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Maternal Use of Cigarettes, Pipes, and Smokeless Tobacco Associated With Higher Infant Mortality Rates in Cambodia

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Abstract

In the Western Pacific Region, rural women use loose tobacco in betel quid chewing and pipe smoking. We examined the relation between maternal use of tobacco and infant mortality (IM) in a national sample of 24 296 birth outcomes in adult women (n = 6013) in Cambodia. We found that (1) age-adjusted odds of IM were higher for maternal use of any tobacco (odds ratio [OR] = 1.69; 95% confidence interval [CI] = 1.27–2.26); (2) age-adjusted odds of IM were higher for cigarette use (OR = 2.54; 95% CI = 1.54–4.1), use of pipes (OR = 3.09; [95% CI = 1.86–5.11]), and betel quid chewing (OR = 1.55; 95% CI = 1.10–2.17); and (3) these associations remained after multivariable adjustment for environmental tobacco smoke, malnutrition, ethnicity, religion, marital status, education, income, occupation, and urban/rural dwelling. In addition to finding the established association with cigarettes, we also found that maternal use of smokeless tobacco and pipes was associated with higher rates of infant death in Cambodia.

Keywords

water pipe; smoking/tobacco/drug abuse; public health; maternal and child health; women's health; family medicine; global health

Introduction

The association between maternal tobacco use and risk of perinatal complications has primarily focused on maternal cigarette smoking—an exposure that is a known risk factor for perinatal death, preterm birth, low birth weight, and small for gestational age.¹ Some of the causal pathways underlying this association include fetal hypoxia, intrauterine growth

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restriction, and placental abruption.¹ To date, numerous investigations have identified more than 7000 chemicals in inhaled tobacco smoke that cross the placenta and can potentially harm the fetus.² A recent statistical summary of the data from 173 687 cases and 11.7 million controls identified the potent effect of maternal smoking on an ever-widening range of birth defects.²

In the Western Pacific Region (WPR), the rate of cigarette smoking among men is the highest in the world (55%), but among women, it remains quite low (3%–8%).^{3,4} Does maternal tobacco use represent an important public health concern in the WPR?

To investigate this question, we need to also consider the health effects of noncigarette (ie, smokeless tobacco, water pipes, and other pipes) forms of tobacco used by women of reproductive age in the region. In Southeast Asia and Asia-Pacific nations, smokeless tobacco in the form of a betel quid (betel leaf, areca nut, slaked lime, and loose tobacco rolled into a packet) is a common form of tobacco use among women.⁵ The effect of smokeless tobacco use during pregnancy on perinatal complications is less well known. Findings from India (Mumbai cohort),⁶ Sweden,⁷ South Africa (Birth to Ten Study),⁸ and aborigines in Taiwan^{9–12} have linked smokeless tobacco and/or betel quid use to higher perinatal mortality rates and/or other adverse outcomes (ie, low birth weight and preterm birth).

The other noncigarette forms of tobacco used in the WPR include the tobacco water pipes and other pipes found in rural areas.^{13,14} The water pipe of rural Asia tends to be a tubular shaped homemade pipe made of bamboo, clay, or PVC material with a short spout for insertion of loose tobacco.¹³ Overall, tobacco pipe (water pipe or other pipes) smoking is common among ethnic tribal groups (ie, Akha, Hmong, and Khamu) living in communities as large as 90 000 throughout Southeast Asia.¹⁴ In 2010, findings from the Global Adult Tobacco Survey of Vietnam indicated that there were an estimated 4.1 million tobacco water pipe smokers in the nation.¹⁵ In a 2006 national survey of Cambodia, the prevalence of tobacco pipe use among ethnic minorities living on the Laos-Cambodia border exceeded 48% in women.¹⁶ Salim et al¹⁷ have reported a strong spatial correlation between use of a tobacco pipe (water pipe or other pipes) by women and infant mortality (IM) in Cambodia.

In the present study, we examined the association between maternal tobacco use (cigarettes, betel quid, and tobacco pipes) and IM (stillbirths through death in the first year of life) in a national sample of Cambodian women.^{3,18,19} For the study, we analyzed the data from the largest nationwide survey of adult (age 18 years and older) tobacco use ever conducted in Cambodia (n = 13 988) that was completed through a collaborative effort of the Fogarty-NIH sponsored Tobacco Control Leadership Training Program (TCLT) and the National Institute of Statistics (Ministry of Planning, Phnom Penh, Cambodia).^{3,19,20} In a special supplement to the 2006 tobacco survey, women completed items on lifetime birthing history and reported the outcomes of each pregnancy.²⁰ Our analyses focused on the 6013 parous women who reported the outcomes from 24 296 pregnancies that occurred during their lifetime.

Methods

Study Population

For the TCLT survey, we assembled a nationwide, representative sample of 13 988 adults 18 years and older that has been previously described.^{3,20} Briefly, we conducted a stratified 3-stage cluster sample using the 1998 Cambodia General Population Census as a sampling frame. Specifically, we stratified the country into 17 sampling domains consisting of 12 individual provinces and 5 groups of similar provinces. Within each domain, we then randomly selected 26 villages (we use the term *village* to represent a rural village or urban area of comparable size) by circular systematic sampling. Each village was further subdivided into “enumeration areas” (block of about 110 households), and for each village, 1 enumeration area was randomly selected for surveying.

Survey teams consisted of 4 to 5 interviewers and enumerators from the National Institute of Statistics (Ministry of Planning, Phnom Penh, Cambodia) working in each of the 17 census-derived regions described above. A total of 92 personnel were trained by the National Institute of Statistics, including one of the authors (PNS), in the pretesting and administration of the survey. In addition to conducting the interviews, these teams updated the household enumeration and cartography of the sampling units that was obtained during the 1998 census.

The survey teams covered all private households and included single-member households. The survey did not cover institutional households such as military barracks, prisons, hospitals, and boarding houses or residents of temples (ie, monks). In each household, all adults 18 years and older were asked to participate in the study (with informed consent), and we found that less 3% declined to complete the survey. Among 13 988 adults, we identified 6122 women who had experienced at least 1 pregnancy at the time of the survey. Among these women, we excluded 23 women who did not give complete vital status data on the child. Also, we excluded 86 women for whom we could not ascertain smoking status at the time of each of their pregnancies. Thus, for the final sample we studied 6013 women who reported the outcomes from 24 296 pregnancies that occurred during their lifetime.

Questionnaire

The national prevalence survey administered in 2005–2006 included items on demographics, tobacco use, anthropometrics (ie, mid-upper-arm circumference and height), diet (food frequency questionnaire), current health, women’s health, and media exposure. Survey items were designed by data during (1) focus groups conducted on tobacco and health issues in rural and urban centers, (2) graduate-level training in survey research of Ministry of Health personnel that involved selection and modification of items from tobacco use surveys of other nations,²¹ and (3) consultation with local NGOs who had conducted provincial surveys on tobacco use.

Tobacco Items—The survey included items on commercial cigarettes, hand-rolled cigarettes, chewing tobacco, tobacco pipe, age at initiation of tobacco, reasons for starting to smoke, knowledge and attitudes about tobacco, and smoking cessation. The tobacco items

were in the form of (1) interviewer-administered items adapted from WHO surveys and other national prevalence surveys that measured intensity and duration of tobacco use^{3,22} and (2) interviewer-administered pictograms of commercial and local tobacco products based on the findings of qualitative research (focus groups and key informants) of rural and urban tobacco users in Cambodia.

Environmental tobacco use was measured using items measuring the number of days per week a participant (in this case the mother) inhaled smoke for at least 15 minutes in the home, work, or public place.¹⁸

Maternal Tobacco Use—Maternal tobacco use was determined for each reported birth outcome by an index constructed from items on age at initiation of tobacco use, current tobacco use, length of time since cessation of tobacco use, and maternal age at the specific birth. If maternal age at initiation was at least 1 year prior to maternal age at birth, maternal tobacco use was confirmed for that particular pregnancy. Cessation periods of >2 years were used to exclude a mother from the maternal tobacco use category.

Validity Study—For a validity substudy,²² we randomly sampled 201 adults (ages 21–84 years) from a rural province and then administered the TCLT survey and collected saliva samples for cotinine testing using the NicAlert (Nymox Corporation) test. Relative to salivary cotinine levels, we found excellent validity for the items and pictograms of current tobacco use (sensitivity = 86%, 95% confidence interval [CI] = 78.9%–93.1%; specificity = 94%, 95% CI = 87.6%–98.4%; and positive predictive value = 93%, 95% CI = 89.7%–98.7%]).

Reproductive Health Items—Reproductive health variables were added to the survey and were adapted from items used on the 2005 Demographic and Health Survey (reproductive age women, aged 15–49 years).²³ For all parous women, the survey items were used to ascertain a lifetime birthing history that for each full-term pregnancy through the time of the survey included the following: mother's age at birth, stillbirth, death before 1 year of age, death before 5 years of age, and current vital status of the birthed child. The IM outcome defined by this study includes both death before 1 year of age and stillbirth.

Statistical Analysis

The unit of analysis for this study was an individual pregnancy. Thus, the 24 296 pregnancies were stratified by provincial domain and clustered by enumeration area and mother. Therefore, the statistical analysis needed to account for the stratified, multistage cluster sampling design (ie, by domain, enumeration area, and mother). The 95% CIs for prevalence, means, and odds ratios (ORs) for IM and health variables were calculated using a Taylor series linearized approach to compute between-cluster variance estimators that accounted for the intracluster correlation among participants within the same village. Point estimates for prevalence, means, and ORs were further adjusted by sample weights to account for different sampling fractions within each of the 17 sampling domains described above. ORs were derived from logistic regression models, where IM at less than 1 year was the dependent variable and independent variables included maternal tobacco use,

demographics, anthropometrics, and baseline health status. These statistical analyses were performed using SUDAAN software release 9.0 (RTI International, Research Triangle Park, NC).

Results

Maternal Demographics of the Births

Our sample consisted of 24 296 births among 6013 mothers (mean age of 46.6 years at the time of the survey) who had been pregnant at least once during their lifetime. Each mother gave birth to a mean of 4 children (range = 1–18) and was an average age of 27.9 years (range = 15 to 55 years) at the time of birth. In Table 1, we provide maternal demographic characteristics of the birth mothers. These data indicate important differences by tobacco use ($P < .001$), whereby maternal tobacco users tended to have a lower level of education (< 6 years), were living below the poverty level (< 1 US\$ per day), reported farming as the primary economic activity, and were rural dwelling.

In multivariable logistic regression models, we related demographic and health variables to odds of IM, defined as death at less than 1 year of age or a stillbirth as the outcome. We found a significant positive association with age at time of survey (3% increase in odds of IM per year of age) and a significant negative association with mother's age at birth (2% decrease in odds of IM per year of maternal age at birth) and added these variables as confounders to all larger models.

In Table 2, we show the relation between selected demographic and health variables and the odds of IM after adjustment for age at time of survey and maternal age at birth. We found that higher education (> 6 years) and higher income (> 3 US\$ per day) were both associated with a lower odds of IM. Significant 2- to 3-fold increases in odds of IM were found for ethnic and religious minorities (local tribes, “animists”).

Maternal Tobacco Use

The prevalence of maternal tobacco use (smoked or smokeless) in the sample was 16.2% (95% CI = 15.1% to 17.5%) and occurred in 4360 pregnancies. As regards type of tobacco, 13.2% (95% CI = 12.1%–14.4%) chewed tobacco ($n = 2959$ pregnancies), 3.3% (95% CI 2.8%–3.9%) smoked cigarettes ($n = 1146$ pregnancies), and 0.35% (95% CI 0.31% to 0.40%) smoked pipes ($n = 375$ pregnancies). Mixed use (smoked + smokeless) occurred in only 120 pregnancies.

In a model with age at time of survey, mother's age at birth (maternal age), and maternal use of any form of tobacco (cigarettes, pipes, and smokeless tobacco), we found that maternal tobacco use was associated with about a significant 69% increase in odds of IM (OR = 1.69; 95% CI = 1.27–2.26). In Figure 1, we present the findings from a multivariable model using terms for exposure to cigarettes, smokeless tobacco, and pipes (relative to no maternal use of any form of tobacco) and with age at time of survey and maternal age at birth as confounders. These data indicate that the odds of IM significantly increased more than 3-fold for use of the tobacco pipe (OR = 3.09; 95% CI = 1.86–5.11), more than 2-fold for the

use of cigarettes (OR = 2.54; 95% CI = 1.54–4.1), and by about 55% for the use of chewed tobacco (OR = 1.55; 95% CI = 1.10–2.17).

In larger models for maternal tobacco use, we included 9 confounder variables (environmental tobacco smoke, malnutrition [assessed by mid-upper-arm circumference <22 cm], ethnicity, religion, marital status, education, income, occupation, and urban/rural dwelling) in addition to age at time of survey and age at time of birth. Adjustment for the 9 additional variables did not produce a substantial change in the effects for maternal use of a tobacco pipe (OR = 4.35; 95% CI = 1.58–12.03), cigarettes (OR = 2.30; 95% CI = 1.39–3.83), or chewing tobacco (OR = 1.44; 95% CI = 1.03–2.02).

Discussion

We examined the relation between maternal tobacco use and IM in a large prevalence survey of 24 296 birth outcomes reported in a national sample of Cambodian women. Our major findings are as follows: (1) IM was significantly higher (relative to nonusers during pregnancy) for maternal use of any tobacco (OR = 1.69; 95% CI = 1.27–2.26) in an age-adjusted (at survey and at time of pregnancy) model; (2) IM was also significantly higher for the following specific types of tobacco: cigarettes (OR = 2.54; 95% CI = 1.54–4.1), tobacco pipe (OR = 3.09; 95% CI = 1.86–5.11), and smokeless tobacco in the form of a betel quid (OR = 1.55; 95% CI = 1.10–2.17); (3) all age-adjusted associations indicating harm of maternal tobacco use remained significant in a multivariable model that adjusted for environmental tobacco smoke, malnutrition, ethnicity, religion, marital status, education, income, occupation, and urban/rural dwelling.

The implications of the higher infant death rate in maternal tobacco users even after adjusting for a wide range of poverty indicators is discussed.

Maternal Smoking of Tobacco in Cambodia (Cigarettes and Pipes)

The strong association between maternal cigarette smoking and infant death identified in our analysis confirms that this known perinatal risk factor is, in Cambodia, further adding to the already high infant death rates. It is interesting to note that even with the very low prevalence of cigarette smoking among Cambodian women (3%) and, consequentially, low statistical power to detect associations, a significant 2-fold increase in the rates was still evident in our analysis (Figure 1).

Because of the low prevalence of maternal cigarette smoking, the public health and policy implications of the maternal smoking-IM association primarily relate to supporting tobacco control efforts aimed at preventing cigarettes from becoming a common habit in Cambodian women. Cambodia ratified the WHO Framework Convention on Tobacco Control in 2005 and is currently implementing Framework Convention on Tobacco Control (FCTC) initiatives in the country.²⁴ Our findings indicate that if brands that target women do proliferate among women of reproductive age in Cambodia, the results could be devastating because, even at 2006 levels, the few Cambodian mothers who did smoke while pregnant more than doubled their odds of a perinatal death in a nation where the rate of IM is already high.

The more than 3-fold increase in IM rates for use of the tobacco pipe was primarily occurring in the Mondol Kiri and Rotanak Kiri provinces on the Lao-Cambodia border that are home to a wide range of non-Khmer ethnic minorities (ie, Khamu and Akha) who use the pipe as part of a tobacco habit and also in religious ceremonies. This association using mother-child-level data given here (Figure 1) is concordant with the spatial association reported by Salim et al²⁵ indicating a concentration of pipe smoking and higher IM rates in this border region. It is important to note, however, that the findings in this report demonstrate a maternal tobacco smoking-infant death relation even after control for ethnicity and poverty-related factors.

Similar to the beliefs associated with manufactured water pipes used in the Eastern Mediterranean region,^{26–28} there is a belief among Southeast Asian water pipe smokers that the water in the pipe filters out some of the harmful components of the tobacco smoke.¹³ The most recent data on the manufactured water pipes of the Eastern Mediterranean region indicate, however, that maternal water pipe smoking is associated with adverse birth outcomes.^{29–33} For the homemade water pipe used in Southeast Asia, our group reported expired CO levels in the users that were comparable to that for cigarettes.¹³ To our knowledge, this is the first study of the association between homemade pipe use among pregnant women and infant death.

Maternal Smokeless Tobacco/Betel Quid Use in Cambodia

Public Health Implications—In Cambodia, the predominant form of tobacco used among women of reproductive age is smokeless tobacco in the form of a betel quid. Findings from the 2011 National Adult Survey of Tobacco use²⁴ indicate that 80% of female betel quid users were initiated into their habit during their reproductive years—a finding that complements qualitative work that links the habit to a “rite of passage” among women. In this issue of the journal,³⁴ we also report that for pregnant users, more than 60% initiated or increased their use of tobacco during the pregnancy. Initiation of betel quid use during pregnancy in Cambodia has been linked to a traditional medicine remedy for morning sickness.^{3,35}

The public health impact of maternal smokeless tobacco use in Cambodia is considerable and needs formal estimation as part of tobacco control surveillance. Data from 2006 and 2011 national prevalence surveys^{3,24} indicate that of the 1.9 million tobacco users, more than 500 000 are women using smokeless tobacco in the form of a betel quid. When considering that each female user is giving birth to about 4 children in their lifetime (Table 1), the prevalence of prenatal exposure to betel quid metabolites ranges in the millions—resulting in perinatal deaths and, among the surviving infants, the potential for long-term health effects as yet unknown (see next section).

The burden of maternal smokeless tobacco use in Cambodia is especially challenging for local tobacco control efforts because the loose tobacco is difficult to target with FCTC implementation initiatives on taxation and health warning labels. The problem is compounded by the use of this form of tobacco as part of long-held cultural, familial, and traditional medicine practices.

Mechanism of Action: Maternal Betel Quid Use—The findings from Cambodia linking betel quid exposure to higher rates of infant death are in agreement with large-scale studies from India^{6,36} indicating 2- to 5-fold increases in risk of stillbirth for betel quid. Also notable are the findings from Taiwanese aborigines that link maternal betel quid use without tobacco^{9–12} to a 90-g deficit in birth weight and a 0.4-cm deficit in birth length.

What is the mechanism by which maternal use of a betel quid containing tobacco, areca nut, slaked lime, and betel leaf can produce adverse infant outcomes?

When examining betel quid use as a risk factor, it is important to note that the risk is not attributable to combustion products but rather to alkaloids (ie, nicotine and arecoline) released by the smokeless tobacco and areca nut components of the quid and absorbed in the buccal mucosa. The authors of several recent reviews have noted the paucity of human data on the effect of maternal intake of nicotine from a smokeless source on the developing fetus.^{37–39} Among the betel quid metabolites produced during maternal betel quid use, nicotine from the tobacco component and other alkaloids (arecoline, arecaidine, guvacine, and guvacoline) from the areca nut could potentially have harmful teratogenic roles.

Finally, in the same sample of Cambodian women that we studied, Singh et al⁴⁰ have recently reported an association between female betel quid use and infectious disease (HIV/AIDs, typhoid, dengue fever, and malaria). The link was not thought to be directly causal but rather a consequence of the effect of this habit on suppressing the immune system and, through constant injury to the oral mucosa, providing a route of entry for the pathogen. Vertical transmission of pathogens in this context is yet another mechanism of action that could link this tobacco habit in women to increased risk of infant death in Cambodia.

Limitations

Limitations of this analysis need mention. A causal link between tobacco use and IM is being inferred based on women's recall of their past pregnancy outcomes and lifetime use of tobacco. Recall bias is certainly a factor, and the associations, although longitudinal across a recall spectrum, need confirmation in a formal prospective design.

Conclusions

In a national sample of Cambodian women, we found that all forms of smoked and smokeless tobacco use by pregnant women were associated with higher rates of infant death. The findings highlight the need for public health measures to prevent smoked tobacco use from emerging as a habit in women and the need for education regarding the negative consequences to the infant from a mother's use of betel quid that often starts during a pregnancy.

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Figure 1.

Odds ratios for infant mortality (death at less than 1 year and stillbirth) for 3 forms of maternal tobacco use (relative to no use of any form of tobacco during the pregnancy) are given for 24 296 births among parous women of the Tobacco Control Leadership Training Survey of Cambodia (2006).

Table 1

Selected Demographic Characteristics of the Mothers for Each of the 24 296 Births Are Given by Maternal Tobacco Use During Each Pregnancy.

Maternal Characteristics	All	Maternal Tobacco User	Nonuser During the Pregnancy
Mean age at birth	27.88	31.24	27.22
Ethnicity (%)			
Khmer	94.21	87.78	95.46
Cham	4.13	7.56	3.47
Local tribe ^a	0.73	2.82	0.32
Other ^b	0.92	1.84	0.75
Religion (%)			
Buddhist	94.86	89.09	95.98
Muslim	4.20	7.57	3.55
Christian	0.27	0.10	0.30
Other ^c	0.63	3.24	0.12
None	0.04	0.00	0.05
Marital status (%)			
Never married	0.14	0.05	0.16
Currently married	81.54	73.50	83.10
Divorced or separated	2.93	3.52	2.82
Widower/Widow	14.83	22.69	13.30
Living together	0.56	0.25	0.62
Education			
0–6 years	90.01	98.36	88.40
7–12 years	9.52	1.64	11.04
13–15 years	0.29	0.00	0.34
>15 years	0.18	0.00	0.22
Income (per day)			
<1 US\$	86.57	93.45	85.24
1–2 US\$	6.48	4.21	6.92
>2–3 US\$	2.86	1.01	3.21
>3 US\$	4.09	1.34	4.63
Occupation			
Does not work	21.74	22.33	21.63
Professional	0.19	0.00	0.23
Health professional	0.12	0.00	0.15
Nurse or midwife	0.06	0.16	0.04
Medical or nursing assistant	0.04	0.00	0.05
Traditional or faith healer	0.07	0.09	0.06
Technical	1.16	0.54	1.28
Clerical	0.09	0.00	0.10
Service	0.17	0.52	0.10

Maternal Characteristics	All	Maternal Tobacco User	Nonuser During the Pregnancy
Fireman/Police	0.04	0.03	0.05
Sales	13.45	3.57	15.36
Tobacco farming or preparation	0.47	0.81	0.41
Farming, agriculture and livestock	58.38	68.96	56.33
Labor	2.36	2.37	2.35
Trades and crafts	1.63	0.63	1.83
Armed forces	0.02	0.00	0.03
Residence			
Urban	14.45	5.08	16.26
Rural	85.55	94.92	83.74

^aIndigenous “hill tribes” found throughout Southeast Asia.

^bChinese, Vietnamese, Laos, Thai, and Other.

^cLocal or tribal religions (ie, Animist).

Table 2

Age-Adjusted (Age at Time of Survey and Age at Time of Birth) Models Relating Selected Demographic and Health Variables to Infant Mortality at <1 Year Among 24 296 Births.

Variable	OR [95% CI]
ETS	
No ETS	1.00 [referent]
ETS exposure	0.84 [0.64, 1.12]
Malnutrition ^a	
Normal	1.00 [referent]
Undernourished	1.50 [1.01, 2.23]
Wasting	0.81 [0.32, 2.07]
Ethnicity	
Khmer	1.0 [referent]
Cham	1.58 [0.89, 2.80]
Local tribe ^b	3.34 [2.03, 5.50]
Other ^c	1.03 [0.43, 2.43]
Religion	
Buddhist	1.0 [referent]
Muslim	1.56 [0.88, 2.75]
Christian	1.19 [0.42, 3.34]
Other ^d	2.13 [1.32, 3.42]
None	—
Marital status	
Currently married	1.0 [referent]
Divorced or separated	1.10 [0.48, 2.51]
Widow/Widower	1.24 [0.88, 1.76]
Living together	0.38 [0.04, 3.22]
Education	
0–6 years	1.0 [referent]
7–12 years	0.54 [0.30, 0.97]
>12 years	—
Income (per day)	
<1 US\$	1.0 [referent]
1–2 US\$	1.20 [0.77, 1.87]
>2–3 US\$	0.70 [0.30, 1.62]
>3 US\$	0.44 [0.22, 0.90]
Occupation	
Traditional healers and medical assistants	1.0 [referent]
Technical	0.29 [0.04, 2.18]
Sales	0.86 [0.53, 1.40]
Farming, agriculture and livestock	1.34 [0.97, 1.84]

Variable	OR [95% CI]
Labor	1.72 [0.79, 3.75]
Trades and crafts	1.61 [0.77, 3.38]
Residence	
Urban	1.0 [referent]
Rural	1.43 [0.93, 2.19]

Abbreviations: OR, odds ratio; CI, confidence interval; ETS, environmental tobacco smoke.

^aAs measured by mid-upper-arm circumference <22 cm in the mother.

^bIndigenous “hill tribes” found throughout Southeast Asia.

^cChinese, Vietnamese, Laos, Thai, and Other.

^dLocal or tribal religions (ie, Animist).