportions of women who consumed alcohol or tobacco in each demographic and maternal characteristic grouping are tabulated in Table 1. Individually, different levels of educational status ($\chi^2 = 13.117$; d.f. = 2; $P = 0.001$) and household income ($\chi^2 = 11.781$; d.f. = 2; $P = 0.003$) were significantly associated with alcohol consumption. Specifically, women with a university or polytechnic qualification were more likely to be alcohol consumers than women without these qualifications. Women from high-income households (>$50 000) were significantly more likely to consume alcohol than those from other income households. The prevalence of alcohol consumption was also significantly higher ($\chi^2 = 27.259$; d.f. = 2; $P = 0.000$) in women who were neither pregnant nor breastfeeding (80%; 95% CI 73.9–85.5%) compared with pregnant women (38%; 95% CI 22.2–56.4%) and breastfeeding women (66%; 95% CI 54.3–76.1%).

With respect to tobacco consumption, significant inter-category differences were found for age group ($\chi^2 = 42.408$; d.f. = 2; $P = 0.000$), education level ($\chi^2 = 24.550$; d.f. = 2; $P = 0.000$), household income ($\chi^2 = 13.612$; d.f. = 2; $P = 0.001$) and marital status

($\chi^2 = 5.989$; d.f. = 1; $P = 0.014$). Specifically, younger women, women without university or polytechnic qualifications, women from middle- or low-income households (≤$50 000 per year), or women who were not in a permanent relationship were more likely to be smokers than their counterparts. In addition, non-pregnant non-breastfeeding women (27%; 95% CI 20.8–33.7%) and pregnant women (27%; 95% CI 12.9–44.4%) were more likely to be smokers ($\chi^2 = 6.643$; d.f. = 2; $P = 0.036$) than breastfeeding women (13%; 95% CI 6.2–22.0%).

Multivariate factors associated with consumption of alcohol and tobacco

Alcohol consumption

The factors associated with alcohol consumption are presented in Table 2. The Hosmer and Lemeshow goodness-of-fit statistic confirmed agreement between the predicted and observed numbers of events ($\chi^2 = 4.015$; $P = 0.856$). The fitted regression explained 24.5% of the variation in the outcome variable. The variables age and marital status were not present in the final model developed. An interaction between the pregnancy and breastfeeding factors was significant ($P = 0.007$), but none of the interactions between the other factors were significant.

The odds of alcohol consumption are increased for women from the high-income households compared with those from the low-income households ($P = 0.012$), but there is no evidence of a difference between the low-income group and either the middle-income group ($P = 0.748$) or the group who did not disclose their incomes ($P = 0.572$). There is evidence that those with a university education ($P = 0.024$) have higher odds of alcohol consumption than those who have only a secondary education, but there is no evidence ($P = 0.074$) of a difference between women with a secondary education and those with a polytechnic education. Those of non-Caucasian ethnicity show a 57% reduction in odds of alcohol consumption ($P = 0.040$) compared with Caucasians. Current smoking increases the odds of alcohol consumption ($P = 0.039$).

Both the main effect of pregnancy ($P < 0.001$) and the interaction between pregnancy and breastfeeding ($P = 0.007$) are significant. For women not breastfeeding, the odds of consuming alcohol are lower if pregnant, but the odds of consuming alcohol are similar for women who are breastfeeding or who are not pregnant (or both). However, the reliability of the interaction estimate is low, because only seven out of 317 women in the study are both pregnant and breastfeeding, producing a very wide confidence interval.

Table 2. Factors associated with alcohol consumption (1 if consuming, 0 otherwise).

Factor	Parameter*	Odds ratio (95% CI)	*P*-value (chi-squared test)
Income (reference <$20 001)			
$20 001–50 000	–0.134	1.14 (0.51–2.59)	0.784
>$50 000	1.319	3.74 (1.34–10.4)	0.012
Undisclosed	0.308	1.36 (0.47–3.95)	0.572
Education (reference secondary)			
University	0.923	2.51 1.13–5.61	0.024
Polytechnic	0.666	1.95 (0.94–4.03)	0.074
Ethnicity (Caucasian = 0; Otherwise = 1)	–0.848	0.43 (0.19–0.96)	0.040
Tobacco consumption (Yes = 1; No = 0)	0.808	2.24 (1.04–4.83)	0.039
Pregnant (Yes = 1; No = 0)	–2.687	0.07 (0.02–0.20)	<0.001
Breastfeeding (Yes = 1; No = 0)	–0.589	0.08 (0.29–1.06)	0.075
Pregnant by breastfeeding interaction	3.052	21.17 (2.30–195.2)	0.007
Constant	0.498		

*The estimated coefficients for the fitted logistic regression.

Tobacco consumption

The factors associated with tobacco consumption in the final model are reported in Table 3. The Hosmer and Lemeshow goodness-of-fit statistic confirmed agreement between the predicted and observed numbers of events ($\chi^2 = 14.021$; $P = 0.081$). The fitted regression explained over 32% of the variation in the outcome variable. The factors income, ethnicity and pregnancy status were not present in the final model developed. The final model reported has the main effect of marital status added because the interaction between alcohol consumption and marital status appeared in the best model. Other interactions led to no additional model improvement.

There is evidence that those with either a university education ($P = 0.006$) or a polytechnic education ($P = 0.044$) have lower odds of tobacco consumption compared with those who have only a secondary school education. There is strong evidence ($P < 0.001$) that older women smoke less, with a reduction of 0.139 in the log odds of smoking with each additional year of age. Breastfeeding women also have lower odds of smoking ($P = 0.015$) than non-breastfeeding and non-pregnant women, whereas there is no evidence that a pregnant woman has reduced odds of smoking as the pregnant variable was removed early in the backwards procedure.

Both the main effect of alcohol consumption ($P = 0.020$) and the interaction between alcohol consumption and marital status ($P = 0.032$) are significant. For women in a non-permanent relationship, the odds of consuming tobacco are significantly higher if they also consume alcohol. The odds of consuming tobacco are the same for women in a permanent relationship or who are not consuming alcohol (or both).

Discussion

This study provides unique data on the rates of alcohol and tobacco use among post-partum women. It shows that among 6–24-months post-partum urban women in the South Island of New Zealand, the rate of alcohol consumption (72%) is high, and the rate of tobacco (23%) consumption is moderate. Most women who consumed alcohol were light drinkers (96%), although average measures of alcohol when used alone, as was conducted in the current study, can camouflage inter-individual variations in patterns of alcohol use (Kaskutas 1995) and lead to misclassification. Likewise, just over half of the women (56%) who smoked cigarettes were light smokers. Comparing these prevalence rates with the national average for New Zealand women of childbearing age (MoH 1999) showed that the rates obtained in the current study was lower by 6% for both alcohol and tobacco consumption.

Our study also showed that rates of alcohol and tobacco consumption depended on maternal status (i.e. pregnant, breastfeeding). Specifically, women who were pregnant were less likely to consume alcohol than non-pregnant and non-breastfeeding women. These results agree with other studies that have documented a cessation of alcohol consumption

Table 3. Factors associated with tobacco consumption (1 if consuming, 0 otherwise).

Factor	Parameter*	Odds ratio (95% CI)	*P*-value (chi-squared test)
Education (reference secondary)			
University	–2.218	0.11 (0.14–0.84)	0.033
Diploma	–0.836	0.43 (0.19–0.98)	0.044
Age	–0.139	0.87 (0.81–0.93)	<0.001
Breastfeeding (Yes = 1; No = 0)	–1.219	0.30 (0.11–0.79)	0.015
Marital status (Permanent = 1; Non-permanent = 0)	1.240	3.46 (0.59–20.1)	0.168
Alcohol consumption (Yes = 1; No = 0)	2.256	9.54 (1.43–63.7)	0.020
Alcohol consumption by marital status interaction	–2.255	0.11 (0.01–0.83)	0.032
Constant	2.106		

*The estimated coefficients for the fitted logistic regression.

during pregnancy (Little *et al*. 1976; Bolumar *et al*. 1994). However, breastfeeding women were not less likely to consume alcohol than the non-pregnant and non-breastfeeding women of our study. These results corroborate with that reported in another New Zealand study, in which more than half resumed alcohol consumption at 6 weeks post-partum (McLeod *et al*. 2002a) and alcohol consumption was not associated with their intention to breastfeed (McLeod *et al*. 2002b).

The high rate of alcohol consumption (80%) among non-pregnant and non-breastfeeding women in our study is also a concern, because overseas studies have shown that more than half of all pregnancies are unplanned (Forrest 1994). These high rates of unplanned pregnancies, if relevant for New Zealand women, indicate that a high proportion of New Zealand women are at risk for drinking alcohol in early pregnancy, which is a vulnerable period for alcohol teratogenicity (Streissguth *et al*. 1989). Public health professionals must ensure that all New Zealand women of childbearing age are fully aware of this risk.

Our results also corroborate observations made almost a decade ago, which suggested that, during pregnancy, New Zealand women give up the consumption of alcohol more easily than the consumption of tobacco (Clissold *et al*. 1991). This is not surprising, because nearly half of women smoking in our study were smoking at levels deemed risky for continuing this behaviour in pregnancy (Colman & Joyce 2003). Other overseas studies also have shown that women who smoke are likely to continue this behaviour during pregnancy (Bolumar *et al*. 1994; Ebrahim *et al*. 1998; Colman & Joyce 2003; Cnattingius 2004). Smoking in pregnancy has been associated with adverse pregnancy outcomes (USDHHS 2001) and negative foetal effects (Schwartzbaum *et al*. 1991; Fergusson *et al*. 1998; Law *et al*. 2003; Chong *et al*. 2004; Gray *et al*. 2004; Jaakkola & Gissler 2004). In contrast, breastfeeding, in our study, was associated with lower odds for smoking. Notwithstanding, this may merely characterize women who choose to breastfeed longer than 6 months, because a recent study on women in the UK showed that smoking women were less likely to breastfeed beyond 6 months compared with mothers who did not smoke (Donath & Amir 2004). A New Zealand study also has indicated that tobacco consumption was negatively associated with the intention to breastfeed (McLeod *et al*. 2002b). Hence, our result with regard to tobacco consumption and breastfeeding needs a further investigation.

Tobacco consumption by breastfeeding women has also been associated with negative effects on the fetus or infant (Dahlstrom *et al*. 1990; Mascola *et al*. 1998). Nicotine is excreted at high levels in breastmilk (Dahlstrom *et al*. 1990), and urinary cotinine levels are 10-fold higher among the breastfed compared with bottle-fed infants of smoking mothers (Mascola *et al*. 1998). The effects of exposure to environmental smoke on child development and micronutrient status are also well documented (Becker *et al*. 1999; Dybing & Sanner 1999; McLachlan *et al*. 2004). Because tobacco consumption is an addictive behaviour, which is difficult to give up, it is essential to educate women of childbearing age about its ill effects not only on their own health but also on the health of their children.

Other maternal characteristics were also associated with the higher risk of alcohol or tobacco consumption, and these characteristics differed for alcohol as compared with tobacco consumption. Overall, however, being a current consumer of alcohol was also a significant risk factor for tobacco consumption and vice versa (Tables 2,3). With respect to alcohol consumption, Caucasian women and women with a higher education and household income were more likely to consume alcohol than their counterparts. Similar results were found in an overseas Behavioural Risk Factor Surveillance System survey, in which non-pregnant women reporting any alcohol use were more likely to be Caucasian, and have higher levels of education than those not reporting alcohol use (CDC 2002). In an earlier New Zealand study of pregnant women, similar demographic characteristics, for consumers vs. non-consumers of alcohol, were reported with respect to education and income levels but not ethnicity (Counsell *et al*. 1994). This suggests that women with a higher education and income who consume alcohol may be at risk for continuing this behaviour in pregnancy.

With respect to tobacco consumption, our analysis showed that age, household income, level of education and relationship status were associated with these practices. Specifically, the odds were higher for younger women, for women whose highest level of education was secondary school, and for women who were not in a permanent relationship. Similar results were found in Spain, where smoking women were younger, without university degrees, not married and drinkers of alcohol (Bolumar *et al*. 1994). Likewise, in an earlier New Zealand study, women with higher levels of education and socio-economic status had lower prevalence rates of smoking both before and during pregnancy (Clissold *et al*. 1991). Colman and Joyce (2003) also report a lower prevalence of smoking among college-educated American women, and such women were more likely to quit smoking prior to pregnancy. Other national and international studies also have found similar socio-demographic characteristics for women who smoked in pregnancy (Kwok *et al*. 1983; Alison *et al*. 1993). These results suggest that antismoking campaigns, unlike alcohol education campaigns, must place special emphasis on younger, less well-educated women from low-income households.

The results of our study are only generalizable to 6–24-months post-partum urban women living in the South Island of New Zealand, but not to women living in the North Island because of inter-island differences in population ethnic and socio-demographic characteristics. Compared with the 1996 New Zealand census, for 6–24-months post-partum women living in our surveyed cities (Statistics NZ 1997), a slightly higher proportion of participants were Caucasian (88.0% vs. 77.5%) and had a university education (21.8% vs. 9.2%), and a slightly lower proportion were from low-income households (14.5% vs. 21.2%) than would be expected. This response rate bias may have resulted in a slight overestimation of the prevalence of alcohol consumption, for this population, because being Caucasian, having a high income and having a university level of education were associated with increased odds for alcohol consumption. Conversely, the prevalence of smoking may have been slightly underestimated for this population, because a university level of education was associated with lower odds for smoking. Moreover, in the current study, information on different types of alcoholic beverages consumed was not collected. The average number of drinks per week or per month was also collected without specifically defining a standard drink. However, the impact of these limitations on the results of the current study is minimal as the focus of this research was to report the prevalence of any alcohol use and characterize women who consumed any alcohol according to their socio-demographic characteristics and maternal status.

Conclusions

This survey suggests that nearly three out of four 6–24-months post-partum urban women in the South Island of New Zealand consume alcohol, and almost one in four consumed tobacco. Pregnant (38% vs. 80%) but not breastfeeding women (66% vs. 80%) were less likely to consume alcohol than non-pregnant and non-breastfeeding women. Although these results cannot be generalized to all New Zealand women of childbearing age, it may be prudent to educate all such women on the negative effects of alcohol and tobacco on foetal and child development. Young women with lower levels of education and household incomes, in particular, must be reached by antismoking campaigns. Finally, because of the dearth of published information on the prevalence of alcohol and tobacco consumption among breastfeeding women, more research is necessary to establish these prevalence rates, the patterns of drinking behaviour, and the impact of these lifestyle behaviours on breastfeeding infants and young children.

Acknowledgement

This research was supported by a grant from the Health Research Council of New Zealand.

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