Relationships Among Smoking, Drinking, Betel Quid Chewing and Pregnancy-related Nausea and Vomiting in Taiwanese Aboriginal Women

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A cross-sectional survey was conducted to investigate the associations among smoking, drinking, betel quid chewing and pregnancy-related nausea and vomiting (N/V) in Taiwanese aboriginal women. A total of 901 aboriginal women from 11 hospitals were recruited into this study. A structured questionnaire on demographic and obstetric information, smoking history, alcohol consumption, betel quid chewing habits, and N/V by checklist was used to collect data. The findings of this study indicated that the prevalence of N/V, maternal smoking, drinking, and betel quid chewing were 75.6% ($n=682$), 22.8% ($n=201$), 31.9% ($n=287$), and 34.7% ($n=313$) respectively. Multiple logistic regression with adjustment for age, body mass index and antiemetics use revealed significant relationships between smoking habits and N/V before confirmation of pregnancy and during pregnancy. In comparison with those who did not smoke, women smoking in excess of 10 cigarettes a day before pregnancy were 1.65 times more likely to develop N/V; and women smoking in excess of 10 cigarettes a day during pregnancy were 2.79 times more likely to develop N/V. Based on the findings of this study, smoking was associated, with a dose-response effect, with pregnancy-related N/V. Reducing the intake of cigarettes could decrease the risk of pregnancy-related N/V. Health care providers should help these women decrease their uncomfortable symptoms and improve their experiences of pregnancy and birth outcome during critical times.

Key Words: aborigines, betel quid, drinking, pregnancy-related nausea and vomiting, smoking
(*Kaohsiung J Med Sci* 2009;25:62–9)

Smoking, drinking and betel quid chewing have a close relationship and have been well documented as risk factors for various diseases in women, including oral cancer [1–3], and these habits are also associated with adverse pregnancy and birth outcomes [4–7]. The associations among adverse pregnancy and birth outcome and smoking [8,9], drinking [4,10], and betel quid chewing [5,6] have been studied widely. Smoking during pregnancy affects both the birth outcome of the fetus, increasing risk of intrauterine growth retardation and preterm birth [11,12], and women's health [7,12]. Alcohol intake is associated with spontaneous abortion [5] and fetal alcohol syndrome [10]. Betel quid chewing is associated with premature labor and stillbirth and low birth weight [6]. Betel quid is commonly believed to dispel nausea among some ethnic groups [13], but there is no research evidence to support this.

Received: Oct 7, 2008 Accepted: Nov 24, 2008
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The smoking rate among pregnant women was reported to be 11.4% in the United States [14] and 15% in Finland [15], and the alcohol consumption rate was reported to be 23–57.4% in western countries [10,16]. In Taiwan, the prevalence of smoking, alcohol consumption, and betel quid chewing for ethnically Chinese Taiwanese women was 7.3%, 7.9% and 3.7%, respectively [17]. For aboriginal pregnant women, the rates were 11.6–14.5%, 43.6–67.7%, and 36.4–43.6% respectively [5,18], whereas the smoking rate among ethnically Chinese Taiwanese pregnant women was 2.6–4.6% [19,20] and the betel quid chewing rate was 0.78% [21].

Nausea and vomiting (N/V) are common symptoms of pregnancy that affect the health of both the pregnant woman and her fetus (resulting in low birth weight, for example) [22]. These symptoms may even threaten the lives of the mother and her fetus if N/V progress to hyperemesis gravidarum [23–25]. The prevalence of N/V during pregnancy among women in western countries ranges from 50% to 80% [26,27] and is 77.4% in pregnant Taiwanese women [28]. However, there is no evidence for N/V in aboriginal women in Taiwan, although Profet [29] proposed that pregnancy-related N/V has no cultural boundaries.

There are various inconsistent interpretations about the contributing factors for N/V in pregnancy. Women who were young [30–32], primipara, nonsmoking [30,31], of lower education [26,30], middle-to-low income, working part-time [26], and overweight [30] experienced more vomiting than others. Kallen et al [32] indicated that multipara women had more N/V, and women who smoked before pregnancy had a lower risk of N/V. Weigel and Weigel [33] indicated that pre-pregnancy alcohol consumption is correlated with a decreased risk of N/V. However, some other studies suggested that there was no significant relationship among pregnancy-related N/V, age [28,34], educational level [31,34], financial situation, marital status [34], parity [28], smoking [27,33], or alcohol consumption during pregnancy [27].

In Taiwan, 14 aboriginal tribes constitute nearly 2.1% of the entire population [35]. According to the literature review above, the associations among adverse pregnancy and birth outcomes, smoking, drinking, and betel quid chewing have been studied widely. However, few studies have explored the prevalence of N/V in pregnant aboriginal women and the relationship among smoking, drinking, betel quid chewing and physical symptoms of pregnant women such as N/V. The purpose of this study was to investigate the prevalence of pregnancy-related N/V and the associations among smoking, drinking and betel quid chewing with pregnancy-related N/V in Taiwanese aboriginal women, who show a high prevalence of smoking, drinking and betel quid chewing [5,18].

Methods

Participants

Aboriginal women from 11 hospitals located in southern and eastern Taiwan, who had just given birth in a hospital and delivered a single infant, were recruited into this study. Women who had been diagnosed with pregnancy complications or medical illnesses such as gestational diabetes mellitus and pregnancy-induced hypertension were excluded. The data collection for this study began after obtaining the approval from the Human Research Ethics Committee of Kaohsiung Medical University. Recruitment was voluntary and informed consent was obtained from each participant. All participants were notified that they had the right to reject or withdraw from the study at any time and they were informed that all information acquired in association with the study that could identify them would remain confidential. Participants' names and other identifying information were not on the questionnaires. A code number was assigned to ensure confidentiality. All of the women completed the questionnaire at the hospitals within 72 hours postpartum. A total of 901 women agreed to participate in a personal interview and to fill out a structured questionnaire and checklist about their demographic and obstetric information, smoking history, alcohol consumption, betel quid chewing habits, and N/V. N/V was defined as "a feeling of impending vomiting" (p. 247) and/or "ejection of the stomach contents through the mouth" (p. 391) [36]. The participation rate was 93.8% (901 of 961); 60 questionnaires were not completed. No significant difference in pregnancy-related N/V and demographic characteristics of women was found between participants and non-participants.

Data analysis

Two sample *t* tests were used to examine differences in continual variables for the participants with and without pregnancy-related N/V. Chi-squared tests were

Table 1. Characteristics of 901 aboriginal women with and without nausea and vomiting (N/V) during pregnancy*

Maternal parameter	N/V (n=682)	Non-N/V (n=219)	$p^{\dagger}$
Age (yr)	26.89±5.24	27.15±5.70	0.546
Body weight before pregnancy (kg)	56.34±10.73	56.40±11.73	0.945
Prenatal weight gain (kg)	14.68±6.40	15.36±7.08	0.186
Parity	2.17±1.28	2.06±1.16	0.251
Maternal height (cm)	156.96±5.21	156.19±5.75	0.063
Years of smoking	20.80±10.92	20.15±10.88	0.447
Years of drinking	16.22±11.19	16.11±10.84	0.903
Years of betel quid use	19.32±10.88	20.24±10.65	0.284
Frequency of prenatal clinic visits	9.08±3.24	8.58±3.38	0.057
Gestational age (wk)	38.33±1.91	38.18±2.10	0.334
Body mass index (kg/m^2)	22.86±4.23	23.12±4.82	0.448

*Data presented as mean±standard deviation; †two-sample t test.

used to test the association between sociodemographic variables and women with/without pregnancy-related N/V. Crude odds ratios (ORs) with 95% confidence intervals (CIs) were computed from simple logistic regression to examine the association between N/V and the sociodemographic variables. Adjusted ORs were obtained by multiple logistic regressions with age in years, body mass index and use of antiemetics as covariates to control for potential confounders. All statistical analyses were performed using SPSS version 14.0 (SPSS Inc., Chicago, IL, USA) for Windows.

Results

A total of 901 women participated in this study and the age of the participants ranged from 16 to 47 years (mean, 27.02±5.47 years). Of the 901 women, 568 (63.0%) were educated to above senior high school, most (n=772, 85.7%) were married, 678 (75.2%) were unemployed, and 569 (63.2%) were primiparas. The prevalence of maternal smoking, drinking, and betel quid chewing was 22.8% (n=201), 31.9% (n=287) and 34.7% (n=313), respectively. The three most commonly consumed alcoholic beverages were beer (45.3%), Whisbih (24.7%; a kind of Chinese herbal wine), and Rosé wine (20.7%). Six hundred and eighty-two (75.6%) women had pregnancy-related N/V. The incidence of N/V for different ethnic groups ranged from 71.1% to 80.8%: 80.8% (n=63) for Bunon, 72.2% (n=174) for Amis, 75.0% (n=24) for Puyuma, 77.6% (n=318) for Paiwan, 71.1% (n=27) for Rukai, and 71.1% (n=54) for Atayal. The means and frequency distributions of all demographic, obstetric, and clinical characteristics were not significantly different between the participants with and without pregnancy-related N/V (Tables 1 and 2). The mean age, smoking, drinking, and betel quid chewing durations were similar in both groups (Table 1). The prevalence of N/V among the individual aboriginal groups was also similar in both groups (Table 2).

The smoking, drinking, and betel quid consumption quantities before and during pregnancy for the two groups are presented in Table 3. The multiple logistic regressions adjusted for age in years, body mass index and use of antiemetics revealed significant associations between smoking habits and N/V before pregnancy and during pregnancy. Before pregnancy, women who smoked more than 10 cigarettes a day were 1.65 times (95% CI, 1.03–2.65; p=0.036) more likely to develop N/V, and women who smoked fewer than 10 cigarettes a day did not show a significantly higher risk of developing N/V (p=0.833). During pregnancy, women who smoked more than 10 cigarettes a day were 2.79 times (95% CI, 1.25–6.22; p=0.012) more likely to develop N/V, while women smoking fewer than 10 cigarettes a day had no significantly higher incidence of N/V (p=0.378). None of the other variables were significantly associated with N/V, including alcohol consumption and betel quid chewing.

Discussion

Based on the findings of this study, smoking is related, in a dose-response effect, to pregnancy-related N/V. Quitting smoking or reducing the amount of cigarettes

Table 2. Characteristics of 901 pregnant aborigines with and without nausea and vomiting (N/V)

	N/V*	Non-N/V*	Crude OR	95% CI	*p*
Age (yr)					0.097
<20	34 (5.0)	15 (6.8)	1.00		
20–25	268 (39.3)	81 (37.0)	1.46	0.76–2.82	
26–30	232 (34.0)	61 (27.9)	1.68	0.86–3.28	
≥31	148 (21.7)	62 (28.3)	1.05	0.54–2.07	
Educational level					0.427
≤9 yr	257 (37.7)	76 (34.7)	1.00		
>9 yr	425 (62.3)	143 (65.3)	0.88	0.64–1.21	
Marital status					0.211
Married	590 (86.5)	182 (83.1)	1.00		
Other	92 (13.5)	37 (16.9)	0.77	0.51–1.16	
Employment status					0.113
Employed	160 (23.5)	63 (28.8)	1.00		
Unemployed	522 (76.5)	156 (71.2)	1.32	0.94–1.86	
Parity					0.631
Primipara	247 (36.2)	83 (37.9)	1.00		
Multipara	435 (63.8)	136 (62.1)	1.08	0.79–1.48	
Partner's education					0.108
≤9 yr	246 (36.1)	66 (30.1)	1.00		
>9 yr	436 (63.9)	153 (69.9)	0.77	0.55–1.06	
Partner's employment status					0.357
Employed	590 (86.5)	184 (84.0)	1.00		
Unemployed	92 (13.5)	35 (16.0)	0.82	0.54–1.25	
Use of antiemetics					0.000
Yes	55 (8.1)	2 (0.9)			
No	627 (91.9)	217 (99.1)			
Ethnic group					0.430
Bunon	63 (9.2)	15 (6.8)			
Amis	174 (25.5)	67 (30.6)			
Puyuma	24 (3.5)	8 (3.7)			
Paiwan	318 (46.6)	92 (42.0)			
Rukai	27 (4.0)	11 (5.0)			
Atayal	54 (7.9)	22 (10.0)			
Other	22 (3.2)	4 (1.8)			

*Data presented as *n* (%). OR = odds ratio; CI = confidence interval.

smoked could decrease the risk of N/V. Fortmann and Killen [37] indicated that women now smoked more heavily and had greater difficulty than men in quitting. In addition, Yang et al [18] found that approximately 80% of aboriginal women could recognize the adverse effects of smoking on pregnancy outcome, but only 50% of women stopped smoking during their pregnancy. Health care providers should actively help pregnant women to decrease or stop smoking, using methods such as developing a suitable smoking cessation plan and referring cases to a counseling center [38], or recommending smoking reduction (to <10 cigarettes/day) to alleviate N/V among women who are not persuaded by discussion of smoking cessation counseling. Therefore, a good strategy is to educate and help pregnant women with a gradual smoking cessation program, to reduce the number of cigarettes to fewer than 10 per day as a first step towards complete cessation.

Our findings, which show that smoking during pregnancy is a risk factor for N/V, differ from three previous studies [27,30,31], which concluded that smoking before pregnancy is a risk factor of N/V; our findings were also different from those of Kallen et al [32], for whom smoking before pregnancy was associated with a lower risk of N/V. A possible explanation

Table 3. Smoking, chewing and drinking habits related to nausea and vomiting (N/V) in 901 pregnant aborigines

	N/V*	Non-N/V*	aOR†	95% CI	*p*
Before pregnancy					
Smoking (cigarettes/d)					
No	438 (64.2)	130 (59.4)	1.00		
Yes, <10	175 (25.7)	56 (25.6)	1.04	0.71–1.52	0.833
Yes, ≥10	69 (10.1)	33 (15.1)	1.65	1.03–2.65	0.036
Drinking alcohol (times/mo)					
No	293 (43.0)	91 (41.6)	1.00		
Yes, <10	312 (45.7)	90 (41.1)	0.87	0.62–1.23	0.436
Yes, ≥10	77 (11.3)	38 (17.4)	1.51	0.95–2.41	0.082
Betel quid chewing (quids/d)					
No	396 (58.1)	130 (59.1)	1.00		
Yes, <10	226 (33.2)	61 (27.7)	0.76	0.53–1.08	0.129
Yes, ≥10	59 (8.7)	29 (13.2)	1.22	0.72–2.07	0.451
During pregnancy					
Smoking (cigarettes/d)					
No	536 (78.6)	160 (73.1)	1.00		
Yes, <10	132 (19.4)	47 (21.5)	1.19	0.81–1.77	0.378
Yes, ≥10	14 (2.1)	12 (5.5)	2.79	1.25–6.22	0.012
Drinking alcohol (times/mo)					
No	472 (69.2)	142 (64.8)	1.00		
Yes, <10	169 (24.8)	66 (30.1)	1.24	0.87–1.76	0.237
Yes, ≥10	41 (6.0)	11 (5.0)	0.93	0.46–1.88	0.837
Betel quid chewing (quids/d)					
No	443 (65.1)	146 (66.4)	1.00		
Yes, <10	197 (28.9)	56 (25.5)	0.76	0.52–1.10	0.144
Yes, ≥10	41 (6.0)	18 (8.2)	1.07	0.58–2.01	0.823
Husband smokes					
No	139 (20.4)	41 (18.7)	1.00		
Yes	543 (79.6)	178 (81.3)	1.05	0.70–1.56	0.831

*Data presented as *n* (%); †computed by multiple logistic regression with adjustment for age in years, body mass index and use of antiemetics. aOR = adjusted odds ratio; CI = confidence interval.

for this difference may be due to the use of adjusted odds ratios to control for the potential confounders. In contrast to the previous studies by Kallen et al [32] and Weigel and Weigel [33], who did not control for any potential confounding variables, we used multiple logistic regression to adjust for age in years, body mass index and the use of antiemetics. In addition to the negative effect of N/V from smoking, pregnancy-related N/V is associated with low birth weight [22]; betel quid chewing is associated with smoking or drinking and there is a cumulative effect of chewing betel quid and smoking or alcohol consumption on adverse birth outcomes [6]. Future research is needed to determine the cumulative or interactive effects of smoking, drinking, betel quid chewing, and N/V on adverse pregnancy and birth outcomes using a larger sample size, because our sample size and the research design of this study are not sufficient to examine these effects.

The prevalence of smoking (22.8%) in this study was higher than that in previous studies of pregnant women in the United States (11.4%) [15] and of pregnant aborigines in Taiwan (11.6–14.5%) [5,18]. Our study is consistent with the model of the four stages of the cigarette epidemic for women, particularly stage 2—rising female prevalence [39]. Smoking among pregnant aboriginal women is a significant issue which needs immediate intervention because the prevalence of smoking has increased significantly in the same locations over the past 10 years. The prevalence of drinking (31.9%) and betel quid chewing (34.7%) was lower than that in previous studies

[5,10,18] based on a local population of aboriginal women. One possible explanation is that the participants of this study are pregnant aboriginal women from both eastern and southern Taiwan, and not just from one locality. Accordingly, the results of our study may be more relevant.

The prevalence of N/V in different tribes of pregnant aborigines (71.1–80.8%) was similar to the previous findings for Taiwanese (77.4%) [28], Afro-Caribbean (71%) and Caucasian women (78.5%) [40], and for Hispanic pregnant women (50.5–72.9%) [33]. Our findings also support Profet's conclusion [29] that pregnancy-related N/V has no cultural boundaries. These women of different ethnicities all had pregnancy-related N/V, but at different prevalence rates. In addition to the uncomfortable symptoms, studies have shown that over half of the women could accept physicians' suggestions [19] and were willing to quit smoking during pregnancy out of concern for the fetal health [20]. Health care providers should take the opportunity to help these women to decrease or quit smoking during this critical time. It is also strongly suggested that health education, particularly concerning the harmful effects of smoking, alcohol drinking, and betel quid chewing, should be stressed in concert with pre-pregnancy and routine prenatal care for these women, and to focus on reducing the quantities of cigarettes, alcohol and betel quid consumed based on the evidence from this study.

This study only focused on the presence or absence of N/V. Future research should also consider the frequency and severity of N/V. A possible limitation of this study was that it was a cross-sectional study and used a self-report method to collect data: "Although self-reports represent a powerful mechanism for obtaining data, researchers who use this approach should always be aware of the risk of response biases" (p. 350) [41]. Self-report might be affected by social desirability and participants' beliefs that their perceptions were acceptable under the social norm or presented favorable images of themselves [41]. This study measured the prevalence of smoking, drinking and betel quid chewing among aboriginal pregnant women. However, the data might not completely reflect the accurate situation of the participants because of the potential bias of social desirability. A future study should be developed to test the social desirability bias in self-report research in aboriginal pregnant women.

Acknowledgments

This study was supported by grants from the National Science Council of Taiwan (NSC 90-2314-B-037-079). The authors would like to thank the directors of the participating nursing departments and the aboriginal women who gave birth at the recruitment hospitals for their help in collecting the data for this study.

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台灣原住民婦女煙、酒、檳榔與孕期噁心嘔吐之相關性研究

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本研究目的為調查台灣原住民婦女抽煙、飲酒、吃檳榔和孕期噁心嘔吐的相關性；採用橫斷式的研究方法。總共有來自 11 所醫院，901 位原住民婦女參與本研究。使用結構式問卷收集資料，問卷內容包括人口學資料、產科訊息、吸煙史、飲酒和食用檳榔的習慣，以及噁心嘔吐的檢核表。研究結果發現，噁心嘔吐、母親吸煙、飲酒和食用檳榔的盛行率分別為 75.6% (*n* = 682)、22.8% (*n* = 201)、31.9% (*n* = 287) 和 34.7% (*n* = 313)。以邏輯式複迴歸並調整年齡、身體質量指數和止吐劑之使用，進一步分析發現懷孕前及懷孕期間的吸煙習慣和噁心嘔吐有顯著相關；相較於不抽煙的婦女，在懷孕前及懷孕期間每天吸煙超過 10 支者則分別會有 1.65 和 2.79 倍的較高機會形成噁心嘔吐。依據本研究結果，吸煙會以劑量反應的效應方式和孕期噁心嘔吐有關。減少吸煙的量應能減少孕期噁心嘔吐發生的危險機率。健康照護提供者應在此關鍵時期（懷孕前或懷孕期間）幫助這些婦女減輕她們不舒服的症狀，以改善她們的懷孕和生產結果。

關鍵詞：原住民，檳榔，飲酒，孕期噁心嘔吐，吸煙

(高雄醫誌 2009;25:62–9)

收文日期：97 年 10 月 7 日

接受刊載：97 年 11 月 24 日

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