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Randomized trial of a secondhand smoke exposure reduction intervention among hospital-based pregnant women

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HIGHLIGHTS

- Pregnancy may be an opportune time to engage in SHS risk reduction.
- Chinese pregnant women can be empowered to confront their male smoking relatives.
- Pregnant women can be taught techniques to reduce their exposure to SHS.

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ABSTRACT

Objective: This study sought to assess the effectiveness of a secondhand tobacco smoke (SHS) prevention program based on an expanded Health Belief Model (HBM) incorporating self-efficacy among pregnant women in a hospital setting in Taiwan.
Methodology: This study utilized a two-group longitudinal randomized controlled trial design. Participants in the intervention group ($n = 50$) enrolled in a SHS prevention program based on the HBM, while participants in the comparison group ($n = 50$) received standard government-mandated counseling care. Both groups were given questionnaires as a pre-test, two weeks into the intervention, and one month following the conclusion of the intervention. The questionnaire and intervention were developed based on the understanding gained through a series of in-depth interviews and a focus-group conducted among pregnant women. Exhaled carbon monoxide was also measured and used as a proxy for SHS exposure.
Results: Intervention group scores were all significantly higher than comparison group scores ($p < 0.001$), indicating a significant increase in knowledge, HBM scores, cues to action, self-efficacy, preventative behaviors, and a significant decrease in smoking exposure. These differences remained significant at the one-month follow-up assessment ($p < 0.001$).
Conclusions: These results should encourage health professionals to educate pregnant women regarding the harms of SHS while both empowering and equipping them with the tools to confront their family members and effectively reduce their SHS exposure while promoting smoke-free social norms.

1. Introduction

Numerous tobacco-related diseases and premature deaths are consequences of persistent tobacco exposure (Panzano, Wayne, Pickworth, & Connolly, 2010). The disease burden resulting from SHS exposure includes cardiovascular disease, lung cancer, respiratory disease, breast cancer, chronic obstructive pulmonary disease (COPD), tuberculosis, as well as developmental defects in children and fetuses (Oberg, Jaakkola, Woodward, Peruga, & Pruss-Ustun, 2011).

The toxic substances in SHS can also readily cross the placenta and affect the fetus directly, increasing the risk for impaired fetal growth, low birth weight, preterm delivery, as well as neonatal and perinatal morbidity and mortality (Hackshaw, Rodeck, & Boniface, 2011). In addition to physiological sequelae, exposure to SHS while in utero has also

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been demonstrated to be associated with a greater frequency of psychological distress, drug consumption, eating disorders, and body image problems later in life (Omoloja et al., 2013). The findings from the above studies underscore the need to reduce the exposure of pregnant women to SHS.

Exposure to SHS at home by a smoking spouse has been shown to be a major source of exposure (Yoo et al., 2010) with smoking cessation among the spouses of pregnant women being one of the most effective ways to reduce SHS exposure during pregnancy. This is particularly the case in Taiwan where the brunt of tobacco exposure stems from men whose smoking prevalence is over seven-times that of women (Bureau of Health Promotion, 2012), with this sexual disparity being supported by the role that tobacco plays in social and cultural interactions in male-dominated Chinese culture (Ma et al., 2008).

Unlike some countries where smoking has become a social stigma in the last few decades, in Han Chinese cultural circles male smoking is still very much accepted. Smoking behavior plays important social and cultural roles (Ma et al., 2008) with cigarettes acting as social tools and facilitators of engagement, most predominately among men. Such behaviors are largely intertwined with the Confucian heritage of social networks which underlie all of Chinese social behavior. Across this cultural backdrop where confrontation is avoided and conformity is idealized, tobacco use and sharing serve as physical manifestations of social harmony (Davey & Zhao, 2012). Being cognizant of this, women have traditionally accepted the fact that men smoke in their presence (Goodman, 2004), with one study conducted by Yang et al. reporting that 54.4% of pregnant women placed no restriction on their husband's smoking at home (Yang, Tong, Mao, & Hu, 2010). Furthermore, as attempts aimed at encouraging smoking cessation among the husbands of pregnant women in both the east and west have met with limited success and failed to achieve sustained effects (Aveyard, Lawrence, Evans, & Cheng, 2005; Loke & Lam, 2005), SHS reduction may represent the most effective strategy for harm reduction.

However, even among the husbands of Western countries, in-pregnancy smoking cessation programs have not demonstrated sustained effects (Aveyard et al., 2005), and only one pilot study in the literature conducted in Sichuan, China has focused on helping pregnant women to reduce their exposure to SHS through an educational intervention. While that study's results were encouraging, demonstrating the success of their Health Belief Model (HBM)-based educational intervention, it did not incorporate either a random sample or a comparison group in its design (Lee, 2008).

Therefore, this study set out to further validate the effect of an educational intervention utilizing the HBM framework to educate pregnant women about the harms of SHS while both empowering and equipping them with the tools to confront their family members and effectively reduce their SHS exposure.

2. Methods

2.1. In-depth interviews and focus-group discussions

This study utilized in-depth interviews (IDIs) and focus group discussions (FGDs) to establish a better understanding of the needs and obstacles of our target population. All of the FGDs/IDIs were conducted in Mandarin Chinese using a discussion guide. The guide included questions and queries on the following themes: the hazards of smoking and SHS exposure, attitudes and behaviors towards SHS, and knowledge regarding the health effects of SHS on pregnant women and children. A single health educator performed 50-minute IDIs among 12 pregnant women. Each IDI lasted about 50 min. One senior nurse and one health educator worked as a team to conduct the FGDs among two groups of four women. Each FGD lasted about 90 min during which time the women were asked to elaborate on their experience with SHS exposure and to describe how they felt and acted around SHS, including what obstacles they confronted and what kind of help they would like to have. They were also asked specifically about SHS and the health of their baby. None of the women who participated in the IDIs or FGDs were subjects in the present study.

Through the FGDs and IDIs, the women expressed a feeling of powerlessness and low self-efficacy. Many of the issues that emerged from the interviews were similar to the general impressions about the social and cultural backdrop of the entrenched problem of smoking, the status of women in Chinese society, and the prevailing barriers to a smoke-free environment. The findings from these interviews were used to design the content of the questionnaire and the pilot intervention utilized in this study with one of the major aims of this intervention being directed towards increasing the women's sense of self-efficacy in reducing their exposure to SHS.

2.2. Conceptual framework

The conceptual basis of this empirical study was built on the expanded HBM including Bandura's addition of self-efficacy (Bandura, 1977). This model is a motivational framework and based on the proposition that a person will take a health-related action if she feels that a negative health condition can be avoided, and that she is capable of doing it (Glanz, Rimer, & Viswanath, 2008). Many studies investigating health behavioral changes have utilized the HBM, with the model having moreover been operationalized to investigate SHS exposure among other populations (Li et al., 2003). The conceptual framework for this study is presented in Fig. 1 and Fig. 2.

2.3. Study design

A two-group longitudinal randomized controlled trial was conducted. First, all the women registering for their government-mandated prenatal care visits during May of 2010 at the obstetrics and gynecology clinic of Taipei City Hospital, Taiwan were identified. Then those that met the following inclusion criteria were considered eligible for the study: eighteen years of age or older, had not exceeded 12 weeks of gestation, non-smoking, had smoking husbands or relatives living with them, and gave written informed consent. We continued taking cases until we had a total of 120 subjects based on our sample size calculation and after allotting for potential loss to follow-up. We then used their registration numbers to randomize the pregnant women to either the intervention group or comparison group. Fifty-five participants were randomly assigned to the intervention group and 65 to the comparison group. During the 20-week program conducted between November 2010 and March 2011, five participants (9%) from the intervention group and 15 (23%) from the comparison group dropped out due to lack of interest. Every participant filled out the 20-minute questionnaire three times at prenatal care visits which were all interspaced by one month intervals. The subjects in the intervention group also received a 50-minute face-to-face educational intervention at the second prenatal care visit and two 10-minute follow-up phone calls the first and second weeks following the intervention. This yielded a total of 100 subjects and a retention rate of 91% among the intervention group and 77% among the comparison group.

Participants in the intervention group ($n = 50$) were enrolled in the program based on the expanded HBM incorporating self-efficacy, while participants in the comparison group ($n = 50$) received standard counseling care. Prior to the intervention, both groups were given pretest questionnaires at their first prenatal care visits. The intervention was conducted one month later, when both groups returned for another prenatal care visit. The immediate post-intervention effect questionnaire was also distributed at this time to both groups to test the immediate effect. The one month post-intervention assessments were distributed one month following the intervention at another prenatal care visit to test the delay of impact effect (Green, 1977). Fig. 1 presents a flow chart of the study process.