

Avoidance of Environmental Tobacco Smoke among Pregnant Taiwanese Women: Knowledge, Self-Efficacy, and Behavior

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ABSTRACT

Background: The issue of active and passive cigarette smoking among pregnant women at home has become a major source of debate. The purpose of this study was to explore the knowledge of, self-efficacy with, and behavior toward avoiding environmental tobacco smoke and related factors among pregnant women in Taiwan.

Methods: A cross-sectional research design was used. Women ($n = 281$) visiting the outpatient antenatal clinics of one regional hospital and two medical centers in Taipei for routine obstetrical care volunteered to fill out questionnaires.

Results: Participants on average had little knowledge of this issue and felt less than "very confident" in resisting environmental tobacco smoke and indicated that it was only "usually true" that they practiced avoidance behaviors. The knowledge of, self-efficacy with, and behavior toward avoiding environmental tobacco smoke were all related to both the woman and her partner's educational levels. There were significant differences in mean knowledge, self-efficacy, and avoidance of environmental tobacco smoke scores among different household smoking groups. A multiple regression revealed that overall avoidance of environmental tobacco smoke was positively associated with self-efficacy, with a no-smoking policy at home, and with both a woman and her partner's educational levels.

Conclusions: The high prevalence of subjects suffering from active (6.05%) and passive smoking (58.72%) suggests that clinicians can target interventions designed to increase pregnant women's self-efficacy and to advise them to try to set up their own smoking policy at home.

INTRODUCTION

SMOKING IS ASSOCIATED with an increased risk of developing and of dying from many cancers, cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD), and more,

as well as an increased risk of adverse reproductive outcomes.¹ Maternal cigarette smoking during pregnancy is associated with increased risk of miscarriage, intrauterine growth retardation, preterm delivery, reduced infant weight, and higher infant mortality.^{1,2} Many studies have

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This research was supported by grant BHP-92-Anti-Tobacco-2U03 from the Bureau of Health Promotion, Department of Health, Taiwan.

also suggested that the pregnant woman's exposure to her partner's smoking may contribute to reduced birth weight³⁻⁵; paternal smoking also increases the risk of infant respiratory infections and sudden infant death syndrome (SIDS), irrespective of the maternal smoking status.³ Efforts to reduce prenatal cigarette smoke exposure have largely focused on encouraging women to quit smoking during pregnancy,^{6,7} but interventions to promote maternal smoking cessation have not been very successful.^{4,8-10} Although women are more likely to attempt to quit smoking during pregnancy than at other times in their lives, only one third stop successfully,⁹ and 50%–80% of pregnant smokers relapse in the postpartum period.¹¹ Research has found that family support can be an important factor in contributing to prenatal or early postnatal smoking cessation; family members' own tobacco use, as well as their attitudes and behavior toward smoking by a pregnant woman, can have a powerful influence on women's smoking.⁵ Exposure to daily passive smoke at home (usually from a partner) is an important risk factor for continued smoking during pregnancy, and support from the partner is the most important contributor to success in quitting.³ Targeting public relations efforts toward the development of a smoke-free family has, therefore, become an important objective in many nations.^{7,12}

Smoking is the leading source of indoor air pollution.¹³ The amount of environmental tobacco smoke exposure, as measured by serum cotinine concentration in pregnant women, was statistically negatively associated with the fetal biparietal diameter and the newborn child's birth weight.¹⁴ Thus, prenatal smoking cessation may not eliminate health risks if women are exposed to smoke-laden environments. Sources of environmental tobacco smoke may include partners, friends, colleagues, and relatives who smoke and permissive rules about smoking in the home, car, and work environment. Although indoor tobacco smoking has been banned or significantly limited in many workplaces and public settings, the home is one of the only places with no external limits on smoking. Effective health promotion messages and programs must help develop a pregnant woman's confidence in her ability to avoid environmental tobacco smoke from those living with her.

Women continue to smoke.¹⁵ In Taiwan, approximately 4.6% of women smoke during preg-

nancy despite the numerous adverse health consequences of smoking.^{16,17} Although the prevalence of maternal smoking in Taiwan may not be as high as it is in other countries,⁶ more than half of the pregnant women may be exposed to environmental tobacco smoke in their homes.^{16,18} The prevalence of cigarette use has been reported to be 50% for men aged ≥ 15 years and 58.3% for men aged 25–44 years; it is likely that the female partners of these men are of similar, reproductive age.¹⁸ Recent studies support home smoking restrictions as being positively associated with increased attempts to quit, the intention to quit, lighter smoking, and sustained cessation.¹⁹⁻²¹ Further, smoke-free rule in homes can also reduce the risk of children becoming smokers,¹² yet little is known about the extent to which pregnant women have control over avoiding environmental tobacco smoke with the presence of other smokers in the home. The purpose of this study was to explore pregnant women's self-efficacy in avoidance of environmental tobacco smoke. Results of this study can inform pregnant women about the establishment of a smoke-free policy in the home to protect themselves and their unborn children. Although much has been published about the relationship between abstinence self-efficacy and smoking cessation, only a few published reports have examined self-efficacy with regard to avoidance of environmental tobacco smoke.²¹

MATERIALS AND METHODS

Design

This was a cross-sectional study. All women who had a routine obstetrical appointment in the outpatient antenatal clinics of two medical centers and one regional hospital were approached by one of three research assistants to take part in the study. Each woman was asked to complete a brief questionnaire in the waiting room prior to her appointment. The self-completion questionnaire took 20–30 minutes to complete. Primary variables of interest included behaviors and self-efficacy in avoiding environmental tobacco smoke and knowledge about health risks and policies on smoking and smoking cessation. Both the ethics and methodology of the study protocol were approved by the hospitals in question; all the women who volunteered for the study pro-

vided written consent. Results of a power analysis based on pilot test results indicated that a sample of 243 women would have 80% power to detect an effect size of 0.2 (α 0.05).²²

Subjects

Participants were recruited from three hospitals in Taipei. Flyers and information from clinic nurses were used to recruit women who received prenatal services between June and September 2004. Women were eligible for the study if they could read and write Chinese, were at least 16 years old, either 16, 28, or 38 weeks pregnant as per the recommended prenatal checkup times in the first, second, and third trimesters that would be covered by the National Health Insurance (NHI) program. The reason for selecting only women at the noted weeks of pregnancy was for future planning for intervention in each gestational stage. Under the NHI program, only certain prenatal checkups were covered by the plan. A grocery bag with wheels equal to a monetary reward of US\$10 was offered as an incentive to participate.

Study variables/questionnaire

The questionnaires covered demographic characteristics, household smoking status, knowledge about health risks and policies on smoking and smoking cessation, and a self-reported measure of self-efficacy and avoidance of environmental tobacco smoke. Based on the work of Carmines and Zeller,²³ development of this research instrument included focus group discussion to generate items; content validity was established using a panel of eight experts in nursing, health education, and smoking cessation. The index of content validity (CVI) was determined by the proportion of experts who rated items as content valid (a rating of 3 or 4) using a 4-point ordinal rating scale. Finally, a pilot test of 30 pregnant women determined its face validity. Items were deleted based on correlations, variances, item-scale correlations, and alpha coefficients.²⁴

The pregnant women's avoidance of passive smoking was assessed using the Avoidance of Environmental Tobacco Smoke Scale.²⁵ The original 10-item scale was developed to characterize subjects' behaviors associated with resisting environmental tobacco smoke and identifies situations in which the exposure to environmental tobacco smoke occurs, such as, "If I encounter a friend who is smoking, I will still sit and talk with

him/her while he/she is smoking", "When I am in a restaurant, I will leave if unable to sit in the nonsmoking section," and "If I am with people who are smoking and I cannot leave, I will ask them to refrain from smoking." This scale has been tested on college students and young mothers, and a known group comparison indicated a very high reliability and validity.²⁵ The questionnaire used a 4-point scale for respondents to indicate their level of avoidance behavior (from 4, almost always true, to 1, almost never true). The scale was scored by averaging the answers, with the scores reversed for items worded negatively. In this study, two items were added especially for pregnant women's avoidance behaviors developed from focus group discussion: "When I encounter someone smoking outdoors, I will move away to avoiding exposure of smoke," and "I don't feel it is a problem to be in a smoking environment." After translation and back-translation of the scale, the CVI was determined (CVI = 0.98), and the overall reliability coefficient of 0.83 was comparable to the original published results of Martinelli.²⁵

Social cognitive theory suggests that changes in behavior are influenced by a person's self-efficacy or confidence in taking action in specific situations.²⁶ The 6-item Avoidance of Environmental Tobacco Smoke self-efficacy scale was self-developed to assess how confident the woman was that she could keep others from smoking around her in public places, in others' homes, and also in her own home. Response options for these items ranged from 0 (not at all confident) to 4 (extremely confident), producing mean scores of between 0 and 4, with higher scores representing higher confidence in avoiding environmental tobacco smoke. This scale was established to have an internal consistency coefficient of 0.83 and a CVI of 0.96.

The Knowledge of Smoking questionnaire contains 11 multiple-choice questions covering health risks of active and passive smoking on maternal and fetal health as well as current anti-smoking regulations in Taiwan; three items required multiple answers. The potential score ranged from 0 to 30 for this scale, and the score was converted to an accuracy proportion [(number of correct answers/30) \times 100], with a higher score indicating better knowledge. The validity and reliability of this scale (CVI = 0.86, Kuder-Richardson (KR)-20 = 0.67) were also acceptable, as specified by DeVellis.²⁴

Social demographic predictors of home smoking control included in the analyses were maternal age and both the woman and her partner's educational levels and employment status. Information on the woman's gestation and gravidity was also collected.

Analysis of data

In order to explore pregnant women's knowledge of, self-efficacy with, and behavior toward avoiding environmental tobacco smoke, related factors, and predictors of avoidance behavior, data were collected through a survey method. The data were analyzed using the SPSS PC (version 10.0) statistical software package (SPSS, Chicago, IL). Descriptive statistics (frequency distributions, means, and standard deviations [SD]) were used to characterize the study population. Unless otherwise specified, differences in the background characteristics and major outcome variables between smoking groups were examined using chi-square test, Student's *t* test, and analysis of variance (ANOVA) at the univariate level, and multiple linear regressions were used for the multivariate analysis.

RESULTS

Overall, 802 pregnant women were approached; however, 282 did not meet the inclusion criteria because of language barrier or unqualified weeks of pregnancy. Among 520 qualified subjects, 132 (25.38%) refused, and 107 (20.57%), although consenting, were unable to complete at least 50% of the questionnaire before they were called in for their appointment. This left a response rate of 54.04% ($n = 281$). By chart review to compare any difference between non-participants and survey subjects, there was no significant difference in age and marital status.

Sample demographics and household smoking prevalence and patterns

The characteristics of the women in the survey are summarized in Table 1. The demographic characteristics of the study sample were similar to data retrieved from 8102 women who gave birth from 2002 to 2003.¹⁷ Participants were classified into three household smoking status categories based on response to a series of items con-

TABLE 1. CHARACTERISTICS OF SAMPLE ($N = 281$)

<i>Characteristic</i>	<i>Frequency (%)</i>
Education ($n = 279$)	
<High school	17 (6.1)
High/vocational school	89 (31.9)
College	81 (29.0)
University or higher	92 (33.0)
Spouse/partner's education ($n = 277$)	
<High school	17 (6.1)
High/vocational school	79 (28.5)
College	68 (24.5)
University	75 (27.1)
Postgraduate	38 (13.7)
Trimester	
First	65 (23.1)
Second	107 (38.1)
Third	109 (38.8)
Gravidity	
Primigravida	154 (54.8)
Multigravida	127 (45.2)
Working situation ($n = 234$)	
Employed	130 (55.6)
Unemployed	104 (44.4)
Age (mean \pm SD)	29.66 \pm 4.83

cerning the smoking status of members living in the same household. Ninety-four women (33.5%) were classified as living in the smoke-free families, indicating that they were nonsmokers and none of their family members in the same household were current smokers. Among 187 pregnant women who lived in smoking households, 17 were active maternal smokers (refers to pregnant women who either did not abstain at all or had smoked during the week before the survey). The other 165 were passive smokers who were nonsmokers but lived with smokers in their household who may have been the spouse/partner ($n = 138$), other family members living in the same household ($n = 12$), or both the partner and other families living together ($n = 15$). Among women with partners who smoked ($n = 153$), the majority (56.9%) reported that they had cut down on the number of cigarettes smoked since the woman's pregnancy, as had 50.5% of the other family members who smoked. Regarding household smoking regulations, subjects were asked to select one answer to best describe their household smoking situation: smoking was not allowed in any place, smoking was allowed in certain designated areas, or there is no smoking regulation at home. Only 43.7% of the subjects stated that there was a strict no-smoking policy in their home (Table 2).

There was no significant variation in subjects' characteristics by household smoking status except for both women and their partners' educational levels. A higher educational background in both women (chi-square (5, $n = 279$) = 30.31, $p < 0.000$) and their partners (chi-square (5, $n = 277$) = 38.66, $p < 0.000$) tended to represent higher proportions of smoke-free families. Cross-tabulation indicated that 71.8% of pregnant women in the low-education group did not have environmental tobacco smoke control set up in their homes (chi-square (5, $n = 275$) = 16.05, $p < 0.000$), and similar results were found for these women's spouses/partners' educational background (chi-square (5, $n = 273$) = 31.86, $p < 0.000$).

Factors related to knowledge of, self-efficacy with, and behavior toward avoiding environmental tobacco smoke

Pregnant women's knowledge of smoking was assessed to evaluate subjects' understanding or denial of health risks and policies. On average, women only scored 53.26% (SD 14.99), indicating that most women did not have a strong understanding of the health risks of active and passive

smoking on maternal and fetal health or of current antismoking regulations in Taiwan. Among the adverse health consequences of smoking, >80% of subjects did not know of the increased risks of developing breast cancer and premature menopause for women and higher odds of developing dental cavities and infantile colic in their children.

Average scores on the 6-item avoidance of environmental tobacco smoke self-efficacy ranged from 0 to 4 (mean \pm SD, 2.97 \pm 0.85), indicating that pregnant women felt less than "very confident" in resisting environmental tobacco smoke. In terms of pregnant women's behaviors in avoiding environmental tobacco smoke, the average score of 3.09 (SD 0.52, range 1.42–4) indicated that women believed it to be "usually true" that they avoid environmental tobacco smoke. Women who were nonsmokers practiced better avoidance behavior (mean \pm SD, 3.37 \pm 0.41) than passive smokers (mean \pm SD, 3.00 \pm 0.48) and smokers (mean \pm SD, 2.39 \pm 0.51).

Knowledge of, attitudes toward, and behavior toward avoidance of environmental tobacco smoke were significantly related to both the women and their partners' educational levels. Pregnant women with higher educational preparation

TABLE 2. PATTERNS AND SOURCES OF ACTIVE AND PASSIVE SMOKE OF SAMPLE

Variable	Frequency (%)
Household smoking status ($n = 281$)	
Smoke-free family	94 (33.5)
Smoking family	187 (66.5)
Source of smoking ($n = 187$)	
Maternal active smoke	12 (6.7)
Both active and passive	5 (2.7)
Passive smoke	165 (90.6)
Missing	5 (N/A)
Women's smoking status ($n = 280$)	
Never smoked	231 (82.5)
Quit before pregnancy	4 (1.4)
Quit after pregnancy	28 (10)
Current smoker	17 (6.1)
Spouse/partner who smoked ($n = 153$)	
Smoked as usual	64 (41.8)
Smoked less after pregnancy	87 (56.9)
Smoked more after pregnancy	2 (1.3)
Other householder's smoking status ($n = 97$)	
Smoked as usual	48 (49.5)
Smoked less after pregnancy	49 (50.5)
Household smoking regulation ($n = 277$)	
Not allowed	121 (43.7)
In designated areas	104 (37.5)
No regulation	52 (18.8)
Missing	4 (N/A)

not only knew more about smoking risks and antismoking laws ($r_s = 0.35, p < 0.01$) and were more confident about their ability to control passive smoke ($r_s = 0.18, p < 0.01$) but also took more concrete actions to avoid environmental tobacco smoke ($r_s = 0.43, p < 0.01$) than those with lower educational preparation. A consistent pattern was observed in knowledge of ($r_s = 0.29, p < 0.01$), self-efficacy with ($r_s = 0.23, p < 0.01$), and behavior toward ($r_s = 0.48, p < 0.01$) the women's partners. Maternal age was positively associated with avoidance behavior ($r = 0.16, p < 0.01$); employed women (mean \pm SD, 3.13 ± 0.47) also performed better in avoiding environmental tobacco smoke than those unemployed (mean \pm SD, 2.99 ± 0.59) ($t = -2.18, p < 0.05$). Knowledge about environmental tobacco smoke was higher among primigravida women (mean \pm SD, 55.92 ± 13.86) than multigravid ones (mean \pm SD, 50.08 ± 14.64) based on Student's t test analysis ($t = -3.40, p < 0.001$). Stages of pregnancy (trimester) were not associated with either the knowledge of, self-efficacy attitude toward, or behavior toward avoiding environmental tobacco smoke.

To explore the differences in knowledge of, self-efficacy attitude toward, and behavior toward avoiding environmental tobacco smoke among different household smoking groups, ANOVA was applied. Overall, mothers who continued to smoke were less likely to be aware of, or convinced of, the dangers of smoking ($F(2, 271) = 7.11, p < 0.01$) and were less confident ($F(2, 270) = 5.91, p < 0.01$) and capable in avoid-

ing environmental tobacco smoke ($F(2,273) = 40.19, p < 0.001$) than women who suffered from passive smoking or those without household tobacco smoke exposure. There were also significant differences in knowledge of ($F(3, 270) = 5.07, p < 0.01$), self-efficacy with ($F(3, 269) = 4.02, p < 0.01$), and behavior toward ($F(3, 272) = 28.37, p < 0.01$) avoiding environmental tobacco smoke at the source of smoking. Women in smoke-free family groups performed the best, and active maternal smokers had the lowest scores on both scales. However, when the source of smoking was from their husbands or partners, women had better self-efficacy but had worse avoidance behavior than when the passive smoke was from other family members. Finally, women with a no-smoking home policy had better knowledge ($t = -2.39, p < 0.05$), self-efficacy ($t = -3.19, p < 0.05$), self-efficacy ($t = 3.19, p < 0.01$), and avoidance behaviors ($t = -7.60, p < 0.000$).

Factors predicting avoidance of environmental tobacco smoke

In order to identify the variables most strongly related to pregnant women's practice of avoiding passive smoking, each significant variable in the bivariate analysis was entered into a multiple regression (Table 3). After adjusting for age, employment, and education levels (both the women and their partners) (model 1), self-efficacy of resistance to passive smoke significantly predicted the pregnant women's behavior in avoiding environmental tobacco smoke ($F = 25.92, p <$

TABLE 3. MULTIPLE REGRESSION OF MAJOR VARIABLES ON PREGNANT WOMEN'S AVOIDANCE OF ENVIRONMENTAL TOBACCO SMOKE (N = 281)

Predictor variable	Model 1		Model 2		Model 3	
	β	t	β	t	β	t
Age	0.05	0.86	0.08	1.54	0.06	1.20
Employment	-0.01	-0.21	-0.03	-0.51	-0.02	-0.32
Woman's education	0.32	4.34***	0.25	3.65***	0.24	3.70**
Partner's education	0.25	3.62***	0.21	3.31**	0.15	2.32*
Self-efficacy			0.40	7.52***	0.38	7.30***
Knowledge			0.02	0.36	0.00	0.03
Home smoking policy					0.19	2.14*
Household smoking status					0.06	0.70
Constant	2.51		1.74		1.74	
Adjusted R ²	0.25		0.40		0.45	
F	20.23		25.92		23.47	
p	0.000		0.000		0.000	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

0.000). This variable explained 15% of the variance; knowledge, however, was excluded from the regression model (model 2).

In regression model 3, the home smoking policy and household smoking status were transformed into dichotomous variables and added to the regression. Overall avoidance of environmental tobacco smoke was significantly positively associated with self-efficacy, with a no-smoking policy at home, and with both women and their partners' educational levels ($F = 23.47$, $p < 0.000$). A home smoking policy explained 5% of the variance; household smoking status, however, made no significant contribution to the multiple regression model.

DISCUSSION

As it is possible to spontaneously stop smoking and there is high motivation for women to alter this behavior, the potential for a positive health impact is great during pregnancy, and many programs have targeted smoking cessation by pregnant women.²⁷ Interventions and provider advice that focus solely on maternal behavior do not address the full range of smoking risks, however, given that women are at continued risk of exposure to passive smoking. This may be problematic among women who quit smoking for their pregnancies but who live in an environment that is permissive of others' smoking. Therefore, it is important to address the problem of environmental tobacco smoke exposure during pregnancy. The present study examined factors associated with pregnant women's behavior in avoiding environmental tobacco smoke. Factors related to pregnant women's behavior in resisting active and passive smoking need to be further identified in order to develop better strategies for minimizing and avoiding exposure. Information on the success of interventions to reduce environmental tobacco smoke exposure of pregnant women is limited.

In our study, the prevalence of women exposed to active (17 of 281 = 6.05%) and passive smoking (165 of 281 = 58.72%) was consistent with the results of Lin,¹⁷ who surveyed 12,857 women who gave birth in seven municipal hospitals in Taipei. Lin¹⁷ found that 44% of all pregnant women had been exposed to second-hand smoke from their spouses, and an additional 10% had been exposed from other family members. Lin's

findings (54%) were slightly lower than ours (58% < 72%), which may have been due to the nature of the convenience sampling we used and which may have overrepresented the high prevalence of passive smokers who enrolled in our study. Although pregnant women suffering from passive smoke practiced better behaviors in avoiding environmental tobacco smoke than did smokers, as indicated in our results their risks were consistently higher than those of nonsmokers. An astonishing 54%–66.5% of the women resided with a smoker and were potentially exposed to the adverse health effects of second-hand smoke. These women were trapped in an environment that exposed them to multiple health problems not only in terms of the pregnancy and health outcomes of the infant but also in terms of coronary artery disease, stroke, and various types of cancer. However, >80% of the sample we surveyed were not aware of the long-term health risks of active and passive smoking.

Other studies have also supported the need to address smoke exposure during pregnancy.^{8,11} Overall, smokers were less likely to be convinced of the dangers of smoking related to pregnancy and child development than were those exposed to passive smoking or who lived in a smoke-free household. This may imply a knowledge deficit on the part of continuing smokers, and it may also reflect a belief by such women that these risks are unlikely, possibly influenced by their observation that smokers frequently have normal birth weight babies.²⁸ It may be advisable to deemphasize the immediate risks to the mother and fetus and stress other aspects of smoking that may be of more personal relevance and carry long-term health risks to women and children, such as cancer and cardiovascular disease.

In the present study, 43.7% of the women claimed to have set up an antismoking policy in their homes, which is lower than the proportion of persons who were covered by smoke-free home rules, which ranged from 51% in Kentucky to 86% in Utah, in the United States.¹² Other studies have reported prevalences of home smoking restrictions ranging from 12.5% to 43% in homes with children and at least one smoker.²¹ Dunn et al.²⁹ found that the percent of pregnant women who allowed smoking in their homes was 31.7% of nonsmokers, 46.9% of abstainers, and 84.7% of smokers. A consistent pattern was observed in exposure to the partner's second-hand smoke across smoking categories, and education levels

were associated with second-hand smoke exposure. In our study, both women and their partners' educational levels were associated with the household smoking status and the presence of a smoking policy at home. Women with a higher educational background usually marry someone with an equivalent educational level, and these couples represented a higher proportion of nonsmokers themselves; also, a higher proportion lived in nonsmoking households. Results of this study indicate that these women were more confident in setting up smoking restrictions in their households than were women with a high school or lower education.

According to social cognitive theory, self-efficacy is a predictor of behavior.²⁶ Consistent with other studies,²¹ confidence in one's ability to control smoking in the living environment was a significant predictor of avoidance of environmental tobacco smoke in this study. Few other studies have explored exposure avoidance self-efficacy among parents of infants and children. Strecher et al.³⁰ also found that a mother's confidence in her ability to protect her children from environmental tobacco smoke varied as a function of the setting and the individuals with whom the mother must intervene to limit exposure. Crone et al.³¹ reported that mothers found it more difficult to ask family or friends than to ask their partners not to smoke in the presence of the infant. In this study, pregnant women revealed better self-efficacy in avoiding environmental tobacco smoke from their partners but higher tolerance of it from their husbands or partners than from other family members.

The multivariate analysis also revealed that environmental tobacco smoke avoidance behaviors were dramatically higher among the women who have higher self-efficacy and had a no-smoking policy at home. Because of the nature of a cross-sectional study design, the present study does not allow conclusions with regard to cause and effect. However, pregnant women suffering from passive smoking might strengthen their confidence in response to someone who smoked in their household by setting up a no-smoking policy. The findings of this study suggest that health professionals and smoking cessation programs should be more aggressive in targeting women's self-efficacy and in instructing them on how to set up a smoking policy at home, as these two factors positively predicted the actual performance of avoiding environmental tobacco smoke among

pregnant women. In line with this recommendation, self-efficacy can play a major role in determining the degree to which women can avoid passive smoke. The U.S. Surgeon General has concluded that eliminating smoking in indoor spaces is the only way to fully protect nonsmokers from second-hand smoke exposure.¹² Thus, interventions that target pregnant women alone would be problematic if the woman lives with a smoker. Findings of this study are particularly important for policymakers to consider strengthening health education on the importance of this issue to women's spouses and other family members. Through this widespread effort, a consensus can be formed to help set up total smoking bans in these households in order to create a supportive healthy environment rather than leaving pregnant women to fight on their own.

Limitations

This study used a convenience sample of women who were either 16, 28, or 38 weeks pregnant and sought routine obstetrical care at three urban hospitals, and the findings might not be able to be generalized to women at other pregnant stages or in other settings. There is always the possibility when respondents complete a forced choice questionnaire that questions may be misinterpreted. Nonparticipants could not be characterized because of the passive nature of recruitment. The extent of the active and passive exposures was not assessed to verify the psychometric properties of the scales used in this study because of resource limitations.

CONCLUSIONS

Actions to limit smoking inside the home are being undertaken by many pregnant women to try to limit environmental tobacco smoke exposure in lieu of or in conjunction with smoking cessation. The results of the present exploratory study suggest that establishment of a policy against smoking in the home might produce the best chance for women to actually avoid environmental tobacco smoke. Pregnant women's attitudes about their ability to control exposure appear to be predictors of active environmental tobacco smoke control. Low self-efficacy might be amenable to intervention. Clinicians are encouraged to screen for environmental tobacco smoke

exposure from household members and other individuals in the pregnant women's environment. Clinicians should explore with pregnant women how confident they feel in their ability to enforce a policy that limits or eliminates smoking around them. More research is needed to determine effective strategies for facilitating efforts made by families to ensure a smoke-free environment.

Prenatal smoking cessation will not eliminate health risks if women continue to be exposed to second-hand smoke. This study compared the knowledge of, self-efficacy with, and behavior toward avoiding environmental tobacco smoke among pregnant women in Taiwan. The findings provide further empirical support for the implication that women's self-efficacy and avoidance of environmental tobacco smoke are correlated with family smoking status, and different interventions are needed to meet pregnant women's needs. It is important that additional risks of environmental tobacco smoke exposure be addressed through a more comprehensive approach to prenatal smoking, such as biochemical verification of the level of exposure. Clinicians can also determine the prevalence of smoking and environmental tobacco smoke exposure among their clientele by implementing a survey. Hence, early interventions that begin raising awareness about the risks of environmental tobacco smoke exposure during pregnancy and that help women develop skills for negotiating situations where smoking occurs would benefit maternal and prenatal health. Antismoking counseling should, therefore, be incorporated into prenatal counseling and given as a standard procedure at the beginning of obstetrical care.

ACKNOWLEDGMENTS

We thank Dr. Jane Robinson for her careful review of the manuscript, and we also extend thanks to the women who participated in the survey.

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