EFFECTIVENESS OF THE SECONDHAND SMOKE SELF-PREVENTION PROGRAM OF PREGNANT WOMEN WITH SMOKING FAMILY MEMBERS

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DOCTOR OF PUBLIC HEALTH

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SUNISA CHANSAENG

A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PUBLIC HEALTH

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ABSTRACT

Pregnant women with smoking family members are at risk of exposure to secondhand smoke, which has negative effects on pregnancy for both the mother and the fetus. Therefore, self-prevention behavior of pregnant women from exposure to secondhand smoke is important. This mixed methods study employed a combination of qualitative and quantitative approaches to explore the situation and needs of pregnant women to protect themselves from exposure to secondhand smoke and to examine the effectiveness of the secondhand smoke self-prevention program of pregnant women with smoking family members. The qualitative sample consisted of 9 antenatal care staffs, 17 pregnant women, and 14 smoking family members. Qualitative data were collected using a structured interview and analyzed using thematic analysis. The quantitative study was a randomized controlled trial. The sample consisted of 98 pregnant women with smoking family members. They were randomly assigned to an experimental arm and a control arm, with 49 participants in each arm. Quantitative data were collected using questionnaires on knowledge about secondhand smoke, self-efficacy, and secondhand smoke self-prevention behavior of pregnant women with smoking family members, and urinary nicotine detection in pregnant women using the

Elisa test. Data were analyzed using descriptive statistics, Chi-square test, and repeated measures ANOVA.

The qualitative results revealed five themes, including unclear understanding of secondhand smoke; influences shaping perceptions related to secondhand smoke; attempt to prevent secondhand smoke exposure; barriers to prevention of secondhand smoke exposure; and needs related to prevention of secondhand smoke exposure.

The quantitative results showed that:

1. After receiving the program, the knowledge about secondhand smoke, self-efficacy and self-prevention behavior from secondhand smoke of pregnant women with smoking family members were higher than before receiving the program.

2. After receiving the program, the urinary nicotine of pregnant women was lower than before receiving the program.

From the findings, it is recommended to explore the situation and needs of pregnant women, antenatal care staffs, and smoking family members in order to recognize their needs and plan activities in the program to prevent secondhand smoke that are appropriate for pregnant women. Smoking family members should be involved in the program incorporating activities to provide knowledge, and enhance their self-efficacy and skills for preventing secondhand smoke along with pregnant women.

หัวข้อดุษฎีนิพนธ์ ประสิทธิผลของโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่สมาชิกในครอบครัวสูบบุหรี่

ผู้เขียน นางสาวสุนิสา จันทร์แสง

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บทคัดย่อ

หญิงตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่มีความเสี่ยงต่อการสัมผัสควันบุหรี่มือสอง ซึ่งส่งผลเสียต่อการตั้งครรภ์ ทั้งตัวมารดาเองและทารกในครรภ์ พฤติกรรมการป้องกันตนเองของหญิงตั้งครรภ์จากการสัมผัสควันบุหรี่มือสองจึงเป็นสิ่งสำคัญ การศึกษาครั้งนี้ใช้วิธีการวิจัยแบบผสมผสานทั้งเชิงคุณภาพและเชิงปริมาณ เพื่อศึกษาสถานการณ์และความต้องการในการป้องกันตนเองจากการสัมผัสควันบุหรี่มือสอง ของหญิงตั้งครรภ์ และเพื่อศึกษาประสิทธิผลของโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่ กลุ่มตัวอย่างเชิงคุณภาพได้แก่ บุคลากรที่เกี่ยวข้องกับการฝากครรภ์ 9 คน หญิงตั้งครรภ์ 17 คน และสมาชิกในครอบครัวที่สูบบุหรี่ 14 คน เก็บรวบรวมข้อมูลเชิงคุณภาพ โดยใช้เครื่องมือ คือแนวการสัมภาษณ์แบบมีโครงสร้าง วิเคราะห์ข้อมูลโดยใช้การวิเคราะห์แก่นสาระ(Thematic Analysis) และการวิจัยเชิงปริมาณเป็นการศึกษาเชิงทดลองสุ่มแบบมีกลุ่มควบคุม กลุ่มตัวอย่างประกอบไปด้วยหญิงตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่จำนวน 98 คน ได้รับการสุ่มเข้ากลุ่มทดลองและกลุ่มควบคุมกลุ่มละ 49 คน เก็บรวบรวมข้อมูลเชิงปริมาณโดยใช้แบบสอบถามความรู้เรื่องควันบุหรี่มือสอง การรับรู้สมรรถนะแห่งตน พฤติกรรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่ และการตรวจหาปริมาณนิโคตินในปัสสาวะของหญิงตั้งครรภ์โดยใช้การทดสอบแบบ Elisa test วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา การทดสอบไคสแควร์ และวิเคราะห์ความแปรปรวนแบบวัดซ้ำ

ผลการวิจัยเชิงคุณภาพพบว่า มี 5 ประการสำคัญ ได้แก่ ความเข้าใจที่ไม่ชัดเจนเกี่ยวกับควันบุหรี่มือสอง อิทธิพลที่มีผลต่อการรับรู้เกี่ยวกับควันบุหรี่มือสอง ความพยายามในการป้องกันการสัมผัสควันบุหรี่มือสอง อุปสรรคในการป้องกันการสัมผัสควันบุหรี่มือสอง และความต้องการเกี่ยวกับการป้องกันการสัมผัสควันบุหรี่มือสอง

ผลการวิจัยเชิงปริมาณพบว่า:

1. หลังจากได้รับโปรแกรม ความรู้เรื่องควันบุหรี่มือสอง การรับรู้สมรรถนะแห่งตน พฤติกรรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่สูงกว่าก่อนรับโปรแกรม

2. หลังจากได้รับโปรแกรม ระดับนิโคตินในปัสสาวะของหญิงตั้งครรภ์ลดลงกว่าก่อนได้รับโปรแกรม

ข้อเสนอแนะจากการวิจัยนี้ ควรมีการศึกษาสถานการณ์และความต้องการของสตรีตั้งครรภ์ บุคลากรทางการแพทย์ที่เกี่ยวข้องกับการฝากครรภ์ และสมาชิกในครอบครัวที่สูบบุหรี่ เพื่อให้ทราบถึงความต้องการและวางแผนในการจัดกิจกรรมในโปรแกรมในการป้องกันควันบุหรี่มือสองให้เหมาะสมกับหญิงตั้งครรภ์ รวมทั้งควรนำสมาชิกในครอบครัวที่สูบบุหรี่เข้ามามีส่วนร่วมในโปรแกรม โดยมีการจัดกิจกรรมให้ความรู้ การเสริมสร้างการรับรู้ความสามารถของตนเอง และทักษะการป้องกันตนเองจากควันบุหรี่มือสองร่วมกับหญิงตั้งครรภ์

CONTENTS

LIST OF TABLES

LIST OF FIGURES

STATEMENT OF ORIGINALITY

The dissertation presents new knowledge utilizing the Social Cognitive Theory (SCT) framework to mitigate secondhand smoke exposure among pregnant women with family members who smoke, alongside cotinine urine testing. Through the implementation of this program, pregnant women acquired knowledge and skills enabling them to protect themselves from secondhand smoke, thereby fostering favorable conditions during pregnancy. They accessed accurate and pertinent healthcare options. The study findings offer information conducive to informing policymakers or guideline developers regarding strategies to prevent the adverse effects of secondhand smoke on pregnant women.

ข้อความแห่งการริเริ่ม

ดุษฎีนิพนธ์นี้ได้นำเสนอองค์ความรู้ใหม่โดยใช้กรอบแนวคิดทฤษฎีปัญญาทางสังคมมาช่วยในการป้องกันควันบุหรี่มือสองในสตรีตั้งครรภ์ที่มีสมาชิกในครอบครัวสูบบุหรี่ และมีการตรวจหาสารโคตินินในปัสสาวะ โดยผลที่ได้มาจากการใช้โปรแกรมนี้สตรีตั้งครรภ์จะมีองค์ความรู้ในการป้องกันตนเองและทักษะการหลีกเลี่ยงควันบุหรี่มือสอง ทำให้เกิดภาวะที่ดีขณะตั้งครรภ์ และมีทางเลือกในการดูแลสุขภาพที่ถูกต้องเหมาะสม ข้อค้นพบการวิจัยให้ข้อมูลที่สะท้อนให้ผู้เกี่ยวข้องนำไปกำหนดนโยบายหรือแนวทางในการดำเนินงานป้องกันอันตรายจากควันบุหรี่มือสองที่ส่งผลกระทบกับสตรีตั้งครรภ์

CHAPTER 1

Introduction

Principle and rationale

Globally, 22% of adults worldwide who are 15 years of age or older consume tobacco (World Health Organization [WHO], 2023), of whom 80% are living in low- and middle-income nations (WHO, 2021). In Thailand, it is estimated that each person smokes 11 cigarettes per day (National Statistical Office, 2023). Tobacco Control Research and Knowledge Management Center revealed 4,962,045 households with smoking family members, implying that 10,333,653 non-smokers were exposed to secondhand smoke (SHS) in their household. Throughout the world, the SHS index revealed 52.3 individuals who smoked associated with the death of one individual who did not smoke (Yousuf et al., 2020).

Pregnant women, in particular, are among persons with large exposure to SHS. Cumulative regional estimates of daily SHS exposure among pregnant women were highest in Southeast Asia (57.23%), followed by Middle East and North Africa (47.08%), and Europe (24.78%) (Reece, Morgan, Parascandola, & Siddiqi, 2018). In Thailand, 11.7% of pregnant women reported secondhand smoke exposure, with 24.8% of them being exposed to SHS at home every day and 57.4% reporting having one smoking family members (Sonthon & Sonthon, 2021). Moreover, 90.4% of non-smoking pregnant women in Thailand had been exposed to SHS in the past 30 days, with 48.7% of them reporting SHS exposure at home (Thai Health Promotion Foundation, 2017). Consistently, research showed that urinary cotinine ratio was significantly higher in pregnant women exposed to SHS (Sobh, Mohammed, Adawy, Nassef, & Hasheesh, 2021). In Thailand, most of the survey pregnant women also had a high level of urinary cotinine (93.8%) (Ouiyanukoon & Kalayasiri, 2016). Evidence showed that 24.8% of Thai pregnant women were exposed to SHS at home every day and 57.4% reporting

having one smoking family members (Sonthon & Sonthon, 2021). Similarly, the urine tests for cotinine were positive in 93.9% of Thai pregnant women (Kalayasiri, Supcharoen, & Ouiyanukoon, 2018). Furthermore, it is a concern that SHS exposure among pregnant women was caused by smoking family members, leading pregnant women to have 23.90 times higher SHS exposure than those without smoking family members (Ouiyanukoon & Kalayasiri, 2016). Similarly, another study showed that having smoking family members especially husband (65.0%), not receiving information about harms of SHS (77.7%), and having no arrangement for smoke-free home environment (71.9%) all contributed to SHS exposure during pregnancy (Sonthon & Sonthon, 2019). From these situations, pregnant women are constantly exposed to SHS from their smoking family members.

SHS refers to a mixture of the smoke formed from the combustion of tobacco products and smoke exhaled by smokers (Sobh et al., 2021) and can harm persons exposed to it as much as or even more than the smokers themselves (Johnson & Glantz, 2008). Biochemical assessment of SHS exposure can be detected by measuring nicotine and its metabolites. Cotinine, a primary metabolite of nicotine, has been used a reliable marker for SHS exposure because urinary cotinine has a relatively longer half-life (16–20 hours) than nicotine (Moon, Kong, & Kim, 2018). SHS contains over 4,000 harmful chemical compounds, including nicotine, tar, cyanide, benzene, cadmium, methanol, ammonia, and arsenic (WHO, 2018). There are also more than 250 other substances that can bring about serious illnesses such as lung cancer, oral cancer, esophageal cancer, bronchial cancer, chronic obstructive pulmonary disease, and asthma (Centers for Disease Control and Prevention [CDC], 2022). Compelling evidence claims that exposure to SHS is responsible for the death of more than 880,000 individuals worldwide every year (Yousuf et al., 2020).

The effects of SHS on the pregnant woman and developing fetus are numerous. Exposure to teratogenic agents in SHS, particularly during the first trimester, have the greatest chance of causing major birth defects because many important developmental changes take place during this time. In the first trimester, major structures of the body, such as spine, head, arms and legs, are forming (Poels, Bijma, Galbally, & Bergink, 2018). Nicotine stimulates the narrowing of blood vessels, thereby reducing the flow of oxygen and nutrients necessary for fetal growth. Exposure to SHS in pregnant women increases

the risk of placental disorders, premature birth, respiratory infections, asthma, sudden death syndrome, and hyperkinetic disorder (Capra, Tezza, Mazzei, & Boner, 2013). A previous study showed that mother's exposure to SHS during pregnancy was associated with low birth weight, specifically, and overall newborn health problems, including jaundice, diabetes, and low birth weight (Kalayasiri et al., 2018). The negative impact on the health of the fetus due to exposure to cigarette smoke in pregnancy continues as the infant grows and matures. The long-term impacts may be behavioral, including difficulty to concentrate, hyperactivity, learning disabilities, and increased risk of taking up smoking in the future (Baheiraei et al., 2015), as well as an increased risk of attention disorders and social behavior (Roger, 2009). Thus, self-preventive behavior of SHS exposure is essential among pregnant women.

Self-preventive behavior of SHS exposure refers to the action of pregnant women to prevent themselves and their fetus from SHS exposure from other people who smoke either inside or outside the house by walking away, refusing to be in smoke-filled situation, not allowing people to smoke in their presence, avoiding going to places where people regularly smoke, asking smokers to stop smoking, breathing in as little SHS as possible, wearing a medical mask, and washing clothes to eliminate SHS (Ding et al., 2010). WHO emphasizes the importance of smoke-free homes by engaging the partners of pregnant women, and other household members to decrease tobacco use (WHO, 2014). Consistently, Thailand has enforced a law to protect the rights and health of non-smokers from involuntary exposure to SHS, calling for smoke-free public areas (Non-Smokers' Health Protection Act, BE 2535, 1992) and the 2019 Family Development and Protection Act to protect the welfare of non-smoking family members (Family Development and Protection Act, 2019). Moreover, the Parent School handbook educates pregnant women about appropriate self-care behaviors to promote the health of both pregnant women and fetus. However, it does not mention the prevention of SHS (Bureau of Health Promotion, Department of Health, Ministry of Public Health, 2016). Despite such efforts, self-preventive behavior of pregnant women remains suboptimal, especially when the smokers are family members. In China, a small proportion of pregnant women walked away when the smokers were their mothers (17.06%) or the husband (19.66%); opened a window less often in case the mother-in-law (5.20%) or their mother (4.56%) was a smoker; and rarely asked smokers not to smoke when the smoker was their mother-in-law (17.48%) or their

own mother (18.85%) (Xu et al., 2017). Only 43.7% of pregnant women in Taiwan set a strict no-smoking policy in their home (Chen, Lee, Chou, Kuo, & Hsu, 2007) and 98% of pregnant women did not have any regulations regarding in-house smoking and 14% remained exposed to SHS (Khanal et al., 2018). In Thailand, pregnant women had a low level of self-preventive behavior of SHS exposure (Pookpan, Tachasuksri, & Siriarunrat, 2021). The behavior least reported by Thai women living in smoking household was the control of SHS exposure while only 53.2% of pregnant women had a high level of overall avoidance behavior of SHS (Prathumsuwan, Kalampakorn, & Inthasorn, 2019). Although creating smoke-free environments is one of the most effective ways to prevent SHS exposure (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2014), 22.2% and 46.7%of pregnant women permitted smoking in some parts of the house and in all parts of the house, respectively (Sonthon & Sonthon, 2019).

Given the low level of pregnant women's self-preventive behavior of SHS exposure from smoking family members, understanding the factors influencing their SHS self-preventive behavior is crucial in order to address this issue. Knowledge of SHS is a significant contributor of pregnant women's self-preventive behavior. It refers to the accurate understanding about SHS that includes the definition of SHS, symptoms, and effects of exposure to SHS, harmful substances in SHS, illness related to SHS, and laws for health protection of non-smokers. Knowledge acquisition is fundamental for any change in behavior to occur. Previous studies suggested a positive relationship between knowledge of SHS and SHS avoidance behaviors (Evans, Sims, Judge, & Gilmore, 2012; Lin et al., 2010). Nevertheless, pregnant women still lack knowledge about SHS and how to perform self-preventive behavior of SHS exposure at home (Bayrami et al., 2021). Moreover, another powerful predictor of self-preventive behavior is self-efficacy. It refers to persons' belief in their capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1977, 1986, 1997). A high level of self-efficacy was associated with a more avoidant behavior towards SHS (Evans et al., 2012; Lee et al., 2018). Self-efficacy of resistance to SHS significantly predicted pregnant women's behavior in avoiding environmental tobacco smoke (Chen et al., 2007). In Thailand, self-efficacy of SHS avoidance behavior was significantly related to SHS avoidance behavior in women with smoking family members (Prathumsuwan et al., 2019). Therefore, to

achieve an optimal level of SHS self-preventive behavior, it is of fundamental importance to develop SHS knowledge while enhancing self-efficacy using a theory that takes human behavior, cognition, and the environment into consideration as a whole.

Social Cognitive Theory (SCT) explains and predicts health behavior and describes methods to change health behavior through the influence of individual experiences, the actions of others, and environmental factors on individual health behaviors. SCT looks beyond the individual to emphasize the dynamic, ongoing processes in which personal factors interplay with environmental factors, such as family members, and the physical environment. According to SCT, human behavior is conceptualized based on the triadic reciprocal determinism as a result of interactions among personal factors such as biological properties, beliefs, expectation, emotions, and thoughts; environmental factors such as social influences, and the behavior itself (Bandura, 1977). SCT revolves around the process of knowledge acquisition or learning directly correlated to the observation of models called observational learning governed by four components: 1) attention by paying attention to what the model is doing; 2) retention by transforming and restructuring the information conveyed by modeled events into rules and conceptions for memory representation; 3) production where symbolic conceptions are translated into appropriate courses of action; and 4) motivation by receiving positive reinforcement and incentives to perform the observed behavior (Bandura, 1971). SCT also focuses on increasing a person's self-efficacy through four sources: 1) mastery experience that are personal experiences of managing efforts toward performance accomplishments; 2) vicarious experiences by witnessing others' success; 3) emotional arousal that occurs when someone contemplates doing something provides clues as to the likelihood of success or failure; and 4) verbal persuasion that involves telling the persons that they can perform the behavior (Bandura, 2004). Moreover, central to SCT is the idea that people are capable of self-regulation of their thoughts, emotions, motivation, and actions. Self-regulation consists of three sub-processes: 1) self-observation where persons pay attention to the aspects of their behaviors; 2) judgment process by comparing present performance with one's goal; and 3) self-reaction in which both self-observation and judgment process lead to self-reaction, depending on the incentives (Bandura, 1986). Therefore, the use of SCT allows the researcher to enhance the SHS self-preventive behaviors among pregnant women that is a health-related behavior, which is impacted by

a broad range of personal cognitive and behavioral factors, as well as environmental factors such as their family members. More specifically, when applied to SHS and related behaviors, SCT takes into account the effects of prior experiences, observational learning, self-efficacy to impact SHS self-preventive behavior, and the acquisition of knowledge and skills necessary to successfully perform a behavior (Bandura, 2004).

From the literature review, previous studies both in Thailand and in other countries investigated SHS exposure among pregnant women. In other countries, factors influencing SHS self-preventive behavior among pregnant women were studied in cross-sectional correlational research (Bayrami, Ebrahimi, Rasouli, & Feizipour, 2021; Lin et al., 2010), and predictive research (Blake et al., 2009; Chen et al., 2007; Vu et al., 2020). In Thailand, previous studies were cross-sectional correlational research (Jantarasiew, Boonyaporn, & Suppasri, 2021; Tanasuk, Kompayak, & Prasertsong, 2020).The factors influencing SHS self-preventive behaviors were quite consistent across studies, including demographic characteristics such as age (Chen et al., 2007; Tanasuk et al., 2020), occupation (Tanasuk et al., 2020; Vu et al., 2020), and income (Tanasuk et al., 2020), as well as other modifiable factors, such as knowledge and understanding of SHS (Lin et al., 2010; Tanasuk et al., 2020; Vu et al., 2020), communication skills about SHS prevention (Tanasuk et al., 2020), self-efficacy (Chen et al., 2007; Lin et al., 2010), perceived threats from SHS exposure (Jantarasiew et al., 2021), perceived susceptibility to SHS exposure (Jantarasiew et al., 2021), perceived severity of SHS exposure (Jantarasiew et al., 2021), perceived benefits of SHS prevention (Jantarasiew et al., 2021), perceived barriers of SHS prevention (Jantarasiew et al., 2021), and social support (Blake et al., 2009). These findings have indicated the significant factors that can be manipulated in programs for enhancing SHS self-preventive behaviors among pregnant women.

Regarding the programs related to SHS preventive behavior, it was found that most of the programs in other countries related to SHS among pregnant women were developed in different research designs, including a cluster randomized controlled trial (Alagiyawanna, Rajapaksa-Hewageegana, & Gunawardena, 2017; Yang, Tong, Mao, Hu, & Lee, 2015), and randomized controlled trial (Chi et al., 2015; Chi, Sha, Yip, Chen, & Chen, 2016) while one program did not specify the research design (Lee, 2008). Most of the programs were developed by integrating Health Belief Model and Social Cognitive Theory (Alagiyawanna et al., 2017; Lee, 2008; Yang et al., 2015) while two programs

integrated Health Belief Model and self-efficacy (Chi et al., 2015; Chi et al., 2016). The strategies used in most of the programs were providing education and skill training or role-plays (Alagiyawanna et al., 2017; Chi et al., 2015; Chi et al., 2016; Lee, 2008; Yang et al., 2015). Some programs provided additional strategies such as counselling (Chi et al., 2015; Lee, 2008; Yang et al., 2015), empowerment (Alagiyawanna et al., 2017; Chi et al., 2015), motivation (Alagiyawanna et al., 2017; Lee, 2008; Yang et al., 2015), role models (Alagiyawanna et al., 2017; Chi et al., 2015), and reinforcement/persuasion (Alagiyawanna et al., 2017). One program conducted a focus group discussion to explore pregnant women's knowledge and perception about SHS for the program development (Lee, 2008). Only one program involved pregnant women's family members and their community, but this involvement was not formally assessed (Alagiyawanna et al., 2017). It is noteworthy that none of the previous programs engaged the smoking family members of pregnant women and the previous programs were not tailored based on the problems or needs of all individuals involved in SHS situation such as the healthcare providers, the pregnant women and their smoking family members. For the outcomes, the programs led to improvements in pregnant women's knowledge related to SHS and self-preventive behavior of SHS exposure, but none of the programs assessed the level of urinary nicotine to obtain reliable information for SHS detection (Chen, Guo, Yuan, Okoli, & Liao, 2021) that is a key component for the assessment of program outcomes. Moreover, all of the programs were developed in other countries, not in Thailand. In Thailand, a quasi-experimental study was conducted to examine the effect of self-efficacy program on smoking, but the outcomes of the program focused on the smoking behavior of pregnant women's husbands and assessing nicotine addiction of the husbands, rather than the SHS self-preventive behavior of pregnant women (Imphitak, Tipwareerom, & Santayakorn, 2015). Thus, the gap of knowledge is that there is a scarcity of program to enhance knowledge about SHS, SHS self-preventive behavior, and reduce the level of urinary nicotine of pregnant women in the Thai context with an emphasis on the involvement of family members.

Therefore, there is a need to develop and examine the effect of a self-prevention program on increasing knowledge about SHS and SHS self-preventive behavior, and reducing the level of urinary nicotine among Thai pregnant women. This program was guided by the SCT that emphasizes a broad range of personal cognitive and behavioral

factors of pregnant women, as well as environmental factors such as their family members. The involvement of family members in each program session would further enhance the success in preventing SHS. The program contents were tailored based on the findings from the in-depth interview with antenatal staff, pregnant women, and their smoking family members to identify the problems and needs for the program activities, which addressed real-life SHS situation at home with the assistance in arranging home environment to promote self-prevention of SHS exposure. The finding from this study will provide useful knowledge for policy-makers to create a policy or guideline to promote skills and behaviors to prevent exposure to SHS among pregnant women.

Purposes of the study

1. To study the situations and needs for the self-prevention program from exposure to SHS for pregnant women.

2. To examine the effect of before and after implementing the self-prevention program from SHS exposure for pregnant women and their smoking family members.

2.1 To compare the knowledge about SHS of pregnant women and their smoking family members between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members.

2.2 To compare self-efficacy of pregnant women and their smoking family members between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members.

2.3 To compare the self-preventive behavior from SHS of pregnant women between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members.

2.4 To compare the urinary nicotine level of pregnant women between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members.

Research hypotheses

1. After receiving the program, the knowledge about SHS of pregnant women and their smoking family members is higher than before receiving the program.

2. After receiving the program, the self-efficacy of pregnant women and their smoking family members is higher than before receiving the program.

3. After receiving the program, the self-preventive behavior from SHS of pregnant women is higher than before receiving the program.

4. After receiving the program, the urinary nicotine level of pregnant women is lower than before receiving the program.

Operational definition

Secondhand smoke (SHS) refers to a mixture of the smoke formed from the combustion of tobacco products and smoke exhaled by smokers that pregnant women are exposed in their household.

Pregnant women refer to a person who is first time visit, aged 18 years and over, visit antenatal clinic at hospitals in Suphanburi province, no more than 16 weeks gestational age, and live with a smoking family member.

Smoking family members refer to a person who is a family member such as husband, father, uncle and grandfather of pregnant women, smokes cigarettes, and lives in the same household as the pregnant women, leading to possible exposure of SHS among pregnant women.

The effectiveness refers to the ability to be successful and produce the intended results, which consist of the knowledge about SHS of pregnant women, preventive behavior from SHS, and urinary nicotine level using materials and multimedia, including the manual of SHS self-prevention, video clips about SHS, and worksheets for role-play of SHS self-prevention.

-Knowledge about SHS refers to the understanding of pregnant women and their smoking family members about the definition of SHS, symptoms and consequences of exposure to SHS, harmful substances in SHS, diseases and health problems caused by SHS, laws related to the protection of non-smokers and the 2019

Family Development and Protection Act. Knowledge about SHS was assessed using the questionnaire developed by the researcher.

-Self-preventive behavior from SHS refers to the action of pregnant women to prevent themselves and their fetus from exposure to tobacco smoke from others both inside and outside the house by walking away, refusing to be in smoke-filled situation, not allowing people to smoke in their presence, avoiding going to places where people regularly smoke, asking smokers to stop smoking, breathing in as little SHS as possible, wearing a medical mask, and washing clothes to eliminate SHS. Self-preventive behavior from SHS was assessed using the questionnaire developed by the researcher.

-Urinary nicotine level refers to the level of nicotine in the urine of pregnant women who are exposed to SHS from their smoking family members. It was measured using ELISA method

The program refers to a set of the activities of the self-prevention program from SHS exposure for pregnant women and their smoking family members based on the Social Cognitive Theory and duration 12 weeks.The program will focus on enhancing observational learning, self-regulation, self-efficacy defined as follows:

- Observational learning refers to the acquisition of pregnant women to perform new behavior of SHS self-prevention, including four processes of attention, retention, reproduction, and motivation.

- Self-regulation refers to the ability of pregnant women to control and monitor their thoughts, actions, and learning, which contributes to the change in SHS self-preventive behavior through self-observation, judgement process and self-reaction.

- Self-efficacy refers to the confidence of pregnant women and their smoking family members in their ability to prevent themselves from SHS effectively through four sources, including mastery experience, vicarious experience, verbal persuasion, and emotional and physiological states. Self-efficacy will be assessed using the questionnaire developed by the researcher.

CHAPTER 2

Literature Review

This randomized controlled trial study aims to investigate the effect of the self-prevention program from exposure to secondhand smoke (SHS) for pregnant women and their smoking family members. The related literature review covers the topics as follows:

1. Overview of secondhand smoke (SHS)
    1.1 Definition of cigarette and secondhand smoke
    1.2 Chemical constituents in cigarette smoke
    1.3 Secondhand smoke at home
2. Harms of cigarette smoke to pregnant women and offspring
3. Policies related to prevention of SHS harms to pregnant women
    3.1. Policies by WHO
        3.1.1 Public education to reduce SHS exposure in the home
        3.1.2 Protection from second-hand smoke in pregnancy (smoke-free homes)
        3.1.3 WHO recommendations on prevention and management of tobacco use and secondhand smoke
    3.2. Policies by Thailand's Ministry of Public Health
        2.1 Parent School for Pregnant Women
        2.2 Non-Smokers' Health Protection Act, B.E. 2535
        2.3 Family Development and Protection Act, 2019
4. Promotion interventions and outcome measured related to SHS among pregnant women
5. Urinary nicotine
    5.1 Definition of urinary nicotine
    5.2 Factors influencing urinary nicotine
    5.3 Measurement of urinary nicotine

6. Knowledge about SHS

6.1 Definition of knowledge about SHS

6.2 Factors influencing knowledge about SHS

6.3 Measurement of knowledge about SHS

7 SHS self-preventive behavior

7.1 Definition of SHS self-preventive behavior

7.2 Factors influencing self-preventive behavior of SHS exposure

7.3 Measurement of SHS self-preventive behavior

8 Social Cognitive Theory

9. Conceptual framework

1. Overview of secondhand smoke

1.1 Definition of cigarette and secondhand smoke

A cigarette is a small, thin cylinder filled with tobacco or another burnable substance that is folded into thin paper for smoking. One end of the cigarette is lit, allowing it to smolder, and the other end is used to inhale smoke. Smoking cigarettes is the most popular way to consume tobacco. According to Cummings (2015), manufacturers have characterized cigarettes as a drug administration system that delivers nicotine in a palatable and appealing form. In general usage, the word "cigarette" denotes a tobacco cigarette, although it can also apply to other substances, like a cigarette made of cannabis or herbs. A cigarette can be differentiated from a cigar by its smaller size, processed leaf, and usually white paper wrapping.

According to WHO (2019), secondhand smoke (SHS), also known as environmental tobacco smoke, is created by burning cigarettes along with other tobacco products, as well as by the smoker's exhaled smoke. It consists of sidestream smoke and mainstream smoke. Sidestream smoke is created by smoking cigarettes or additional materials while they are smoldering in between puffs. Mainstream smoke is released at the mouthpiece as a smoker puffs, then exhales. Many of the substances found in SHS are also found in the smoke that smokers inhale. The main constituents of mainstream smoke released during SHS are carbon monoxide (3–11%), particulates (15–43%), and nicotine (1-9%) (Öberg, Jaakkola, Prüss-Üstün, Schweizer, & Woodward, 2010). Sidestream

smoke has higher amounts of several of the chemicals that are present in cigarette smoke because it is produced under different conditions and at a lower temperature than mainstream smoke. For instance, sidestream smoke contained fifteen times more formaldehyde and twice as much carbon monoxide and nicotine as mainstream smoke (Öberg et al., 2010). It has been estimated that the sidestream component of SHS is around three times as hazardous as the mainstream component (Schick & Glantz, 2005). Acrolein, benzene, carbon monoxide, formaldehyde, and N-nitrosamines are just a few of the chemicals discovered in sidestream smoke that have been linked to cancer or other non-cancerous effects on health, according to a recent report from the California Environmental Protection Agency (Cal-EPA) (Institute of Medicine (US) Committee on Secondhand Smoke Exposure and Acute Coronary Events, 2010). Most of the time, sidestream smoke has higher mass outputs of these chemicals than mainstream smoke.

In addition, several authors have defined SHS in their studies. The descriptor “secondhand” captures the involuntary nature of the exposure. SHS was defined as the smoke from tobacco items, like pipes, cigars, and cigarettes, that smokers exhale and non-smokers unintentionally breathe in (Cheah, Teh, & Lim, 2017). SHS, also called environmental tobacco smoke, is a combination of smoke released by smokers and smoke produced when tobacco products burn (Sobh et al., 2021).

The phrase "environmental tobacco smoke," which was first coined by the tobacco industry, is becoming less and less popular since it suggests that tobacco smoke might be considered ambient or background. While "environmental" does not adequately convey the unintentional form of the exposure, the term "secondhand" does. According to Cham, Mdege, Bauld, Britton, & D'Alessandro (2021) exposure to SHS can occur in the home, at work, or other public spaces like pubs and public transportation. "Involuntary smoking" or "passive smoking" are common terms used to describe the exposure.

1.2 Chemical constituents in cigarette smoke

Over 7,000 substances, a minimum of 69 of which are carcinogenic, and many of which are hazardous to human health are found in cigarette smoke (Talhout et al., 2011). Certain components, like nicotine, are found naturally in tobacco; others, like ammonia, are incorporated during the production process; and the majority, like acrolein, are produced by igniting the tobacco and paper (Hecht, 2011). In addition to tobacco-specific

nitrosamines (nicotine-derived nitrosamine ketone, or NNK, and N-nitrosonornicotine, or NNN), cigarettes also include benzene, 3-butadiene, and formaldehyde, which are known to cause cancer (Biener, Nyman, Stepanov, & Hatsukami, 2013).

Certain components have been connected to certain detrimental effects on health. For instance, two of the most detrimental substances to the respiratory system are acrolein and acetaldehyde, while hydrogen cyanide and arsenic greatly endanger cardiovascular health (Yeager et al., 2016). Apart from the immediate health consequences, certain components (such as nicotine and ammonia) can also lead to indirect harm to smokers by making cigarettes more addictive, which can result in increased frequency or intensity of tobacco use and make it more difficult to successfully quit (Noar et al., 2018). It is crucial to comprehend the chemistry of tobacco products even though the health risks connected with smoking are mostly caused by the chemicals in cigarette smoke. The primary chemical components of cigarettes are briefly discussed in the following.

Nicotine

The alkaloid nicotine found in cigarettes is derived from the tobacco plant, though it can also be made artificially. Smoke from cigarettes contains tobacco, which when inhaled enters the body and carries the nicotine into the lungs where it is absorbed. When cigarette smoke is inhaled, nicotine provides the stimulatory effect. Nicotine enters the pulmonary circulation and spreads and absorbs quickly. Inhaled cigarette smoke has the potential to cross the blood-brain barrier and impact the central nervous system in as little as 20 seconds (Sumanasekera, Nethery, & Nguyen, 2016).

Regarding the mechanism of action, nicotine is a potent psychoactive substance that affects the endocrine, cardiovascular, skeletal motor, and gastrointestinal systems in addition to having a wide range of effects on the central and peripheral nerve systems. Nicotine exerts its effects on various organ systems through three main mechanisms, which include: 1) ganglionic transmission; 2) catecholamine-mediated activation of nicotinic acetylcholine receptors (nAChRs) on chromaffin cells; and 3) stimulation of nAChRs by the central nervous system (CNS) (Dani, Ji, & Zhou, 2001). Nicotine causes an immediate increase in visual and prefrontal brain activity. Many neurotransmitters involved in drug-induced reward are released. Additionally, nicotine increases lipid peroxide, reactive oxygen species, DNA damage, oxidative stress, and neuronal death.

The body's organ systems, cell division, and apoptosis are all affected by nicotinic receptor actions in a wide range of short- and long-term ways.

When individuals directly come into contact with nicotine, they experience burning and irritation in their mouths and throats, elevated salivation, nausea, abdominal pain, vomiting, and diarrhea. Although less common, gastrointestinal problems can nonetheless happen following skin and respiratory exposure. In addition, hyperglycemia, an increase in catecholamine levels in the blood, and a rise in plasma free fatty acids are caused by nicotine. Skeletal muscle blood flow is higher but coronary blood flow is decreased. According to Mishra et al. (2015), the elevated rate of respiration lowers skin temperature, raises blood viscosity, and induces hypothermia, a hypercoagulable state. Among all poisons, nicotine ranks as one of the most deadly and acts quickly. The peripheral and central nervous systems are the target organs in addition to local activities. Tremors, prostration, cyanosis, dyspnea, convulsions, and a gradual decline to collapse and coma are symptoms of acute poisoning. With an LD50 of 30–60 mg of nicotine in humans, respiratory muscle paralysis and/or central respiratory failure can even result in death. According to the Centers for Disease Control and Prevention (2014), the LD50 in children is approximately 10 mg.

For pregnant and breastfeeding women, besides its influence on the mother's circulation, nicotine easily crosses the placenta and directly affects the developing baby and the placental vasculature. Breast milk also contains nicotine (milk/plasma ratio: 2.9). It has been shown that nicotine accumulates in fetal serum and amniotic fluid at somewhat higher amounts than in mother's blood, and that nicotine passes the placental barrier with ease (Benowitz, Hukkanen, & Jacob, 2009). As a neuroteratogen, nicotine has been shown to bind to nicotinic acetylcholine receptors in the developing fetus, impairing neurotransmitter function and changing the course of normal brain development. According to Dwyer, Broide, and Leslie (2008), these developmental damages are assumed to be the cause of the behavioral, emotional, and cognitive issues that smokers' children experience, including attention deficit hyperactivity disorder and learning difficulties.

Tar

The term "tar" refers to a mixture of particle debris and tobacco smoke condensation. Most of the mutagenic and carcinogenic substances found in tobacco smoke are found in tar. Smokers' lungs, mucous membranes, and skin all accumulate tar residue. It harms the respiratory system by chemical and mechanical processes. Most carcinogenic chemicals, including aromatic amines, nitrosamines, and polycyclic aromatic hydrocarbons, are found in it. According to Bhalla, Hirata, Rishi, and Gairola (2009), these substances tamper with macromolecules and metabolic pathways, causing extensive oxidative damage and a pro-inflammatory state.

Carbon monoxide

Because carbon monoxide is produced when carbon-containing substances do not burn completely, the design of the cigarette and the smoker's puffing style have an impact on how much carbon monoxide is produced when smoking a cigarette. Carbon monoxide that has been absorbed quickly binds to hemoglobin to create carboxyhemoglobin, in which every iron atom binds one carbon monoxide molecule at the expense of one oxygen molecule (McDonnell & Regan, 2019). About 45,000 parts per million (ppm) of carbon monoxide, or 4.5% of the total volume, are found in tobacco smoke. Over the course of a cigarette, a smoker is subjected to 400–500 parts per million of carbon monoxide, which results in a baseline hemoglobin level of 4% (with a range of 3-8%). In comparison, the typical blood level of carboxyhaemoglobin in those who do not smoke is 1%. The oxygen–hemoglobin dissociation curve shifts to the left as carbon monoxide concentration rises, indicating hemoglobin's increased affinity for carbon monoxide. The fetoplacental unit and myometrium cannot receive enough oxygen as a result of this left shift.

For pregnancy, exposure to carbon monoxide by mothers may raise the incidence of preeclampsia. Early in pregnancy, exposure to environmental carbon monoxide has been linked to low birth weight (Bell, Ebisu, & Belanger, 2007; Cândido Da Silva, Moi, Mattos, & Hacon, 2014), intrauterine growth restriction (Brauer et al., 2008), and preterm delivery (Liu, Krewski, Shi, Chen, & Burnett, 2006; Wilhelm & Ritz, 2005) . Additionally, the results of cardiovascular illness and related physiological abnormalities have been linked to environmental carbon monoxide exposure (Adar &

Kaufman, 2007). Furthermore, it has been postulated that hypoxia at the fetal-maternal interface due to compromised placentation disperses free radicals, which in vulnerable women results in preeclampsia (Roberts, Pearson, Cutler, & Lindheimer, 2003). Maternal carbon monoxide exposure-induced carboxyhemoglobinemia is another possible cause of fetal hypoxia. Breathed carbon monoxide forms carboxyhemoglobin when it attaches to hemoglobin with a strong affinity (Scherer, 2006). Because carbon monoxide coupled to maternal hemoglobin changes the oxygen/hemoglobin dissociation curve to the left, limiting oxygen transfer across the placenta, even relatively modest maternal carboxyhemoglobin concentrations can affect fetal oxygen transport (Rudra et al., 2010). A single hypoxia episode associated with carbon monoxide poisoning can be extremely harmful to the developing foetus. Studies have shown that every year, carbon monoxide poisoning accounts for over 20,000 ED visits; 4.6% to 8.5% of these patients are thought to be pregnant (Palmer & von Rueden, 2015).

Ammonia

Exposure pathway to ammonia in cigarette smoke occurs primarily through inhalation. Since the respiratory tract is the site of direct interaction with ammonia, the health consequences associated with breathed ammonia reported at levels beyond naturally occurring amounts are often restricted to this area. Humans who are exposed to elevated concentrations of ammonia through inhalation for a brief period of time may experience eye, lung, and mouth burns as well as discomfort. Human respiratory irritation, coughing, wheezing, chest tightness, and compromised lung function can all be increased by prolonged exposure to ammonia (U.S. Environmental Protection Agency, 2016).

In summary, cigarette smoke contains several chemicals such as ammonia, benzene, nicotine, carbon monoxide, tar, ammonia, and carcinogens for humans. Exposure to these substances are harmful to both adults and children.

1.3 Secondhand smoke at home

Exposure to SHS is a significant cause of impairment to people's health and wellbeing. Family members engage in a variety of activities at home, which makes it a typical site for them to be exposed to SHS. Evidence shows that most of SHS exposure occurs at home (Carreras et al., 2021). Nonsmokers' exposure to SHS is rising,

particularly when it comes from family members. According to estimates from the World Health Organization (WHO), family members who smoke will expose half of the world's children and youth to the harmful effects of SHS (WHO, 2021). For non-smoker women, 97.2% of women were exposed to SHS, and three-quarters of them exposed to PS at home, mostly from their husband (57.4%) (Hassan Abdelati, Fatouh Abd El Moneim, Shehata Ibrahim, & Ismail Ismail El Sayed, 2016). In Asia where smoking in the home among males is still quite common, home exposure to SHS is frequent for 57.0% of Asian children and teens (Mbulo et al., 2016). In Thailand, the prevalence of SHS exposure at home ranged between 46.8% (Phetphum & Noosorn, 2020) and 58.2% (Intarut & Pukdeesamai, 2020). The major sources of SHS at home were fathers (45.4%), followed by relatives (24.1%), and siblings (12.4%) (Phetphum & Noosorn, 2020). Similarly, another survey reported that most smokers (81.8%) smoked inside the house and when their children were present, and 63.8% of non-smokers reported being exposed to SHS in their home from their spouses (40.4%), other household members (10.6%), and others (12.8%) (Lapvongwatana et al., 2016). Moreover, one of the building environment characteristics linked to SHS exposure at home was residing in a single-family home with fewer than three rooms (Phetphum & Noosorn, 2020).

Many parents and other family members who smoke still smoke in close proximity to their kids. Parents reported smoking in a variety of settings around their kids. Specifically, Myers, Lev, Guttman, Tillinger, & Rosen (2020) mention a few instances where children may be exposed to tobacco smoke: smoking near a window indoors or on an indoor "balcony," smoking outside when the entrance to the house is open, cigarette smoking in the car when kids are not around, and smoking by the window indoors. However, smoking beside a window or in a different room does not completely eliminate exposure (van Deusen et al., 2009). From this situation, it can be seen that smoking family members may still lack knowledge about the harms of SHS at home. According to a study to examine the parental knowledge about SHS, only 25.5% of the smoking parents correctly answered more than 70% of the knowledge questions (Dai et al., 2021). In Thailand, a study showed that only 58.1% of the smokers had received information regarding the dangers of household SHS exposure (Poopat, Sritippayawan, Kamalaporn, & Phumethum, 2015).

In summary, exposure to SHS inside the home is an urgent issue to be resolved. These findings regarding the situation of SHS at home and the smoking behavior of family members at home suggest that it is important to inform smoking family members about exposure that can happen both outside and indoors, as well as in circumstances they might not think of as involving exposure. This also suggests that the target audience of smoking family members is ignorant and in need of particular, pertinent information.

2. Harms of cigarette smoke to pregnant women and offspring

SHS exposure is a major cause of death and morbidity and is categorized as a human carcinogen (WHO, 2022). Exposure to SHS is harmful to both the mother and the developing baby.

2.1 Harms to pregnant women

Pregnant women who are exposed to SHS have elevated amounts of nicotine, cotinine, and carbon monoxide (CO) in their blood or urine. Pregnant women may experience the effects of SHS from the first to the third semester. The harms of SHS on pregnant women commonly found are as follows:

Compromised immunity

Pregnant women who are exposed to tobacco smoke may experience immune system disruption (Harun et al., 2020). The mother's immune system alters during pregnancy to avoid the fetus being rejected. Pregnant women who are exposed to SHS may experience immune system alterations. A rise in activated leukocytes and a fall in the proportion of regulatory T lymphocyte cells (Treg cells) are two of the changes. Pregnancy-related smoking also alters the balance of functions between Th1 (T helper lymphocyte) and Th2 cells, leading to an upsurge in proinflammatory chemokines, Th1 growth factors, and cytokines. Furthermore, the first semester has a greater percentage of NK cell residues and macrophages (Sabra, Gratacós, & Gómez Roig, 2017).

Lung cancer

The most frequent malignancy linked to SHS exposure is lung cancer. Because carcinogens and other harmful compounds appear to persist in side-stream smoke and inhaled mainstream smoke, there is biological plausibility for this link (Samet et al., 2009). The CYP1A1 gene, which genes for an enzyme that breaks down polycyclic hydrocarbons in cigarette smoke, is expressed more frequently in women (Kirsch-Volders et al., 2010). According to Thomas, Doyle, and Edelman (2005), this rise in expression causes more DNA-forming adducts to form, which are DNA fragments chemically bonded to a carcinogenic substance and may be the initial step in the development of cancer. According to a systematic review, there was a 1.28 (95% confidence interval: 1.10–1.48) pooled relative risk of lung cancer with SHS exposure (Hori, Tanaka, Wakai, Sasazuki, & Katanoda, 2016). Similarly, exposure to SHS and the development of lung cancer in female never smokers were significantly correlated; the relationship was similar in males and females (OR=1.27, 95% CI: 1.11–1.45 for females) (Kim et al., 2014). These results were in line with a systematic review and meta-analysis in China where, for nine population-based studies and twenty-two hospital-based studies, the total percentages of lung cancers linked to SHS exposure among never-smokers were 15.5% (9.0–21.4%) and 22.7% (16.6–28.3%), respectively. In the community-based research, the population attributable proportion for women was 17.9% (11.4–24.0%), whereas in the hospital-based studies, it was 20.9% (14.7–26.7%). In females, the proportion of lung cancer cases linked to exposure in the home (19.5%) was significantly greater than that linked to exposure at work (7.2%) (Du et al., 2020). In Thailand, a study revealed that the occurrence of lung cancer in women exposed to SHS was found to be significantly high at 17.7% (Saenghirunvattana et al., 2013).

Breast cancer

Several fat-soluble substances found in tobacco smoke are known to cause breast cancers. Twenty of the fifty chemicals found in cigarettes that are known to cause cancer particularly target the mammary glands and breast tissue (U.S. Cancer Statistics Working Group, 2009). In addition to the many extensively reported systemic adverse reactions to cigarette smoking, mammary tissue can absorb a large number of tobacco carcinogens, including as polycyclic aromatic hydrocarbons, aromatic amines, and N-nitrosamines,

that are frequently detected in smokers' bloodstreams (Hecht, 2002). These substances can then be metabolized and activated by mammary epithelial cells, forming electrophilic intermediates that can damage DNA and produce adducts (Li et al., 2002). Such tobacco-related DNA adducts are more common in smokers than in those who do not smoke and mammary epithelial cells contaminated with tobacco carcinogens exhibit genomic changes similar to those observed in familial breast cancer. A study revealed that cumulative exposure to cigarette smoke was associated with breast cancer (HR 5 1.19; 95%CI 5 1.06–1.13) (Catsburg, Miller, & Rohan, 2015).

Breastfeeding

SHS exposure also affects breastfeeding. Lower prolactin concentrations have previously been linked to smoking and parenteral nicotine. By raising milk proteins, lactose, and lipids, prolactin is linked to the lactating mammary gland and is essential for maintaining metabolic homeostasis (Ben-Jonathan, Hugo, Brandebourg, & LaPensee, 2006). It is noteworthy that a study conducted on animals revealed smoking to be one of the risk factors for the suppression of prolactin secretion. According to a recent systematic review and meta-analysis, there is a link between breastfeeding cessation during the first six months of life and maternal exposure to smoking. This association may be explained by the way that nicotine and other chemicals in tobacco smoke inhibit the release of prolactin (Suzuki et al., 2019). According to research conducted in Poland, the length of exclusive nursing and the mother's blood cotinine level had an inverse association ($r = -0.195$, $p < 0.001$) (Jedrychowski et al., 2008).

2.2 Harms to offspring

Exposure to tobacco smoke is an evidently harmful and teratogenic phenomena that affects almost every aspect of development and jeopardizes the life of newborns. The following list of obstetric problems and unfavorable fetal outcomes was discovered to be linked to SHS exposure:

Low birth weight

The mechanism underlying the lower birth weight in those who were exposed might be the detrimental impact of nicotine on the placenta's development and function, which would diminish the fetus's oxygen delivery (Watkins, 2011). Nicotine and its main metabolite cotinine are vasoconstrictors in pregnant women, reducing uterine blood flow by 30% to 40%. This lowers the delivery of oxygen and nutrients needed for embryonic growth. Additionally, according to Joya et al. (2014), cotinine inhibits the synthesis of amino acids and decreases the activity of enzymes linked to embryonic growth. There are two ways that maternal blood nicotine affects fetal development. Nicotine directly interferes with the absorption of other vitamins and minerals, like as calcium and vitamin C, which are essential for fetal development (U.S. Department of Health and Human Services, 2010). Acetylcholine is a placental signal molecule that is bound by nicotine and is involved in regulating vascularization throughout placental development, blood flow, fluid volume, and nutrient absorption in the placental vasculature (Rogers, 2009). Placental insufficiency is one of the pathological disorders caused by this condition, which is an imbalance in receptor activation and function (U.S. Department of Health and Human Services, 2010). In a secondary mechanism, nicotine produces blood vessel vasoconstriction, which lowers blood flow to the developing baby via the umbilical cord and lessens the fetus's distribution of nutritional nutrients. A secondary marker of the oxidative stress that the mother and fetus are experiencing could be the presence of nicotine in the blood. This means that the higher the level of nicotine, the more exposure to harmful smoke, which reduces blood flow in the umbilical cord and triggers oxidative stress in the vascular system. Consequently, the number of cells decreases and there is an imbalance in the cell population. In addition, there is a delayed build-up of fat and muscle, which might result in low birth weight (U.S. Department of Health and Human Services, 2010). According to a study that examined the mechanisms underlying the impact of mother's SHS exposure on birth weight, SHS exposure while pregnant raises levels of the inflammatory mediators IL-1β, TNF-α, IL-6, and VCAM-1, which can either directly (through TNF-α) or indirectly (via reduced placental weight) cause low birth weight (Niu et al., 2016). Another study revealed that exposure to SHS significantly decreased the birth weight of neonates ($p = 0.005$). Compared to fetuses that were not exposed, these newborns' mean birth weight was 205.6 g lower, at 2,916.5 g ± 327.3 grams (Ramadani,

Utomo, Achadi, & Gunardi, 2019). According to a study by Sobh et al. (2021), The mean birth weight of the babies born to SHS-exposed mothers was considerably lower than that of the babies born to non-exposed mothers (2989.8 ± 492.2 g versus 3421.2 ± 402.5 g, respectively; p value<0.001). Additionally, there was an inverse correlation between the birth weight and the urine cotinine creatinine ratio (CCR). Consistently, prenatal SHS exposure (OR: 1.62, 95% CI: 1.01–2.62) was linked to higher risks of low birth weight (Oh et al., 2021).

Intrauterine growth restriction

One crucial outcome of SHS exposure is intrauterine growth restriction (IUGR). IUGR is a common alternative diagnosis made for infants who do not meet this growth potential but are not undersized by constitution. The production of acetylcholine, dopamine, serotonin, growth hormones, adrenocorticotropic hormones, and glutamate is brought on by the stimulation of nicotine receptors, and these chemicals have a major impact on embryonic growth. Pregnancy-related alterations in metabolism are also linked to smoking (Sabra et al., 2017). Pregnant women who are exposed to nicotine may experience vascular placental vasoconstriction, decreased placental blood flow, and reduced trophoblast invasion. These effects can hinder healthy placental circularization, which can result in placental hypoxia and disturb placental invasion. Pregnant SHS exposed women had a considerably increased chance of having a poor pregnancy outcome than non-exposed SHS women. Pregnant women who were exposed to SHS had higher odds of IUGR (OR = 10, CI 2–57.4, p value = 0.006) than pregnant women who were not (Sobh et al., 2021). Similarly, another study found that the following fetometric parameters characterizing bone growth were more frequently low (below the 5th percentile) when exposed to cigarette smoke between 30-34 weeks of gestation: biparietal head size (p = 0.006), femur lengths (p = 0.01), shinbone lengths (p = 0.035), head circumferences (p = 0.002), and shoulders bone lengths (p = 0.004). Pregnant women who were exposed to tobacco smoke had low fetal head circumference values in 50.0% of cases (Gryzunova et al., 2021).

Preterm birth

Goldstein, Goldberg, Frazier, and Davis (1964) postulated four theories to explain the association between smoking and preterm birth: According to Ion and Bernal (2014), there are several reasons why smoking is harmful to a fetus: (a) smoking reduces the mother's appetite, which lowers the baby's nutrition; (b) smoking results in vasoconstriction, which lowers the fetus's blood supply, fetal nutritional supply, and slows the breakdown of catabolism results; (c) smoking may directly expose the developing baby to toxins; and (d) elevated fetal CO levels trigger decreased oxygen transport capacity and teratogenic features. Labor induction has been observed with prostagladin. In smokers, prostaglandin levels, such as F2-isoprostane, which is a sign of oxidative stress, are detected in the amniotic fluid and membrane. When compared to non-smokers, F2-isoprostane levels surged three times. Elevated F2-isoprostane levels are thought to be the mechanism linking smoking to premature delivery. Tobacco smoke contains cadmium, which reacts with calcium to affect myometrial function. The oxytocin receptors in the myometrium may be modulated by cadmium. Research indicates that pregnant women who have greater quantities of cadmium also have a greater possibility of preterm birth (Ion & Bernal, 2014). According to research, smoking raises the chance of premature birth by 25% when pregnant. Preterm birth is specifically impacted by SHS exposure (Elkin & O'Neill, 2017; Hayes et al., 2016).

Congenital anomaly

Research has been done on how tobacco smoke affects congenital defects in infants. An elevated likelihood of congenital abnormalities was linked to exposure to SHS, according to a meta-analysis of 33 studies (odds ratio = 1.92; 95% confidence interval 1.61-2.30). SHS was linked to a considerably higher incidence of oral clefts (1.87 [1.47-2.39]) and abnormalities of the neurological, circulatory, and digestive systems (1.17 [1.05-1.32], 1.74 [1.33-2.29], and 2.10 [1.32-3.35) (Zheng, Xie, Yang, & Qin, 2019). This is in line with another study by Hoyt et al. (2016) who found that SHS exposure during pregnancy was associated with neural tube defects: anencephaly and spina bifida; orofacial clefts (cleft lip without cleft palate; cleft lip with or without cleft palate; cleft palate alone); bilateral renal agenesis; amniotic band syndrome-limb body wall complex; and atrial septal defects, secundum. Moreover, there is evidence linking

SHS exposure to embryonic heart malformations, such as as craniosynostotic cleft palate, gastroschisis, transposition of major arteries, and atrial and atrioventricular septal defects (Harun et al., 2020).

In summary, the above review has demonstrated the evidence of an association between SHS exposure during pregnancy and several adverse outcomes of the pregnant women and their offspring. Therefore, it is essential to prevent the exposure to SHS among pregnant women. In order to do so, several policies have been established in relation to the prevention of SHS among pregnant women.

3. Policies related to prevention of SHS harms to pregnant women

3.1 Policies by WHO

3.1.1 Public education to reduce SHS exposure in the home

To guarantee a seamless implementation, consultation and education are required. According to the Protection from Exposure to Second-hand Smoke: Policy Recommendations by WHO (2007), while smoke-free workplace laws improve the possibility that people (smokers and non-smokers) would decide to keep their homes smoke-free, educational measures should be used to limit SHS exposure in the home. Every person has the right to information regarding the dangers of secondhand smoke (SHS), how to make use of their right to a smoke-free space, and how to shield their family from SHS harm. Policies that take into account the home environment are necessary to ensure that public health is sufficiently safeguarded, as here is where children and adults who do not work outside the home are frequently most exposed to SHS. One useful tactic for encouraging SHS protection in the home is education.

Moreover, smokers who work in smoke-free environments use less tobacco overall, and they are more likely to encourage their coworkers to adopt similar restrictions at home (Borland, 2006). Legislation prohibiting smoking in workplaces should therefore be the main tactic used to shield people from secondhand smoke exposure at home.

Campaigns to increase the public's enthusiasm for smoke-free laws can involve education about the benefits of smoke-free living. These campaigns have included messages reminding smokers—especially parents—about the dangers of

SHS exposure in the home and pleading with them to give up smoking. Warnings about health hazards on tobacco packets are an extremely economical public education tool that may be used in conjunction with mass media campaigns to ensure that smokers of all stripes are informed.

3.1.2 Protection from second-hand smoke in pregnancy (smoke-free homes)

In order to lessen SHS exposure in women and children and avoid SHS-related illnesses and fatalities, it has been suggested to raise knowledge of the harmful effects of SHS exposure and to support voluntary smoke-free policies in homes. Healthcare professionals should advise and educate expectant mothers, their partners, and other household members about the dangers of secondhand smoke exposure and ways to lower secondhand smoke in the home. Health care professionals should speak with spouses and other family members directly to educate them about the dangers of secondhand smoke (SHS) exposure to expectant mothers, to encourage lowering SHS exposure, and to provide assistance in quitting smoking.

However, it is necessary to conduct research on efficient methods of evaluating tobacco usage, focusing on key components (WHO, 2014) as follows:

- The most effective ways to talk to and include pregnant women's partners and other family members in order to reduce tobacco use within the family and, in turn, lower the amount of SHS exposure in pregnant women's households.
- The best way to biochemically confirm that partners have stopped smoking and that pregnant women have reduced their SHS exposure.
- Determining the efficacy of low-cost, basic air quality monitors as an intervention tool to promote a decrease in household smoking.
- Determining the degree of intensity necessary for interventions to effectively prevent SHS exposure in residential settings.
- How to make medical professionals more conscious of the significance of screening expectant mothers for SHS exposure.

3.1.3 WHO recommendations on prevention and management of tobacco use and secondhand smoke

The WHO (2014) produced guidelines for the prevention and management of tobacco use and secondhand smoking for:

- Medical personnel, including nurses, midwives, general practitioners, family doctors, obstetricians, and other healthcare staff, who provide care to expectant patients in a medical facility.
- Conventional birth attendants and community health professionals who offer expectant mothers in-home prenatal care.
- Managers of healthcare programs, health facilities, and public health policy makers

When health systems give healthcare professionals a supportive atmosphere for tobacco control, these guidelines will be more effective. This entails making healthcare facilities smoke-free, offering assistance to medical professionals who smoke to quit, providing specialized training and resources to a range of healthcare providers (physicians, mid-level, first-level, community, and lay health workers), and changing antenatal care forms or other system recording tools to include a checkbox and room for provider notes to record tobacco use and SHS exposure as well as pertinent actions implemented. The following actions can be taken by healthcare professionals in order to implement these guidelines:

- Ask, ask, and ask some more: Throughout the course of pregnancy, find out from the woman whether she uses tobacco products and if she is exposed to smoke at work or at home.

- Find out from partners if they smoke at home.

- Teach: Describe to the lady and her partner, if feasible, the reasons why tobacco use and secondhand smoke are harmful to their unborn child.

- Document: Indicate in her medical file whether or not the mother smokes and/or has been exposed to secondhand smoke.

- Take Action: Offer guidance, educational resources, support, and referrals to assist expectant mothers in quitting, or assist partners in keeping a smoke-free home.

Moreover, health service managers can perform the following steps:

- Train: Give doctors, midwives, nurses, and other healthcare professionals smoking cessation training.
- Encourage: Implement smoke-free regulations in healthcare institutions and give employees tobacco-support for cessation
- Support: Offer suitable procedures, equipment, instructional resources, and other instruments to assist pregnant women and their partners in giving up tobacco use.
- Encourage: Establish partner-friendly prenatal clinics and create educational materials for smokers in the household.

In addition, policy-makers can perform the following steps:

- Create, pass, and implement laws prohibiting smoking in public areas.
- Allocate resources to the problem of pregnant women using tobacco.
- Allocate funds to the cause of making all medical facilities smoke-free.

Nonetheless, significant research and knowledge gaps were found, which must be filled by primary study and funding for the creation of randomized controlled trials of therapies for use throughout pregnancy and the postpartum period. Research in low- and middle-income countries (LMICs) is incredibly rare. Furthermore, there were little studies on the efficacious interventions for smokeless tobacco use or other forms of tobacco use during pregnancy, as well as the establishment of smoke-free homes for expectant mothers (WHO, 2014).

Therefore, it is necessary to do research on efficient methods of evaluating tobacco use, focusing on key components like:

- How can pregnant women's tobacco usage and SHS exposure be identified as much as possible? (How to document, what to ask, who to ask, and how to ask)
- Self-reported as opposed to biochemically verified evaluation.
- How can the use of smokeless tobacco products and SHS exposure in pregnant women be objectively assessed?
- Does the biological justification of tobacco use impact the rates of smoking cessation and reduction during pregnancy?

- Reliable and affordable methods for biochemically verifying the usage of smokeless tobacco
- Appropriate cutoff thresholds for pregnancy-specific abstinence validation
- Low-cost techniques to evaluate SHS exposure and tobacco use

2. Policies by Thailand's Ministry of Public Health

2.1 Parent School for Pregnant Women

The Department of Health has defined Parent School as the services provided to educate parents and guardians of children when there is a need to work outside of home. Parent School does not mean educating parents at school, but involves educating parents in an arranged area of a hospital, health-promoting hospital, or outside the hospital setting such as in the park, or at a child care center, with learning-promoting atmosphere and without interruption from others. Parents School consists of five activities as shown in Table 2.1.

Table 2.1 Activities in Parent School

Gestation/ Child Age	Setting	Content	Delivered by
1st Antenatal care	Antenatal clinic	1. Introduction to the Maternal and Child Health Handbook, and the Passport of Life 2. Five areas that require examination to ensure healthy fetus 3. How to promote brain development by taking vitamins, iodine, iron, folate, eggs, and milk	Nurses or public health academics

Table 2.1 (continued)

Gestation/ Child Age	Setting	Content	Delivered by
2nd Antenatal care	Antenatal clinic	1. Nutrition for fetus 2. Prohibited food during pregnancy 3. Supplements for pregnant women, iron, iodine, folate 4. Dental care (based on the content of Maternal and Child Health Handbook) 5. Warning signs for pregnant women and fetus (based on the content of Maternal and Child Health Handbook)	Nurses or public health academics
3rd Antenatal care	Antenatal clinic	1. Promotion of breastfeeding 2. Exclusive breastfeeding for 6 months, impacts of bottle feeding, giving water or other liquids while breastfeeding 3. Vital signs of the fetus and monitoring fetal movement (based on the content of Maternal and Child Health Handbook) 5. Warning signs that require hospital visit and monitoring maternal and fetal complications (based on the content of Maternal and Child Health Handbook)	Nurses or public health academics

Table 2.1 (continued)

Gestation/ Child Age	Setting	Content	Delivered by
4th Antenatal care	Antenatal clinic	1. Labor room tour during hospital visit 2. False and actual warning signs of labor (based on the content of Maternal and Child Health Handbook) 3. Signs and symptoms that require immediate hospital visit 4. Physical exercise	Nurses or public health academics
5th Antenatal care	Antenatal clinic	1. Breathing exercise to reduce labor pain 2. Preparations for safe delivery	Nurses or public health academics

The Parent School includes recommendations for pregnancy, delivery, and postpartum periods. The Parent School aims to educate pregnant women about self-care and fetal care. This education involves brain-based learning (BBL), including 1) relax alertness by arranging a relaxing atmosphere using movement activities, games, and meditation; 2) orchestrated immersion by providing learning activities through senses such as seeing, hearing, smelling, touching, tasting, and moving based on pregnancy-related tasks from low to high difficulty levels and focusing on practice; and 3) active processing of experience by providing activities and educational materials such as slide shows, brochures, flip cards, video multimedia that facilitate sharing of information. Moreover, there is a communication channel via a group on Line application, which promotes interest in learning. At the end of the activities, there is a summary of what is learned, allowing participants to be able to apply the knowledge into practice. However, it is noteworthy that there is a lack of detail about the prevention of SHS in the Parent School (Department of Health, Ministry of Public Health, 2021).

2.2 Non-Smokers' Health Protection Act, B.E. 2535

Thailand was the first country in Asia to enact a control law under the Non-Smokers' Health Protection Act, B.E. 2535, and to impose stringent tobacco control laws. According to the law, the Minister has the authority to designate sites that are off-limits to smoking. If smokers are found to be in one of these zones, they will be fined no more than 2,000 baht. Nonetheless, SHS exposure to people who do not smoke is not limited to nonsmoking zones; nonsmokers who reside outside of nonsmoking locations should also be legally protected in their right to breathe clean air, just like those who do. Legislation protecting everyone equally should not limit the right for inhaling clean air to specific locations. The details are as follows:

Section 1

This Act is called the "Non-Smokers' Health Protection Act B.E.2535"

Section 2

This Act will become operative on the day that it is published in the Government Gazette.

Section 3

"Cigarette" in this Act refers to any cigarette, cigar, other cigarettes, tobacco, or tobacco that has been modified in accordance with tobacco laws. Any act that produces smoke from the burning of a cigarette is considered "smoking". "Public place" refers to any area or vehicle that is open to the general public. "Operator" refers to the proprietor, manager, overseer, or anyone in charge of running the public space. The term "non-smoking area" designates a space where smoking is not allowed. A "smoking area" is a designated location for smoking."Authority" refers to an individual designated by the Minister to carry out this Act. "Minister" refers to the Minister implementing this Act's changes.

Section 4

Publication in the Government Gazette shall be within the Minister's authority.

(1) identifying the categories of public spaces where nonsmokers' health will be safeguarded;

(2) appointing any portion or all of the public spaces under (1) as smoking or nonsmoking spaces;

(3) identifying the state, character, and requirements of 15 non-smoking or smoking spaces concerning air ventilation and smoke; and

(4) identifying the standards and processes for sign demonstrations in the smoking or non-smoking spaces.

The date, time, or duration that the operator has to finish these compliances must also be specified in the publication under subsections (3) or (4).

Section 5

Following the Minister's publication pursuant to Section 4, the operator will be responsible for:

(1) designating any portion or all of the public spaces as smoking or non-smoking areas;

(2) establishing the conditions, standards, and nature of the smoking space; and

(3) setting up the signs in the designated smoking or non-smoking spaces in compliance with the standards and guidelines set forth by the Minister.

Section 6

No person shall be allowed to smoke in anon-smoking area.

Section 7

The authority will be able to access the public areas that the Minister has designated in section 4(1) and (2) between the hours of sunrise and sunset or during business hours in order to examine or oversee the execution of this Act.

Section 8

The authority will show the identity card to the individuals in question in the course of carrying out their duties. The authority's identity card must adhere to the format specified by the Minister and be published in the Government Gazette.

Section 9

Operators and anyone with an interest in public spaces are required to provide reasonable assistance to the authorities carrying out its duties under Section 7.

Section 10

The officers designated by the Penal Code shall have the authority to carry out this Act.

Section 11

If an operator does not follow Section 5(I), they could be fined up to 20,000 baht.

In the event that an operator violates Section 5(2), they could be fined up to 10,000 baht.

In the event that an operator violates Section 5(3), they could be fined up to 2,000 baht.

Section 12

A fine of no more than 2,000 baht will be imposed on anyone found in violation of Section 6.

Section 13

Anyone who hinders or refuses to assist the authority carrying out their obligation under Section 7 faces a maximum sentence of one month in jail, a maximum fine of 2,000 baht, or both.

Section 14

The authority to impose the fine in compliance with the Criminal Procedure Code rests with the qualified investigating officer looking into a matter.

Section 15

This Act will be overseen by the Minister of the Ministry of Public Health, who will also have the authority to designate the authorities and issue directives for the announcements necessary to carry out this Act.

The Act was enacted because doctors agree that smoking cigarettes has a number of negative health effects on both smokers and non-smokers, including coronary artery thrombosis and lung or other organ cancer. Additionally, the symptoms of several illnesses, such allergies or chronic bronchitis, are made worse by cigarette smoke. Furthermore, it has been demonstrated that nonsmokers who breathe in other people's cigarette smoke have the same decline in health as smokers, particularly when those breathing in the smoke are young people. Therefore, it is sensible to prevent cigarette smoke from affecting the health of non-smokers in public locations by outlawing smoking in particular areas, designating designated smoking zones, or taking other appropriate measures. Therefore, the promulgation of this Act is required.

2.3 Family Development and Protection Act, 2019

The Family Development and Protection Act, 2019 emphasizes the prevention of domestic violence in family and the promotion of family and personal welfare development. According to this Act, household smoking is an unlawful act as it considered one type of domestic violence that violates the welfare and health of family members. The definition of "domestic violence" has also been expanded by the Family Development and Protection Act, 2019 to include any act that a family member takes against another family member with the intent of causing or which is prone to cause any harm to a family member's life, body, mind, health, freedom, or reputation, or to coerce or inappropriately influence a family member to engage in, abstain from, or approve of any action that is unlawful. The amended term now covers any activities that impact the “health” or “freedom” of other family members in addition to the previously included harm to life, body, and mind. Furthermore, language that included only "intentional" actions but also any action that is "likely to result" in injury has been included in place of the previous version's provision for "any acts committed through negligence." As a result, "intent" would no longer be a requirement for a crime.

The concept of "domestic violence" has been revised, and as a result, smoking at home may now be included within the definition since it has been shown that second- and even third-hand smoke can harm family members' "health."

Therefore, household smoking is a form of domestic violence due to the following reasons:

1. Household smoking reduces family relationship because wife and children may not desire to be near the smoker. It may also lead to imitation of smoking behavior.

2. Household smoking may result in physical or psychological violence caused by aggression and frustration both verbally and non-verbally.

3. Household smoking causes other family members to be exposed to secondhand and thirdhand smoke.

If a family member’s health is found to have suffered from household secondhand smoke, the smoker will be tried by the Criminal Court under the penal code and by the Central Juvenile and Family Courts for civil actions.

4. Promotion interventions and outcome measured related to SHS among pregnant women

This review presents the previous interventions related to SHS among pregnant women. The first part discusses the interventions related to SHS among pregnant women in general. The second part focuses on the interventions for enhancing knowledge about SHS and SHS self-preventive behavior, and reducing urinary nicotine level.

1. Interventions related to SHS among pregnant women in general

1.1 Family counseling to help expectant mothers minimize their exposure to SHS at home

This program was developed by Soltani, Barzegar, Sangestani, Roshanaii, and Maleki (2019) in a quasi-experimental study among 103 pregnant women exposed to SHS in Iran and their spouses. The program development was based on the attitudes, beliefs, subjective norms, and enabling factors model (BASNEF). For the intervention group (pregnant women and their spouses), four weekly counseling sessions lasting 45–60 minutes each were conducted in groups of up to 10 individuals. The sessions included 45 minutes of counseling and 15 minutes of questions and answers. Family counseling was the main focus of the intervention, which also included question-and-answer sessions, brainstorming sessions, and group discussions. Additionally, informational pamphlets about the dangers of smoking for expectant mothers and their unborn babies were disseminated. Prenatal care was routinely provided to the control group.

Following the intervention, the intervention group's mean number of SHS exposure periods between the intervention and follow-up at home considerably reduced in comparison to the control group ($p<0.001$). Additionally, following the intervention, there were statistically significant ($p=0.04$) differences in the mean scores of behavioral intention of the spouse to cut back on smoking at home, knowledge, attitude, enabling factors, and subjective norms between the intervention group and the control group. Following the intervention, there were notable variations in the intervention group's mean scores for each of the BASNEF model's constructs ($p<0.05$).

For the limitation of this program, although this program involved pregnant women's spouse, the program strategies focused on giving education and counselling about SHS. However, there was no assessment of the issues and needs related to SHS to inform the development of the program.

1.2 Intervention to decrease pregnant women's exposure to ambient tobacco smoke and to advance health beliefs

This intervention was developed by Kazemi, Ehsanpour, and Nekoei-Zahraei (2011) in a two-group longitudinal randomized controlled study. The program had its theoretical basis in the Health Belief Model. The intervention's main goals were to decrease perceived barriers and hazardous reduction techniques, as well as to improve women's perceptions of benefits and susceptibility/severity (e.g., removing oneself from ambient tobacco smoke situation). The instructional material discussed how the harmful compounds from SHS could reach the placenta and raise the risk of prenatal and neonatal illness and mortality for the unborn child. A picture of low birth weight babies and information on how hazardous compounds from SHS can enter the fetus are included in the instructional package. A resource pamphlet was also handed to the women for use at home. The home resource pamphlet conveyed information using straightforward, visual language. Using posters and slide shows, the instruction was given verbally, in-person, one-on-one, and for fifteen to twenty minutes in the first portion and five to ten minutes in the second.

From the results, the intervention group perceived their susceptibility to environmental tobacco smoke exposure (at the third, fourth, and fifth sections), as well as its severity (at the third and fourth sections) and benefits (at the fourth and fifth sections) compared to the control group. However, there was no significant change in the perceived barriers for environmental tobacco smoke exposure. In comparison to the control group, the intervention group's mean weekly exposure at the third, fourth, and fifth parts was clearly lower.

For the limitation of this program, this program focused on providing education to pregnant women. Women are unable to overcome the obstacle of creating smoke-free environments at home, as evidenced by the intervention group's perceived barrier remaining unchanged. The results indicate that educating pregnant women on the health risks associated with exposure to SHS is a useful strategy for strengthening the

theoretical foundations of the Health Belief Model and is linked to a decrease in secondhand smoke exposure. But this is insufficient to provide smoke-free homes.

1.3 Obstetricians' straightforward recommendations for pregnant nonsmoking women to assist their husbands in giving up smoking

This program was conducted by Loke and Lam (2005) in a randomized controlled trial to assess the results of obstetricians' straightforward advise to pregnant women who did not smoke in an effort to encourage their spouses to stop smoking. Each pregnant patient at the Guangzhou Women and Children Health Care Center who did not smoke and whose spouses were smokers was randomly assigned to either the intervention (N = 380) or control (N = 378) group. At their first prenatal appointment, each member of the intervention group received an instructional pamphlet, some easy advice on persuading their spouses to quit smoking, and reminders during following visits; the control group, as is customary, received none of these materials.

Results showed that In the intervention group, more husbands had made an attempt to quit (30.0% versus 22.2%; $p = 0.02$), cut back on the amount of cigarettes they smoked (39.7% versus 17.7%; $p < 0.0001$), and reported not smoking for the previous seven days prior to their wives filling out the questionnaire (8.4% versus 4.8%; $p = 0.04$). The percentage of husbands who had given up cigarettes for at least 30 days did not differ significantly between the groups (6.1% versus 4.2%; $p = 0.26$).

For the limitation of this program, this program only provided advice and education to pregnant women to help their husbands stop smoking. There was no detailed information about the involvement of the husbands in the program, or the skill training for pregnant women to support husband's smoking cessation or avoid SHS exposure.

1.4 Self-efficacy Program on Smoking among Pregnant's Husband

This program was developed by Imphitak et al. (2015) in a quasi-experimental study was conducted to examine the effect of self-efficacy program on smoking, but the program focused on the smoking behavior of pregnant women's husbands and assessing nicotine addiction of the husbands. This program was developed based on self-efficacy (Bandura, 1997). The program duration was 8 weeks with 4 sessions. In the first session for mastery experience, the smoking husbands wrote a plan

for smoking cessation and explained the reasons for ceasing smoking. In the second session for vicarious experience, the husbands were given a role model who was successful in smoking cessation and shared their experience. In the third session for verbal persuasion, the husbands received education about harms of SHS and skills for smoking cessation to help them succeed in quitting smoking. Lastly, in the fourth session for emotional and physiological states, the husbands were persuaded to stop smoking for the health of their family members. They also received home visit and telephone follow-up for encouragement, counselling for barriers, and support from their pregnant wives to increase confidence in quitting smoking.

From the results, the husbands' cigarette consumption differed significantly between before and after the program. The mean scores of husband's smoking behavior at 1, 2, and 8 weeks after the program were statistically different. However, there was no statistically significant difference in the carbon monoxide in the husband's breath before and after the program. No statistically significant difference was found in the mean score of nicotine addiction of the husbands between before and after the program.

For the limitation of this program, this program focused on the participation of husbands in the program, but there was a slight involvement of pregnant women. Pregnant women only participated in giving encouragement to their husband at the end of the program. However, they received no education or skill training related to SHS exposure and prevention.

2. Interventions for knowledge about SHS, SHS self-preventive behavior, and urinary nicotine level

2.1 Intervention for pregnant women on passive smoking

This program was developed by Lee (2008) in a study among pregnant women visiting three Chengdu hospitals for prenatal care. The development of the program was based on health belief model (Glanz et al., 2002) and social cognitive theory (Bandura, 2004). The program was designed based on the findings from a focus group discussion with pregnant women to investigate beliefs, attitudes, and actions while gathering information about the problems women faced at home. A pilot intervention was designed based on these findings. The same participants were used in a second round of

focus group talks to test these messages and concepts. Multifaceted communication activities were conducted with the recruited sample during the intervention phase. The first interaction took place at a hospital event that featured inspirational talks from high-ranking medical staff members, a knowledge-sharing video show, role-playing exercises to practice useful strategies, and games to foster a sense of empowerment. A resource pamphlet was also given to them to utilize at home. The home resource booklet taught skills and conveyed knowledge using straightforward, graphical language.

The hospital records of the women in the sample were identified as study participants since the focus groups revealed that guidance from clinicians is highly valued. When the women went for prenatal visits, this made it easier for the professionals to systematically reinforce the messaging. A phone helpline was established to provide guidance and support. Throughout the intervention period, the researcher gave biweekly telephone consultations, and a round-up event brought participants together to talk about their experiences.

From the results, the post-intervention scores of the participants showed a significant increase in knowledge, a shift in attitudes toward greater disapproval, and a higher propensity to act assertively when faced with SHS in the family when compared to before the intervention. Participants who had some understanding of the detrimental elements of SHS rose from 32.7% to 92.2% ($p < .01$), whereas those who had some understanding of the illnesses brought on by SHS rose from 19.5% to 74.2% ($p < .01$). Before the program, about 38% of the participants knew something about the risks SHS poses to a developing fetus; following the intervention, this percentage increased to 73.4% ($p < .01$). The majority of participants were already aware of the advantages of having a smoke-free household. The 82.8% high pre-intervention rate increased to 95.3% ($p < .05$). Before and after the intervention, 50.7% and 82.8% of participants, respectively, expressed a severe hate and dislike of being around secondhand smoking ($p < .01$). Prior to the intervention, a significant portion of the participants said that they would be inclined to respond assertively if they saw their spouse smoking around them. Following the intervention, the high percentage of 92.2% rose to 98.4% ($p < .05$). During the pre-intervention period, the probability of assertive action was 56.2% when the spouse was the source of SHS, a lower percentage when other family members were the source of

exposure. Nevertheless, following the intervention, this percentage rose to 86.7% ($p < .01$).

For the limitation of this program, although there was an increase in knowledge about SHS, this program engaged only pregnant women, but not other individuals involved in the SHS phenomenon such as the family members of pregnant women or the staffs of health care organizations. Although this program included role-plays to practice tactics of SHS avoidance, there was no involvement of the smoking family members who play a major role in reducing SHS exposure. The contribution of these people would further enhance the effectiveness of the program.

2.2 Secondhand smoke exposure reduction intervention

This program was developed by Chi et al. (2015) in a two-group longitudinal randomized controlled trial study to evaluate the impact of a hospital-based SHS prevention program on expectant mothers in Taiwan. Whereas participants in the control group obtained conventional government-mandated counseling services, those in the intervention group engaged in a SHS prevention program founded on the health belief model integrating self-efficacy.

The 20-week intervention took place for 50 minutes each face-to-face and one-on-one. The interventions were carried out by a senior nurse as part of government-mandated prenatal care appointments for the expectant women. After educating the women on the fundamental risks of SHS to both the mother and the developing baby, the nurse empowered them by outlining strategies for lowering their own exposure to SHS. The nurse proceeded to go into great depth on five strategies for dealing with coworkers and family members who smoke. These five strategies included: employing the baby's health and men's status as family protectors as leverage; changing their passivity into activity; adopting a nonaggressive and gentle approach; highlighting that not smoking around a pregnant woman is not the same as quitting smoking; and, in the event that all other options were exhausted, leaving the area. The intervention group was instructed to role-play several scenarios with the senior nurse in order to put these strategies into practice. The role-playing featured culturally acceptable body language and tone of voice management, and it showed how to subtly bring up the subject of SHS exposure.

Participants received an instructional booklet to take home with them as part of the event. The pamphlet reviewed the conversational strategies they had learnt and practiced during the intervention and emphasized the key elements of the program. Simple, graphical language was employed in the home education booklet to convey concepts and abilities. The nurse gave all of the intervention participants telephone consultation every two weeks during the intervention period. She inquired about how each participant was handling confronting family members and colleagues about their exposure to SHS, offered encouragement and support, and informed them of upcoming visits.

From the results, the intervention group showed a large improvement in knowledge, health belief model scores, cues to action, self-efficacy, preventive practices of SHS, and a substantial reduction in smoking exposure, with all scores significantly higher than those of the comparison group ($p < 0.001$). At a month's follow-up investigation, these differences were still significant ($p < 0.001$).

For the limitation of this program, this program focused only the engagement of pregnant women while other significant people in the situation of SHS exposure, such as the smoking family members or health care staffs, were not involved. The engagement of other people would help the pregnant women to be able to better apply the SHS knowledge they have learned in the real situation. Moreover, this program was conducted during antenatal care visit at a hospital, but did not focus on the household and the community, which is the setting of actual SHS exposure. The education about SHS knowledge with an emphasis on household and community settings would enable pregnant women to perform more effective preventive behavior to manage SHS exposure.

2.3 Prenatal health education intervention

This program was developed by Yang et al. (2015) in a clustered randomized controlled trial conducted at eight hospitals in China to compare standard clinical treatment as a control group to an intervention for prenatal health education. Participants were assigned at random to the control and intervention groups.

The development of the program was based on health belief model (Glanz et al., 2002) and social cognitive theory (Bandura, 2004). The intervention group hospitals' activities continued for more than six months. Three hospital-based group

education sessions, clinical guidance during prenatal checkups, quick (10 minutes) monthly phone conversations, and resources for learning (a resource manual about SHS and communication skills, "no smoking" signage for use at home, and a phone hotline for counseling) comprised the multi-component intervention. The calls were intended as a follow-up regarding the implementation of the smoke-free household policy and skill reinforcement. Three large group sessions (with roughly 90 women per session) covering motivational speeches by hospital administrators, lessons on the risks of smoking and SHS, videos about SHS and communication skills, role-playing dialog exercises, and games based on SHS knowledge were among the hospital-based educational activities conducted over a three-month period. In group sessions 1, 2, and 3, more than 80% of the intervention participants took part in every activity (95%, 90%, and 90%, respectively). During prenatal checks, the advice from the specialist was to ask the husband to smoke outside and to stop smoking in one's presence because SHS is detrimental.

From the results, three months after birth, a greater number of mothers in the intervention group than the control group reported never having been exposed to SHS (Total: 77.9% vs. 52.6%, $p < .001$; Home: 81.2% vs. 53.3%, $p < .001$). Additionally, there were more improvements in smoke-free dwellings and SHS knowledge and attitudes in the intervention group. Three months after delivery, the intervention group's lower reporting of SHS exposure than the control group's was maintained (Total: OR = 0.47, 95% CI = 0.31 to 0.71; Home: OR = 0.33, 95% CI = 0.21 to 0.53). Compared to the control group, the adjusted log concentration of nicotine in hair fell by 0.28 log μg/g greater in the intervention group. However, due to a lack of funding, not every participant's hair nicotine was measured.

For the limitation of this program, considering the program development, this program did not include a qualitative approach to explore the issues and needs of pregnant women regarding SHS. Moreover, this program was conducted in hospital setting using a large group education rather than a small group or face-to-face education, which tend to be more effective. Moreover, the education session was brief, lasting only 10 minutes. At home, they provided only telephone visit with pregnant women to promote smoke-free home, but no details were given on how to achieve smoke-free home environment. However, there was no involvement of other people who also contribute to

SHS exposure such as the smoking family members. In addition, the hair nicotine was not measured in all participants, which might not reflect the actual outcomes of the program.

2.4 Educational interventions for pregnant women to reduce secondhand smoke exposure

Chi et al. (2016) carried out this program in a 3-arm randomized controlled trial (N=50 in each arm) to compare the efficacy of individual and group-based therapies with a group receiving therapy as usual. The intervention was developed based on Health Belief Model (HBM) incorporating self-efficacy. While participants in the individual-based intervention obtained the same instruction through a one-on-one training session, participants in the group-based intervention participated in a 50-minute educational group intervention. Interventions that were both group- and individual-based were carried out in the first trimester of the participants. As a control group for comparison, the treatment-as-usual group had regular prenatal care that was mandated by the government without any interventions.

One of the intervention's components was direct instruction, which aimed to increase understanding of the risks, severity, and susceptibility of exposure to SHS and the advantages of avoiding it. Interventions included teaching SHS refusal-related skills, and handouts with descriptions of these skills were given out. The researchers simulated frequent challenges women encounter when negotiating over their smoking behavior with other members of their family using role-playing. The "Values clarification methods" were implemented in order to improve decision-making skills and self-efficacy. Throughout the intervention, challenging inquiries were posed to encourage critical thinking and aid in internalizing the skills and knowledge that were being taught.

From the results, compared to the treatment-as-usual group, both intervention groups' SHS knowledge was significantly higher. When it came to refusing SHS exposure and SHS behavior, the group intervention outperformed the individual intervention. At the 2-month examination, the self-efficacy of the group-based participants in refusing SHS exposure was statistically higher than that of the treatment-as-usual group. Moreover, at the 2-month follow-up assessment, the group- and individual-based intervention groups outperformed the treatment-as-usual group in terms

of SHS refusal behaviors; however, by the 1-month follow-up, the group-based participants had already outperformed the treatment-as-usual group.

For the limitation of this program, there were some indications that the three groups' smoking prevalence among household members differed from one another, with the group receiving therapy as usual having the lowest frequency and the individual-based intervention group having the greatest prevalence. This could have an impact on the three groups' exhaled CO concentrations, which represent the proportion of SHS exposure. Considering the component of the program, this program did not include a qualitative approach to explore the issues and needs of pregnant women regarding SHS. Moreover, the program was conducted only in the 1st trimester, which is relatively short to confirm the sustainability of the program outcomes. In addition, similar to other programs in the literature review, this program did not involve smoking family members of pregnant women who also play a significant role in SHS exposure.

2.5 Multiple interventions for reducing household exposure to SHS among women

This program was developed by Alagiyawanna et al. (2017). The intervention design was informed by the health belief model, social cognitive theory, and currently available evidence-based SHS preventive treatments. Persuasion, skill development, role modeling, empowerment, signals to action, environmental cues, and reinforcement of activities performed to achieve smoke-free homes were some of the intervention tactics used. Targeting women in homes, multi-component intervention activities focused on the health consequences of SHS exposure, women's attitudes about SHS exposure, the right to live smoke-free, and the empowerment of women to abstain from smoking. Health education classes were conducted in small groups, with an emphasis on interaction and personalized instruction. A conversation was held to determine the issues the women were facing as a result of being exposed to SHS. Women received education on how to use avoidance behaviors, such as leaving the school to express their disapproval of being exposed to SHS. The problems that were identified were ranked in order of importance, and a problem and solution tree was created using the women's input. Women's rights to live smoke-free lives and the health implications of SHS exposure were given special consideration. Women received stickers and leaflets in

their hands. They were convinced to make their homes completely smoke-free. The women were given guidance on how to lessen their exposure to SHS in their own homes. To instruct and inspire people to start activities, modalities like role-playing, storytelling, exchanging experiences, and demonstrations were employed. The duration of each group discussion was approximately sixty minutes. The two health volunteers made a note of the interventions that the women had chosen. These included talking about the negative health impacts of passive smoking with their wives, avoiding SHS exposure, and posting stickers that said, "This house is tobacco smoke free." Furthermore, women began certain activities that strengthened family bonds and enhanced family well-being, even though they had nothing to do with the lowering of SHS. These included family dinners, religious activities, home gardening, appropriate rubbish disposal, hygienic kitchen practices, and household money management. After women gained confidence through making improvements in their own houses, they went to the homes of neighbors to see if the changes could also be extended outside the home. They were initially inspired by the volunteers, and then they informed the community about the findings on their own. Even though they were not officially evaluated, the women clearly started some community-level initiatives. Most of the time, volunteers and other family members—children, spouses, and parents—also tried to engage the nearby homes. After the programs were created, the volunteers progressively cut back on their visits to the assigned households, which they had previously made once every two weeks. For the first three months, the volunteers scheduled once-monthly group meetings with the women in the chosen households; after that, they met once every 1.5 months.

From the results, following the intervention, there was a significant difference ($p < 0.001$) in the intervention group's median scores on knowledge of the health concerns associated with exposure to SHS when compared to the control group.

For limitation of this program, the program provided knowledge about SHS but did not encompass other dimensions of knowledge such laws and protection about SHS for non-smoking family members. Moreover, although the authors mentioned some involvement of family members, such involvement was not formally assessed. Thus, it can be said that this program formally engaged only pregnant women but not their smoking family members.

In summary, from the literature review, most of the previous program focused on providing education or counselling to pregnant women. Only some programs used multiple strategies such as education, counselling, empowerment, motivation, support, and persuasion to enhance the program's effectiveness. However, there is a scarcity of programs to involve the smoking family members of pregnant women. Also, the development of the previous program was not based on the issues and needs of pregnant women as well as other people involved in the SHS situation such as family members and healthcare providers. The exploration of such needs and issues would be beneficial to tailor the program to the actual contexts of pregnant women. In addition, all of the programs were conducted in other countries with different contexts from Thailand. Although there was one program developed in Thailand, that program focused on the participation of smoking husbands, with only slight involvement of pregnant women. Moreover, the program outcomes were the smoking behaviors of husband, rather than enhancing SHS knowledge and self-preventive behavior of pregnant women. Therefore, there is a need for the development of a program to enhance pregnant women's SHS knowledge and self-preventive behavior by integrating the actual needs and issues of SHS and the involvement of their smoking family members.

5. Urinary nicotine

5.1 Definition of urinary nicotine

Urinary nicotine refers to the levels of nicotine and its primary metabolite, cotinine, in the urine, which suggests a recent tobacco smoke exposure (Paci et al., 2018). In humans, cytochrome P450 2A6 (CYP2A6) metabolizes nicotine, a primary constituent of tobacco smoke, in the liver, making cotinine one of the most significant metabolites of nicotine. Cotinine concentration can be found in a variety of bodily fluids, including blood, urine, saliva, and also in nails and hair. Cotinine is excreted from the body by the liver into the urine. Thus, urine sample is a commonly used to detect urinary cotinine. It is correlated with the level of exposure to nicotine. Urinary cotinine has a relatively longer half-life (16–20 hours) than nicotine (Moon, Kong, & Kim, 2018) but the half-life of cotinine is much shorter (16.6 hours) during pregnancy due to accelerated metabolism in pregnancy (Arger et al., 2018; Jhun et al., 2010). Urinary cotinine is often

used to assess SHS exposure because it is non-invasive, and the average half-life of cotinine in the serum, urine, and saliva is nearly similar (Chen, Guo, Yuan, Okoli, & Liao, 2021). The biomarker levels are especially useful to determine effects of recent exposure. According to Fernandes et al. (2020), urine is the biological fluid most suited for quantifying cotinine, which is used to determine exposure to both current and past smoke. Approximately 10-15% of the total amount of nicotine excreted unaltered plus other metabolites is made up of the N-glucuronide conjugate that is excreted in the urine as cotinine (Paci et al., 2018). Urine may be used to estimate recent exposure and reveal higher concentrations, which makes it useful even in low exposure scenarios. This allows diverse analytical techniques to be used more easily (Jones et al., 2013). Cotinine concentration is proportional to the degree of exposure to nicotine. Urine is the most suitable biological fluid to detect current and SHS exposure through the quantification of cotinine. Even in situations of low exposure, the use of urine proves appropriate due to the possibility of estimating recent exposure. The ideal time for measurement is 4 to 8 hours after exposure, at which point the maximum levels of this biomarker can be observed (Fernandes et al., 2020).

5.2 Factors influencing urinary nicotine

From the literature review, the factors influencing the level of urinary nicotine, measured by urinary cotinine, are as follows:

1. Age

A urine cotinine level of ≥50 ng/mL was associated with a 1.19-fold (CI 1.02–1.39, p = 0.026) increased risk in those aged 30-39. Additionally, people between the ages of 19 and 29 were 2.5 times more likely to smoke than people over the age of 70 (Hong, Noh, & Kim, 2018).

2. Gender

A study in Korea showed that the chance of having a urine cotinine level of ≥50 ng/mL was higher in males than in women (OR 4.67, 95% CI 4.09–5.32, $p < 0.001$) (Hong et al., 2018).

3. Education level

From the literature review, there is a significant association between education and the level of urinary nicotine. According to Hong et al. (2018), college graduates were 32% less likely than graduates of primary school to have a urine cotinine level of ≥50 ng/mL ($p < 0.001$). Similarly, the likelihood of ETS exposure at home as determined by urine nicotine levels is considerably increased by lower maternal or father educational levels (Protano et al., 2019). This is also in line with another study revealing that father's education level was a significant influence ($r = -0.208$, $p = 0.05$). The child's cotinine levels decrease as fathers' academic level rises (Jurado, Muñoz, Luna, & Fernández-Crehuet, 2004). Consistently, fathers' low education (OR=18.73; 95% CI: 1.54–227.93; p=0.022) was a risk factor of SHS exposure among infants at home (Nadhiroh, Djokosujono, & Utari, 2020).

4. Income

According to Hong et al. (2018), there was a decreased chance of having a urine cotinine level of ≥50 ng/mL if a household income was in the 25–49th percentile (OR 0.82, 95% CI 0.69–0.98, $p = 0.026$), 50–74th percentile (OR 0.64, 95% CI 0.53–0.76, $p < 0.001$), or ≥75th percentile (OR 0.64, 95% CI 0.53–0.77, $p < 0.001$).

5. Knowledge about SHS

According to a research by Hikita et al. (2019), there was a relationship between partners' ratings of their understanding of smoking and passive smoking and the urine cotinine levels of expectant mothers. Partners whose pregnant wives had urine cotinine levels less than 5 ng/ml had significantly higher scores (9.1 ± 3.2 and 7.5 ± 3.3, respectively, $p = 0.049$) than partners whose pregnant wives had urine cotinine levels greater than 100 ng/ml.

6. SHS self-preventive behavior

The lack of SHS self-preventive behavior is a factor influencing increases in urinary nicotine levels. Exposure to SHS measured with urinary nicotine was reported by persons living with one or more smokers who did not have any home smoking ban (Protano et al., 2019). Similarly, the cotinine levels were also impacted by the parents' at-home behaviors. The mean levels of urine cotinine among children whose fathers confirmed smoking in the living room while the child was present, as well as the number of cigarettes the father smoked each day within the home, increased statistically

significantly. Furthermore, cotinine levels were greater in the kids whose moms acknowledged smoking every day than in the kids whose moms did not (r=0.159, p=0.134). The degree of smokiness reported by the parents gradually raised the amount of cotinine in the children, and this relationship was significant (r= 0.324, p=0.002) with the level of smokiness in the home (Jurado et al., 2004). This is similar to the result of another study, which revealed that comparing to those who did not ($p < 0.05$), those who requested others to put out their cigarettes had an odds ratio of 0.34, meaning that they were 0.34 times less inclined to test positive for SHS using urine cotinine (Park, Lee, & Lim, 2019). Likewise, when compared to infants whose parents smoked in the home without any limits, infants whose parents said they only smoked when the newborn was not there were 3.15 times less exposed to cigarette smoke (OR=3.15 95% CI 1.00-9.92, p=0.05) (Baheiraei et al., 2010).

In summary, the literature review has shown that several factors can contribute to the differences in the level of urinary nicotine. These factors range from non-modifiable sociodemographic factors to modifiable factors such as knowledge about SHS and SHS self-preventive behaviors, which can be manipulated to reduce the urinary nicotine level in persons exposed to SHS.

5.3 Measurement of urinary nicotine

Smoking poses a serious danger for many ailments, including SHS. To prevent disease and establish public health policy, precise evaluations of the epidemiology of normal populations linked to current smoking status or exposure to SHS are crucial (Kim, Lee, Lee, Hong, & Kim, 2011). The measurement of urinary nicotine can be performed using a one-step ELISA (enzyme-linked immunosorbent assay) method. In this method, the antigen (cotinine in urine) competes with the colloidal gold-labelled cotinine antibody and the cotinine on nitrocellulose membrane. This reaction is called competitive binding immunoassay. The best period to measure is four to eight hours after exposure, when this biomarker's highest levels are visible (Jones et al., 2013).

On the nitrocellulose membrane test kit, there are three substances as follows:

1. Reporter conjugated antibody for the Test (T) region: It is a cotinine antibody labelled with certain substances such as enzymes, and colloidal gold, which can detect urinary cotinine. The protein-labelled cotinine is absorbed in the conjugated pad on the Sample (S) region. The protein-labelled cotinine is coated on the Test (T) region.

2. Quality control substance in the Control (C) region: This anti-immunoglobulin substance is coated in the control (C) region and serves to detect cotinine antibody that is labelled with certain substances. If the cotinine antibody is detected, a colored line will be generated on the test strip.

To perform the test, the test kit should be placed on level surface. The name of the person being tested or the number of the sample should be written on the test kit. Then, urine sample is slowly dropped vertically onto the Sample (S) region. The test result is read after the waiting period as indicated on the manual.

The results can be read as follows:

1) No detection of urinary cotinine (negative): When the urine sample is dropped onto the Sample (S) region, the urine samples move along the test pad, carrying with it the cotinine antibody that is labelled with certain substances. As the urine samples move along the test pad, the cotinine antibody that is labelled with certain substances will bind with the cotinine coated on the Test (T) region. A purple line will appear in the Test (T) region. Some of the cotinine antibody that is labelled with certain substances will then bind with the anti-immunoglobulin substance coated on the control (C) region. A purple line will also appear in the Control (C) region. The appearance of a purple line in the Test (T) region and a purple line in the control (C) region indicates that no urinary cotinine is detected.

2) Detection of urinary cotinine (positive): When the urine sample is dropped onto the Sample (S) region, the cotinine in the urine will compete to bind with the cotinine antibody labelled with certain substances. As the urine samples move along the test pad, the cotinine antibody labelled with certain substances that has been binded with the cotinine in urine will not be able to bind with the cotinine coated on the T region. However, it will still be able to bind with the anti-immunoglobulin substance coated on the control (C) region. A purple line will appear in the Control (C) region. The

appearance of only one purple line in the Control (C) region without any colored line in the Test (T) region indicates detection of urinary cotinine.

3) Invalid result: Invalid result can be indicated by an appearance of a purple line in the Test (T) region, but no purple line in the Control (C) region, meaning the test kit is expired or lack quality. Moreover, invalid result can be indicated by the absence of purple lines in neither the Test (T) region nor the Control (C) region.

6. Knowledge about SHS

6.1 Definition of knowledge about SHS

Knowledge about SHS refers to understanding about the health effects of SHS (Lee et al., 2019). Similarly, knowledge about SHS refers to the understanding about SHS-related illnesses in children and in adults (Evans et al., 2012). Knowledge about SHS involved the definition and elements of SHS, illnesses brought on by SHS, and detrimental impacts SHS has on pregnancy and the developing fetus. Likewise, a previous study defined knowledge about SHS of pregnant women as involving the definition of SHS, the health risks it poses to expectant mothers and their unborn children, and the establishments where smoking is strictly forbidden both inside and outside of buildings (Vu et al., 2020). Moreover, knowledge about SHS should also include potential complications of exposure to SHS during pregnancy and the effects of SHS exposure on the fetus (Mazloomy Mahmoodabad, Karimiankakolaki, Kazemi, Keshavarz Mohammadi, & Fallahzadeh, 2019).

6.2 Factors influencing knowledge about SHS

1. Age

Pregnant women aged 31–35 years (coef. = 0.51; 95% CI = 0.02–0.99) had significantly higher knowledge scores than those aged 18–25 years (Vu et al., 2020).

2. Education level

Higher educated pregnant women knew more about the dangers of smoking and anti-smoking legislation (r_s= 0.35, $p < 0.01$) than those with lower educational preparation (Chen et al., 2007). Compared to women without any education, those with a secondary education level (AOR = 6.06; 95% CI = 2.56-14.38) or higher secondary education level

(AOR = 8.46; 95% CI = 2.96-24.13) were more inclined to have higher knowledge scores (Rahman et al., 2019). Consistently, another study showed that education level was associated with pregnant women's knowledge about SHS exposure at home ($p<0.05$) (Bayrami et al., 2021).

3. Employment

Pregnant women who were employed (coef. = 0.66; 95% CI = 0.22–1.11) had significantly higher knowledge scores than those who were self-employed (Vu et al., 2020). Similarly, employment status was associated with pregnant women's knowledge about SHS exposure at home ($p<0.05$) (Bayrami et al., 2021).

4. Socioeconomic status

Compared to women in the poor socioeconomic status group, individuals in the medium socioeconomic status group (AOR = 2.82; 95% CI = 1.78-4.47) or affluent SES group (AOR = 4.55; 95% CI = 2.73-7.60) were more inclined to have excellent knowledge scores (Rahman et al., 2019). This is in line with another study which revealed that family income was associated with pregnant women's knowledge about SHS exposure at home ($p<0.05$) (Bayrami et al., 2021).

5. Gestational age

Lower knowledge scores were associated with an increase in gestation week (coef. = −0.02; 95% CI = −0.03; −0.00).

6. Gravida

Knowledge about SHS was higher among primigravida women (mean SD, 55.92 13.86) than multigravida ones (mean = 50.08, SD=14.64) (Chen et al., 2007).

7. Access to SHS information

The knowledge scores of pregnant women who obtained information about SHS from news/magazines were substantially higher (coef. = 0.65; 95% CI = 0.22–1.08) than those of individuals who did not receive such information (Vu et al., 2020).

6.3 Measurement of knowledge about SHS

1. Knowledge of the SHS scale

This scale was developed by Lin et al. (2010) to examine the understanding of the harmful health consequences of SHS exposure and the best measures to prevent SHS. The scale consists of 12 items. Items are rated on a response choice of "true," "false" or

“unknown”. Total possible scores ranges from 0 to 12, with higher scores indicating a better degree of knowledge about SHS. For psychometric properties, the scale was tested for reliability, yielding a Kuder-Richardson 20 valus of 0.69 (Lin et al., 2010).

2. Knowledge about SHS scale

This scale was developed by Yang, Tong, Mao, and Hu (2010). It assesses the definition and elements of SHS, illnesses brought on by SHS, and detrimental impacts SHS has on pregnancy and the developing fetus. The answer to every possible response was either ‘yes’ or ‘no’, and was scored 1 for a correct answer and 0 for an incorrect or missing answer. The scores for each domain mentioned above are 7, 5 and 12, respectively. Total possible score is 24, with higher scores indicating higher knowledge of SHS.

3. Knowledge of SHS scale

This scale was developed by Sun and Frédéric (2020). It is a set of nine statements designed to gauge one's understanding of SHS. A 5-point Likert scale is used to score the items: strongly agree (4), agree (3), don’t know (2), disagree (1), and strongly disagree (0). From the reported responses, a knowledge score is calculated for each subject by summing the scores of the individual components to get the total score. The knowledge score is the result of adding the scores for each of the knowledge items. Total possible score range from 0 to 36, with a higher the score indicating better knowledge of SHS. Cut-off points to categorize knowledge are as follows: good knowledge (score > 27), satisfactory knowledge (score 18–27) or poor knowledge (score <18) (Sun & Frédéric, 2020).

In summary, although there are some instruments available for measuring knowledge about SHS, these instruments were developed in other countries. They assess SHS knowledge in general, but do not cover certain topics about SHS knowledge in Thai context such as the knowledge about Non-Smokers' Health Protection Act, BE 2535 or the 2019 Family Development and Protection Act. Therefore, in this study, the researcher will develop an instrument for measuring knowledge about SHS that is specific to the That context, covering the definition of SHS, symptoms and consequences of exposure to SHS, harmful substances in SHS, diseases and health problems caused by SHS, laws related to the protection of non-smokers and the 2019 Family Development and Protection Act.

7. SHS self-preventive behavior

7.1 Definition of SHS self-preventive behavior

SHS self-preventive behavior has been defined in several studies. Firstly, Martinelli (1999) defined self-preventive behavior of SHS as the actions or practices to keep oneself from being exposed to the tobacco smoke of other people by refusing to enter a situation with tobacco smoke, controlling exposure of SHS by asking smokers to stop smoking, and trying to breathe in as little tobacco smoke as possible in case avoidance is impossible. Similarly, self-preventive behavior of SHS was described by Ding et al. (2010) as the action of not entering a place with tobacco smoke, walking away from smokers, and asking smokers to stop smoking. According to a recent study, self-preventive practice on SHS was defined as the steps taken by the respondents to protect their own health and the health of those around them at SHS. These actions included proactive preventive practice which referred to self-empowerment, or taking charge of one's own choices and behaviors to avoid self-exposure to SHS, and individual ability to influence others or interfere in a scenario to avoid SHS exposure (bin Nik Mahdi & binti Abd Aziz, 2020). In Thailand, self-preventive behavior of SHS exposure refers to both aggressive and polite actions to avoid exposure to tobacco smoke in household.

For pregnant women, the definitions of self-preventive behavior for SHS exposure are similar. Self-preventive behavior of SHS exposure involved pregnant women's SHS avoidance behaviors by leaving smoke-filled rooms right away or asking people to quit smoking (Lai et al., 2013). The preventive measures pregnant women should take to avoid exposure to SHS in indoor environments are opening a window to improve ventilation, walking away, and dissuade smokers not to smoke (Xu et al., 2017). According to a study by Vu et al. (2020) among pregnant women in Vietnam, self-preventive behavior of SHS was defined as pregnant women's practice of reminding smokers regarding the ban on smoking in public places, workplaces, and homes. The SHS self-preventive behaviors for pregnant women include reminding smokers not to smoke at home, performing action to stop smoking behavior at home by calling for support from surrounding people and requiring smokers to smoke in a separate room (Vu et al., 2020).

In this study, self-preventive behavior of SHS refers to the actions of pregnant women to keep themselves and their fetus from exposure to tobacco smoke from other people both inside and outside the house. These actions include walking away or refusing to be in a situation where there is tobacco smoke, not allowing people to smoke in their presence, not visiting places with regular smoking, asking smokers to stop smoking in their presence, trying to breathe in as little tobacco smoke as possible, wearing medical mask, and washing clothes to remove tobacco odor.

7.2 Factors influencing self-preventive behavior of SHS exposure

From the literature review, several factors contribute to the SHS self-preventive behavior. These factors include sociodemographic characteristics, as well as self-efficacy, perception, attitude, and social support. The details are elaborated as follows:

1. Age

Several studies demonstrated an association between age and SHS self-preventive behaviors. A one-year rise in age in an adult increases the likelihood of having inadequate preventive practices on SHS by 1.0206 times (95%CI:1.0004,1.0412, p=0.046) (bin Nik Mahdi & binti Abd Aziz, 2020). In Thailand, age was significantly and positively related to SHS avoidance behavior in women with smoking family members ($r = 0.116$, $p < .05$) (Prathumsuwan et al., 2019).In pregnant women context, maternal age was positively associated with avoidance behavior of pregnant women ($r = 0.16$, $p < 0.01$) (Chen et al., 2007).

2. Gender

Due to culturally prescribed gender roles, women are more likely to tolerate men who smoke and men's social customs of smoking in order to preserve their identities as devoted spouses, filial daughters or in-laws, and responsible family members who put the needs of the family before their own personal convictions (Mao, Bristow, & Robinson, 2012). Compared to male adults, female adults have 2.0644 times higher likelihood of having inadequate preventative practices on SHS (95%CI:1.0753,3.9635, p=0.029) (bin Nik Mahdi & binti Abd Aziz, 2020).

3. Education level

Higher educated pregnant women avoided tobacco smoke in the environment with more practical measures ($r_s = 0.43$, $p < 0.01$) than lower educated pregnant women (Chen et al., 2007). Education level was significantly related to SHS avoidance behavior in Thai women with smoking family members ($r = 0.128$, $p < .05$) (Prathumsuwan et al., 2019).

4. Residential area

According to a study among pregnant women in Vietnam, A lower practice score in reminding smokers of the smoke-free rule at home, work, and public locations was linked to residing in a rural area (coef. = −0.60; 95% CI = −1.16–−0.04) (Vu et al., 2020).

5. Employment

Pregnant women who were employed (mean (SD) = 3.13 (0.47)) outperformed those who were jobless in avoiding secondhand tobacco smoke (mean (SD) = 2.99 (0.59)) ($t = -2.18$, $p < 0.05$) (Chen et al., 2007). In contrast, a lower practice score in reminding smokers of the smoke-free law at home, workplace, and public locations was linked to being unemployed or a housewife (coef. = −1.08; 95% CI = −1.76–−0.39) (Vu et al., 2020).

6. Income

Income was significantly related to SHS avoidance behavior in Thai women with smoking family members ($r = 0.154$, $p < .05$) (Prathumsuwan et al., 2019).

7. Knowledge of SHS

Mothers who scored highly on SHS knowledge ($\beta = 0.082$, $p < 0.01$) were found to be more inclined to keep away from SHS (Lin et al., 2010). A study with pregnant women in Vietnam showed that higher scores on the practice of reminding smokers about the smoke-free law at home, at work, and in public spaces were associated with higher knowledge scores (coef. = 0.13; 95% CI = 0.03–0.24) (Vu et al., 2020). This is in line with another recent reporting that knowledge had a significant and positive relationship with efforts to prevent SHS exposure at home among Iranian pregnant women ($r=0.403$, $p<0.001$) (Bayrami et al., 2021). In Thailand, women's knowledge and understanding of SHS ($r = .138$, $p <0.05$) and communication skills about SHS

prevention (r = .202, p <0.05) was found to be significant factors related to SHS self-preventive behavior (Tanasuk et al., 2020)

8. Self-efficacy

Based on social cognitive theory, self-efficacy can predict behaviors (Bandura, 1986). Avoidance of SHS was significantly predicted by one's confidence in their ability to limit smoking in their living environment. When someone utilizes and carries out knowledge, self-efficacy serves as a mediator that encourages action. According to Lin et al. (2010), mothers who had a high level of self-efficacy in avoiding SHS ($\beta = 0.397$, $p < 0.001$) were shown to have a higher likelihood of avoiding SHS. Pregnant women's conduct in avoiding secondhand tobacco smoke was significantly predicted by their self-efficacy of resistance to SHS (F 25.92, $p < 0.000$) (Chen et al., 2007). This is in line with a study by Lee et al. (2018) who found that higher self-efficacy was related to higher secondhand smoke avoidance behavior (OR = 1.170, 95% CI 1.054–1.300, p = 0.003). Self-efficacy of SHS avoidance behavior was significantly related to SHS avoidance behavior in Thai women with smoking family members ($r = 0.500$, $p < .05$) (Prathumsuwan et al., 2019).

9. Perception

Perceived fetal health risks was a critical predictor of pregnant women's anti-smoking behaviors. In comparison to women who took no preventive behavior against SHS, pregnant women who adopted preventive behavior against SHS at home had more risk perception of threat susceptibility ($x_{\text{Avoid passive smoking}} = 6.49 > x_{\text{do nothing}} = 5.92$, $p < 0.01$; one-tailed), more risk perception of the severity of the threats ($x_{\text{Avoid passive smoking}} = 6.32 > x_{\text{do nothing}} = 5.77$, $p < 0.05$; one-tailed), and more overall perceived risks ($x_{\text{Avoid passive smoking}} = 6.40 > x_{\text{do nothing}} = 5.84$, $p < 0.01$; one-tailed) (Lai et al., 2013). Similar findings were also reported in Thailand. Perceived benefits of SHS avoidance ($r = 0.313$, $p < .05$) was positively related to SHS avoidance behavior in Thai women with smoking family members while perceived barriers of SHS avoidance ($r = -0.112$, $p < .05$) was negatively related to SHS avoidance behavior (Prathumsuwan et al., 2019). This is in line with another recent study, which demonstrated that perceived threats from SHS exposure (r = 0.27), perceived susceptibility to SHS exposure (r = 0.30), perceived severity of SHS exposure (r = 0.31), and perceived benefits of SHS prevention (r = 0.14) were positively correlated with SHS prevention among women with smoking

family members, while perceived barriers (r = -0.13) were negatively correlated with SHS prevention (p <.05) (Jantarasiew et al., 2021).

10. Attitude

When compared to adults who have a satisfactory attitude regarding SHS, those who have an unsatisfactory attitude toward SHS have 4.1871 times the likelihood of having an unsatisfactory preventative practice on SHS (95%CI:2.0955,8.3665, p=<0.001) (bin Nik Mahdi & binti Abd Aziz, 2020). It was found that mothers who had good attitudes (β = 0.274, p < 0.001) about avoiding SHS (β = 0.397, p < 0.001) were more likely to do so (Lin et al., 2010). This is congruent with another study where pregnant women who adopted preventive behavior against SHS at home had more positive attitudes toward avoiding smoking during pregnancy ($x_{\text{Avoid passive smoking}}$= 6.62 > $x_{\text{do nothing}}$ = 6.16, $p < 0.05$; one-tailed) compared with women who took no preventive behavior against SHS (Lai et al., 2013).

11. Social support

Women who claimed to have inadequate social support to avoid ETS exposure had lower likelihood of avoiding SHS exposure (OR= 0.50; 95% CI=0.30, 0.85; p=0.01) (Blake et al., 2009).

In summary, the literature review shows many factors influencing SHS self-preventive behavior. In particular, the important modifiable factors are self-efficacy of SHS prevention and knowledge about SHS. Therefore, strategies for enhancing these factors are needed to develop effective interventions to enhance SHS self-preventive behavior.

7.3 Measurement of SHS self-preventive behavior

1. Martinelli Scale from Avoidance of Environmental Tobacco Smoke

The Martinelli scale was developed by Martinelli (1998) to examine the measures that could be taken to prevent ETS, such as allowing the mother's car and house to be used for smoking, avoiding the company of smokers, staying in the smoking area of a restaurant, and so on. Respondents use a four-point Likert scale, from "Almost never true" to "Almost always true," to indicate how much they agree with each statement. Higher values indicate more avoidance of ETS. An index ranging from one to four was created by averaging the replies for each question, which served as the composite score

for the analysis. The internal consistency of the questionnaire, which was evaluated in a sample of moms (Mage = 36), was 0.81 (Martinelli, 1998).

In Thailand, the Martinelli scale was adapted by Prathumsuwan et al. (2019) to measure SHS avoidance behavior of women with smoking family members. The adapted version consisted of 3 dimensions: refusing to be in SHS situation, controlling SHS exposure, and being in situations where SHS is unavoidable. Items are rated on a 4-point Likert scale from 1 (never practice) to 4 (practice every time). Scores are interpreted into 3 levels: low avoidance behavior (a mean score of 1.00-2.00), moderate avoidance (a mean score of 2.01-3.00), and high avoidance (a mean score of 3.01-4.00) (Prathumsuwan et al., 2019)

2. An avoidance SHS scale

This scale was adapted by Lin et al. (2010) from Martinelli (1998) was used to assess the mothers' SHS avoidance behavior. The scale used nine different SHS exposure scenarios, such as at home and in other locations, to evaluate the participants' behavior toward SHS. The following general behaviors were examples of SHS avoidance behavior: (1) refusing to enter a space where SHS is present; (2) urging smokers to quit; and (3) reducing exposure when it is not possible to completely remove oneself from SHS, such as by opening a window to let in some of the room's smoke. The responses were recorded on a five-point Likert scale, with 1 denoting no response and 5 denoting extensive response. Higher cumulative scores indicated better conduct to avoid SHS level, with values ranging from 9 to 45. This scale's Cronbach's alpha coefficient was 0.82.

3. Practices about SHS questionnaire

This questionnaire was created by Vu et al. (2020) for measuring practices about SHS among pregnant women. Expectant mothers are questioned about whether or not they informed smokers of the law against smoking in public places, workplaces, and homes. Every item has a rating between 0 and 4, which stands for never to always. In addition, they are requested to disclose any steps they have made to stop people from smoking in these areas. For each question, mothers will receive one point if they have. The entire practice score ranges from 0 to 15, where higher numbers indicate more practice. 0.75 was the Cronbach's alpha score (Vu et al., 2020).

In summary, although there are existing instruments for measuring SHS self-preventive behavior, most of the instruments were developed in other countries and were not specific to SHS self-preventive behavior of pregnant women in Thai context. Therefore, in this study, the researcher developed an instrument for measuring SHS self-preventive behavior that covers all important areas of SHS preventive behaviors among Thai pregnant women to prevent themselves and their fetus from exposure to tobacco smoke from others both inside and outside the house by walking away, refusing to be in smoke-filled situation, not allowing people to smoke in their presence, avoiding going to places where people regularly smoke, asking smokers to stop smoking, breathing in as little SHS as possible, wearing a medical mask, and washing clothes to eliminate SHS.

8. Social Cognitive Theory

Social Cognitive Theory (SCT) explains and predicts health behavior and describes methods to change health behavior. According to SCT, human behavior is conceptualized based on the triadic reciprocal determinism as a result of interactions among personal factors (P) such as biological properties, beliefs, expectation, emotions, and thoughts; environmental factors (E) such as social influences, and the behavior (B) itself (Bandura, 1977). Behavior, cognition and other personal traits, and environmental effects all function as interacting determinants that impact each other bidirectionally in this paradigm of reciprocal causation.

The P → B of reciprocal causation involves the interactions between thoughts, affect and action. Behaviors take shape and direction from expectations, beliefs, self-perceptions, objectives, and intentions. People's thoughts, beliefs, and feelings influence their actions (Bandura, 1986). Their behavior in turn influences their emotional states and thinking processes in part.

The E → P segment of reciprocal causation involves the interactive relations between personal characteristics and environmental influences. Social influences that transmit information and elicit emotional responses through modeling, education, and social persuasion shape and alter human expectations, beliefs, emotional bents, and cognitive abilities (Bandura, 1986). Apart from their words and deeds, people also elicit

distinct responses from their social surroundings based on their physical attributes, such as age, size, race, sex, and physical attractiveness.

The B → E segment of reciprocal causation in the triadic system is the two-way influences between behavior and the environments. Everyday transactions involve conduct that both modifies the environment and is modified by the situations it produces.

It should be noted that a person's surroundings not only shapes their thoughts, but their actions also have an impact on their surroundings. Put differently, an individual's thoughts, feelings, and conduct are influenced by their surroundings, which further affects the environment, and so on. SCT revolves around the process of knowledge acquisition or learning directly correlated to the observation of models. SCT provides opportunities for the performance of behavior through instilling expectations, self-efficacy, and using observational learning and other reinforcements. People pick up knowledge from watching others, and in a reciprocal triadic interaction, the environment, behavior, and cognition serve as the main determinants of development. Every action that is observed has the power to alter someone's cognitive processes. In a similar vein, upbringing can have an impact on an individual's subsequent habits. Therefore, to understand and enhance the SHS self-preventive behavior among pregnant women, this review will take into account observational learning, self-regulation, and self-efficacy that are all important to human's behaviors.

Observational learning

Learning from models can take many different forms, such as the development of new behavioral patterns, norms for evaluation, cognitive skills, and generative rules for the creation of novel behavioral forms. Through observational learning, individuals can watch and study the acts of others, and then mimic similar behaviors. This is frequently demonstrated by "modeling" certain behaviors. People can successfully perform an action if they witness another person demonstrating it. When an observer observes the behaviors and events that the model models, they can learn through observation (Bandura, 1977). Vicarious reinforcement has an instructive role that helps with mastery of the rewarded task and suppression of the punished responses. The internal or external reactions to an individual's activity that influence the probability of the behavior continuing or ceasing are referred to as reinforcement. In general, learners find rewarded

modeling more appealing than modeling on its own. When models are commended for their behavior rather than when they are not acknowledged for it, observers are more alert (Bandura, 1989).

Observational learning is governed by four component sub-functions (Bandura, 1971) as follows:

1) Attention: People's attentional processes dictate what they see among the abundance of modeling effects and what information they deduce from it. If people do not pay attention to or recognize the key components of the model's behavior, they will not be able to learn very much from observation. Unless observers pay attention to what is going on around them, they will not be able to learn. Both the model's attributes—such as how much a person loves or identifies with the model—and the observer's attributes—such as expectations or emotional arousal—have an impact on this process.

2) Retention: The process of actively changing and organizing the data presented by modeled experiences into guidelines and notions for memory representation is known as retention. If someone has no recall of a model's behavior, they cannot be greatly influenced by observing it. It is not enough for observers to just identify the behavior they see; they also need to recall it later. This process relies on the observer's capacity to mentally or physically practice the model's activities, as well as to encode or organize the knowledge in a way that is simple to recall. The remarkable rapidity of observational learning and long-term retention of the modeled contents are specifically explained by verbal coding of the observed occurrences. Instead of being predominantly visual, the majority of cognitive processes that control behavior are verbal. Coding helps with observational learning and retention since it stores a lot of information in a way that is easy to read and understand. Following the conversion of the modeled actions into visual aids and easily accessible spoken symbols, these memory codes function as a roadmap for reproducing matched replies in subsequence. Apart from symbolic coding, rehearsal is a crucial memory enhancer. Individuals who practice modeled behaviors either mentally or in real life are far less inclined to forget them than those who do not reflect on or put what they have observed into practice (Bandura & Jeffery, 1971).

3) Production: This is the process of behavioral production that converts ideas that are symbolic into actions that are suitable. This is accomplished by adjusting behavioral enactments until they align with the internal conception of the activity through a

conception-matching process. A person must assemble a predetermined set of answers in accordance with the modeled patterns in order to accomplish behavioral reproduction. Whether or not a person has mastered the necessary abilities will determine how much observational learning they are able to demonstrate behaviorally. If they have the component parts, they can readily combine them to create new behavioral patterns; nevertheless, behavioral reproduction will be flawed if the response components are absent. For this reason, modeling and practice are necessary to first acquire the subskills needed for complex performances. Replicating the behavior allows someone to get feedback from others and modify how they represent themselves for future use.

4) Motivation: Reinforcement and motivational processes are involved in this stage. People can learn, hold onto, and be capable of performing the modeled behavior with ability; yet, if the behavior is not accepted or well received, the learning may not always translate into overt performance. Positive reinforcement quickly converts observational learning—which had previously remained unexpressed—into action (Bandura, 1965). By dictating what people pay attention to and how actively they code and practice what they have observed, reinforcement influences can also impact the degree of observational learning in addition to directing the overt presentation of matching behavior. As a result, the presence of models—even well-known ones—does not guarantee that other people would adopt their behavioral patterns. Most individuals will ultimately receive matching answers from a model who consistently demonstrates desirable behaviors, gives others instructions to replicate them, physically prompts the behavior when it doesn't occur, and then offers strong incentives.

Self-efficacy

SCT also focuses on increasing a person’s behavioral capability such as knowledge and skills, and self-efficacy to engage in health behaviors. Self-efficacy refers to the degree to which someone feels confident in their capacity to carry out an action. Self-efficacy is impacted by a person's unique abilities, other personal characteristics, and contextual elements (barriers and facilitators) (Bandura, 1997).

Numerous ways exist in which a high sense of effectiveness improves human success and well-being. Individuals who possess a high level of confidence in their talents view challenging jobs as opportunities to learn and grow rather than as dangers to be

avoided. This kind of effective perspective encourages innate curiosity and intense engagement with tasks. They establish difficult objectives for themselves and remain steadfastly committed to them. In the midst of failure, they intensify and persevere. After failures or losses, they swiftly regain their sense of effectiveness. They blame lack of effort or inadequate, attainable knowledge and abilities for failure. They approach potentially dangerous circumstances with confidence that they can handle them (Bandura, 1994).

Four main strategies are identified by SCT for the development of knowledge and self-efficacy as follows (Bandura, 2004):

First, mastery experience refers to firsthand accounts of controlling endeavors toward performance achievements. It makes it possible for the individual to do desirable actions in an achievable but progressively more difficult way. The biggest factor influencing self-efficacy belief is the sense of performance mastery. Achievements bolster a strong sense of self-efficacy. It is undermined by failures, particularly when they happen before a strong sense of efficacy develops. People who only have simple accomplishments develop an expectation of speedy outcomes and become easily disheartened by failure. Experience conquering challenges with tenacious effort is necessary for developing a robust sense of efficacy. A useful lesson that can be learned from some losses and challenges in human endeavors is that success typically needs consistent effort. People who are confident in their ability to succeed persevere in the face of difficulty and bounce back from failures fast. They become stronger from adversity by persevering through difficult times (Bandura, 1994).

Second, symbolic modeling through vicarious experiences involves showing the person that others like themselves can do it. This needs to include thorough explanations of the little actions done to accomplish a difficult goal. Seeing others who are similar to oneself achieve through perseverance increases observers' confidence that they are also capable of mastering similar tasks and succeeding. Perceived likeness to the models has a substantial influence on how modeling affects perceived self-efficacy. The models' accomplishments are more convincing the higher the anticipated similarity. The conduct and outcomes of the models have little effect on people's perceived self-efficacy if they regard the models to be extremely different from themselves. Modeling influences offer more than just a societal norm by which to measure one's own competence. People look

for competent role models who have the skills they want. Competent models transfer knowledge and teach observers practical skills and methods for handling environmental demands through their behavior and expressed ways of thinking. Getting better tools increases one's sense of self-efficacy (Bandura, 1994).

Third, emotional arousal that occurs when someone contemplates doing something provides clues as to the likelihood of success or failure. According to Pajares (2002), stress, anxiety, worry, and fear all have a negative impact on self-efficacy and might result in a self-fulfilling prophesy of failure or an inability to do the tasks that cause fear. Emotional arousal brought on by stressful circumstances influences a person's perceived self-efficacy in handling the circumstance (Bandura & Adams, 1997). Thus, ensuring that people are well-rested and at ease before adopting a new habit is essential to improving both physical and emotional states. This can involve making an attempt to lessen anxiety and sadness while fostering happy feelings, such as when "fear" is reframed as "excitement."

Lastly, verbal persuasion involves assuring the person that they are capable of doing it. Encouraging words can increase understanding and self-assurance to the point when the first steps toward changing behavior are taken. People's conviction that they possess the skills necessary for success can be reinforced through verbal persuasion. When obstacles arise, those who are verbally convinced that they are capable of mastering a certain activity are more likely to mobilize and maintain their effort than those who hold self-doubt and focus on their shortcomings. According to Bandura (1994), convincing increases in perceived self-efficacy can encourage people to put in the necessary effort to succeed, which in turn fosters skill development and a sense of self- efficacy.

Self-regulation

The notion that individuals can self-regulate their motivation, thoughts, feelings, and behaviors is fundamental to SCT. Self-regulation is the process by which individuals manage and direct their behavior. In order to achieve personal goals, it views the individual as goal-directed and actively engaged in creating useful thought and behavior patterns in response to external circumstances. The process of effectively regulating oneself involves performers keeping an eye on the performance environment, creating useful task strategies, executing those plans with expertise, and tracking the outcomes.

People are capable of self-directed behavioral changes because they possess self-regulatory mechanisms. Self-regulation consists of three sub-processes (Bandura, 1986) as follows:

1) Self-observation: Deliberate attention to certain facets of one's own conduct is known as self-observation, or self-monitoring. While essential, self-observation is insufficient for long-term self-regulation on its own. Persons will exert no influence on their own behavior unless they are interested in what they are doing. Thus, self-regulation begins with observing oneself because the success in self-regulation is partially attributable to informativeness, regularity, and accuracy of observation. During self-observation, persons should consider four aspects, including informativeness, regularity, proximity, and accuracy.

2) Judgment process: It refers to evaluating current performance against one's objective. These comparisons let one track their progress toward their goals and can inspire motivation for future work. The information obtained from self-observation does not greatly influence behavior change unless the persons judge whether or not that information is satisfactory based on the personal standards. Both direct instruction and other people's evaluations of one's behaviors can help one acquire standards. Standards in this mode of transmission are derived from the powerful individuals in a person's social circle. In addition, judgment process is influenced by referential performances that include standard norms, social comparison, self-comparison, and collective comparison.

3) Self-reaction: Goal progress can elicit tangible or evaluative self-reactions. Beliefs about progress are involved in evaluative reactions. Both self-observation and judgment process lead to self-reaction, depending on the incentives that can be tangible outcomes or satisfaction. Personal standards also serves as the criteria that influences the degree of one’s maintenance of behavior.

Application of social cognitive theory in research

From the literature review, SCT has been extensively used in research to develop interventions related to SHS in various populations. SCT was used by Lee (2008) in a pilot study to reduce women’s exposure to passive smoking among pregnant women in China based on the SCT’s view that emphasizes the dynamic, continuing processes in which personal characteristics interact with environmental elements, like family and

friends, and the physical environment, looking beyond the individual. The outcomes of the intervention demonstrated a noteworthy rise in understanding, a shift in perspectives about more severe disapproval, and a higher propensity to behave assertively if SHS was present in the household.

Then, Yang et al. (2015) developed and examined the effect of a prenatal health education intervention to increase self-reported “no SHS exposure” before and 3 months after birth. Results from the post-intervention analysis revealed a substantial rise in knowledge, a shift in attitudes toward more severe disapproval, and a higher propensity for assertive behavior when SHS was present in the household.

In addition, Alagiyawanna et al. (2017) used SCT to develop the multi- component program to reduce household exposure to second-hand tobacco smoke among women in Sri Lanka. SCT components included in the program were observational learning (selecting role models of women living in smoke free houses, behavioral capacity (strengthening women's knowledge of what to do in the event that someone smokes inside the house and how to make use of their right to live smoke-free), and self-efficacy (Women are encouraged by volunteers and public health midwives to set goals for their households to become smoke-free, and in doing so, they acknowledge that this is a social norm and a value). From the results, a far smaller percentage of women in the intervention group than in the control group reported SHS exposure in their homes within seven days after the intervention.

In Thailand, no research using SCT with pregnant women has been found. SCT was used in a study by Intarut, Chongsuvivatwong, and McNeil (2016) to guide the development of a school-based smoke free home program in empowering the mother and child to reduce SHS exposure by targeting behavioral capacity, self-efficacy, and outcome expectations related to creating a smoke free home and smoking behaviors. However, from the results, it was found that the intervention could lead to a smoke-free home. Attitude, knowledge and self-confidence on creating a smoke-free home, and self-confidence in avoidance of SHS exposure and persuading smokers to not smoke in their home were significantly improved.

Recently, there was a quasi-experimental study by Kraturerk, Benjakul, Kengganpanich, and Kengganpanich (2020) to examine the effects of smoking cessation program based on SCT among Naval students in the Royal Thai Navy. The program

consisted of activities for creating smoke-free zone environments, knowledge and skills training to quit smoking, guiding their self-efficacy, and outcome expectation of quitting smoking. The results revealed that, at the 4th and 8th weeks after the smoking cessation program, the experimental group had significantly increased their knowledge of quitting smoking, perception on self-efficacy, outcome expectation to quit smoking, and able to quit smoking continuously for more than seven days higher than at the pre-intervention phase than the comparison group $p < .001$. This indicates that the application of SCT could lead to successful smoking cessation.

In summary, from the literature review, SCT has been used extensively as a theoretical basis for developing programs about smoking cessation and secondhand smoke in general populations and in pregnant women. The application of SCT helps to guide the components of the program to foster SHS self-preventive behaviors especially through observational learning, self-efficacy, and behavioral capacity.

9. Conceptual framework

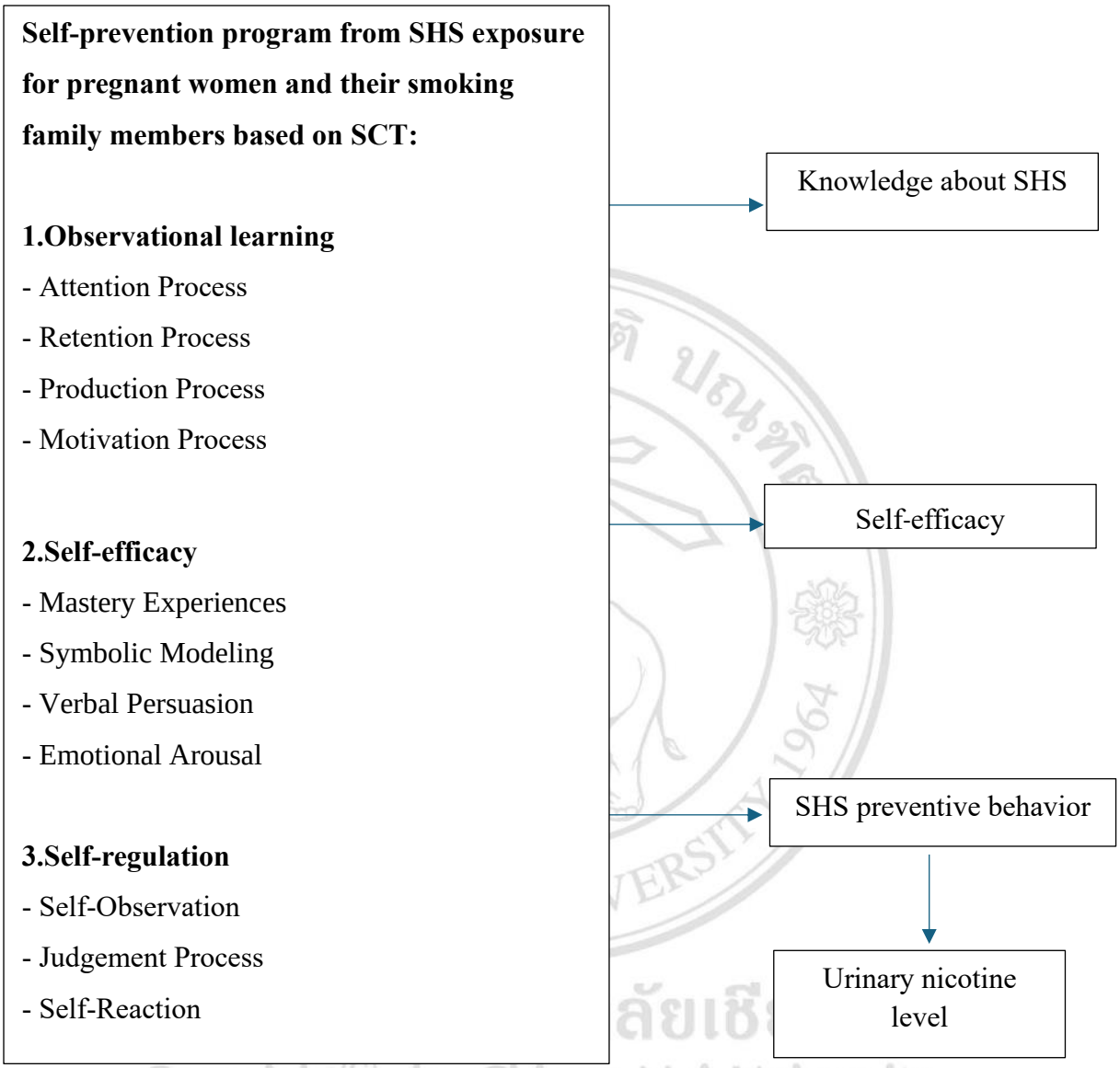


Figure 2.1 Theoretical Framework of the Study

CHAPTER 3

Methodology

Research design

This study employed a mixed methods design with qualitative and quantitative approaches.

Scope of study

This study used a mixed methods design with qualitative and quantitative approaches. The qualitative part was conducted using in-depth interviews. The findings were used to develop the SHS self-prevention program of pregnant women with smoking family members. For the quantitative part, a randomized controlled study was conducted. Participants were pregnant women with no more than 16 weeks gestational age who lived in Suphanburi province with a smoking family member. Participants were assigned into an experimental arm or a control arm. Data were collected between July and August 2022.

Process of the study

This study used in-depth interviews to establish a better understanding of the needs and obstacles of the target population. The guide included questions and queries on the following themes: the hazards of smoking and SHS exposure, the Parent School of the Ministry of Public Health, experience of SHS exposure, self-preventive behaviors towards SHS, and knowledge regarding the health effects of SHS on pregnant women and children. A single health educator will perform 50-minute in-depth interviews with 10 pregnant women and 10 smoking family members. The pregnant women were asked to elaborate on their experience with SHS exposure and to describe how they felt and acted around SHS, including what barriers they had confronted and what kind of help they would like to have. They were also asked specifically about SHS and the health of their baby. Each in-depth interviews lasted about 50 minutes.

The findings from the in-depth interviews were used to develop the self-prevention program from exposure to SHS for pregnant women guided by the social cognitive theory (SCT), which consists of observational learning, self-efficacy, and self-regulation. The program lasted 12 weeks to provide education, counselling, and telephone follow-up. The program outcomes included SHS knowledge, SHS self-preventive behavior, self-efficacy for SHS self-prevention, and the level of urinary nicotine. The program outcomes were assessed before and after receiving the program, and one month after the program ended. Then, pregnant women and staffs were interviewed after participating in the self-prevention program from exposure to secondhand smoke (SHS). The process of this study is shown in Figure 3.1.

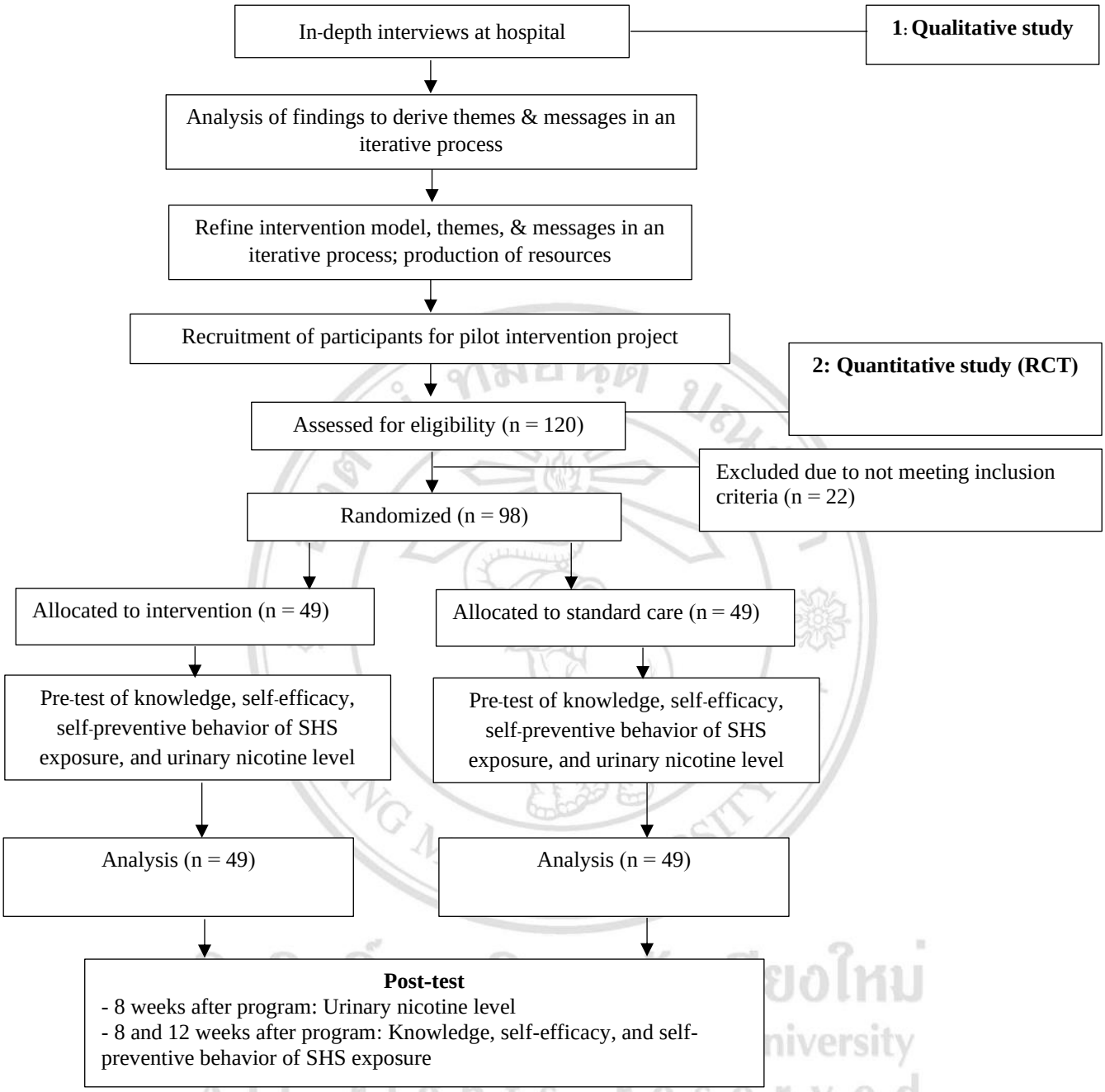


Figure 3.1 Flow diagram of the study

Population and Sample

Qualitative Study Population

The population consisted of persons involved in the antenatal care in Suphanburi province, including three groups: 1) staffs in antenatal care, 2) pregnant women who visited antenatal clinic, and 3) smoking family members.

The first group included the staffs in antenatal care to participate in the structured in-depth interviews to analyze the issues and needs for the self-prevention program from exposure to SHS for pregnant women. The details of participants are as follows:

- Structured in-depth interviews consisted of one Deputy Doctor of Provincial Public Health Office in Administration and one staff in antenatal care of the Provincial Public Health Office, totaling two participants.

The second group included pregnant women who visited antenatal clinic in Suphanburi province to participate in interviews to elicit information about the barriers to self-prevention of SHS exposure in the household, and the needs for the self-prevention program from exposure to SHS for pregnant women.

The third group consisted of smoking family members in Suphanburi province to participate in interviews to elicit information about the issues of smoking in the household and the needs for the self-prevention program from exposure to SHS for pregnant women.

Sample

The sample was recruited using purposive sampling based on inclusion criteria. The detail of sample recruitment in each group is as follows:

The first group consisted of 9 staffs in antenatal care (1 administrative deputy director, 4 physicians in obstetric practice and 4 nurses in antenatal care). They were selected using purposive sampling method to participate in the in-depth interview. The inclusion criteria were as follows: working in a hospital in Suphanburi province; having experience working in antenatal clinic; and willing to participate in the self-prevention program from exposure to SHS for pregnant women and smoking family members.

The second group consisted of 17 pregnant women where data saturation was reached. They shared their opinions and needs for the self-prevention program from

exposure to SHS for pregnant women, which were used for the program development. The inclusion criteria were as follows: visiting antenatal clinic in Suphanburi province; age 18 and over; gestational age of less than 16 weeks; non-smoker; no complications or comorbidity during pregnancy; living with a smoking family member; able to provide information for the development of the program; and willing to participate in the process of the self-prevention program from exposure to SHS for pregnant women and their smoking family members.

The third group consisted of 14 smoking family members in Suphanburi province where data saturation was reached. They shared their opinions and needs for the self-prevention program from exposure to SHS, which were used for the program development. The inclusion criteria were as follows: living with pregnant women, able to provide information for the development of the program; and willing to participate in the process of the self-prevention program from exposure to SHS for pregnant women and their smoking family members.

Qualitative Instrument Development

1) Qualitative research instruments

The qualitative research instruments were developed based on the literature review. The instruments were as follows:

1. Demographic data interview questions

1.1 Staffs involved in antenatal care: There were questions about gender, age, monthly income, education, current organization, and duration of working in antenatal care.

1.2 Administrative staffs and staffs in charge of antenatal care: There were questions about gender, age, monthly income, education, current organization, and duration of working in antenatal care.

1.3 Pregnant women: There were questions about occupation, age, monthly, income, and education.

1.4 Smoking family members: There were questions about gender, occupation, age, monthly income, education, age at smoking onset, type of smoked cigarettes, duration since of smoking onset, number of cigarettes smoked per day, and areas of smoking in the household.

2. The structured in-depth interview guide

2.1 Structured in-depth interview guide for administrative staff and staff in charge of tobacco work in the provincial health office and hospital were developed by the researcher. It consisted of open-ended questions to elicit opinion about the smoking-related policy, parent school manual, and the needs for the self-prevention program from exposure to SHS for pregnant women, as well as relevant suggestions. This information was used as a part of the program development.

2.2 Structured in-depth interview guide for pregnant women was developed by the researcher. It consisted of open-ended questions for a structured interview about the problems related to smoking family members, barriers to avoiding SHS exposure, the 2019 Family Development and Protection Act about household smoking ban, parent school scheme by the Ministry of Public Health, measurement of nicotine, and the needs for the self-prevention program from exposure to SHS for pregnant women, as well as relevant suggestions. This information was used as a part of the program development.

2.3 Structured in-depth interview guide for smoking family members was developed by the researcher. It consisted of open-ended questions for a structured interview about the amount of family member's smoking, areas for smoking in the house, the 2019 Family Development and Protection Act about household smoking ban, harms and impacts of smoking in the presence of pregnant women, barriers to smoking cessation and reduction, and the needs for the self-prevention program from exposure to SHS for pregnant women and smoking family members. This information was used as a part of the program development.

3. Instruments for procedure

3.1 Voice recording devices for interview, including audio recorders and mobile phones

3.2 Materials for note taking during interview, including pens, pencils, and paper

3.3 Devices for capturing visual images during interview, including mobile phones and cameras

Quality testing of research instruments

Validity and reliability

Validity of qualitative instruments

The researcher examined the content validity of the qualitative instruments, including the structured in-depth interview guide for administrative staff and staff in charge of tobacco work in the provincial health office and hospital, the structured in-depth interview guide for pregnant women, and the structured in-depth interview guide for smoking family members using a panel of five experts. The experts included two experts in pregnant women care in community, two obstetricians, and one experts in tobacco smoke. They will examine the appropriateness of wording, clarity, accuracy of questions, and content coverage. The instruments were revised following the experts' suggestions.

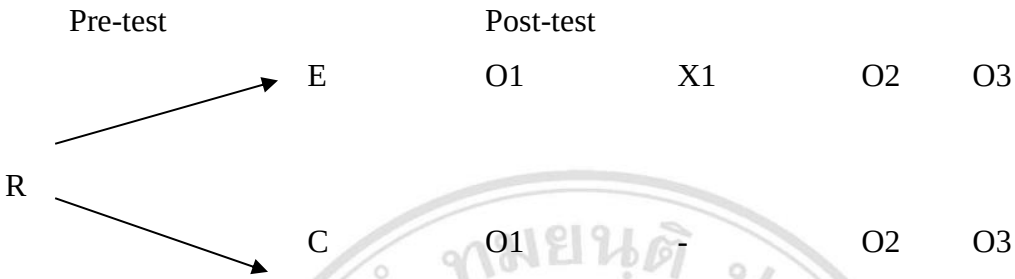
Reliability of qualitative instruments

The researcher tested the demographic data interview questions, the structured in-depth interview guide for administrative staff and staff in charge of tobacco work in the provincial health office and hospital, the structured in-depth interview guide for pregnant women, and the structured in-depth interview guide for smoking family members with five subjects who have similar characteristics to the study sample, including a staff in antenatal care, a physician in obstetric practice, a nurse in antenatal care, a pregnant woman, and a smoking family member. These instruments were revised following the results of the test.

2. Experimental Study

This study was a pretest-posttest randomized controlled trial (RCT) to examine the effect of the program. The participants were randomized into two arms: one arm receiving the program while the other receiving standard care. Pretest was conducted

before the implementation of the program. Posttest was conducted at 8 and 12 weeks after the end of the program.



Note:

R = Randomization E = Experimental arm C = Control arm

X1 = Self-prevention program from exposure to secondhand smoke (SHS) for pregnant women and their smoking family members

O1 = Measurement of knowledge, self-efficacy, self-preventive behavior of SHS exposure, and urinary nicotine level of pregnant women before the program

O2 = Measurement of knowledge, self-efficacy, self-preventive behavior of SHS exposure, and urinary nicotine level of pregnant women at 8 weeks after the end of the program

O3 = Measurement of knowledge, self-efficacy, and self-preventive behavior of SHS exposure of pregnant women at 12 weeks after the end of the program

Population

The population included 3,894 pregnant women who visited antenatal care in Suphanburi in the fiscal year 2021.

Sample

The sample included pregnant women who were recruited using purposive sampling based on the inclusion criteria as follows**:** receiving antenatal care in Suphanburi province; age 18 and over; gestational age of less than 16 weeks. The sample size was calculated from the comparison test based on power analysis, with a power of

80%, significance level of 95%, and an effect size of 0.70, yielding a sample size of 80 subjects. To compensate for possible dropout, 22% of the sample was added, resulting in a total sample size of 98 subjects. They were divided into two arms. One arm (49 participants) received the self-prevention program from exposure to SHS for pregnant women and their smoking family members while the other arm (49 participants) received standard care, totaling 98 participants. The participants were recruited for the experimental arm, followed by the control arm.

Recruitment and sampling

In this study, the participants in both the experimental and the control arms were pregnant women who lived with their smoking family members in Suphanburi province. For the pregnant women, the inclusion criteria were as follows: 1) first antenatal visit with gestational age of less than 16 weeks; 2) non-smoker; 3) no complications or comorbidity during pregnancy; 4) living with at least one smoking family member; 5) able to communicate in the Thai language; 6) willing to participate in the study; and 7) smoking family members were willing to participate throughout the program. The discontinuation criteria were: 1) having threatened abortion; 2) having premature labor; 3) unable to participate throughout the program; and 4) no longer wish to participate in the study.

Randomization

The researcher used permuted block randomization to assign participants into the experimental and control arms. Sequential numbers were put in sealed opaque envelopes. Permuted block randomization with small sample blocks was conducted to ensure group balance at the end of the trial and to promote periodic balance in the sense that sequential patients would distribute equally between arms (Matts & Lachin, 1988). In this study, block size of four was used. Therefore, random allocation ratio was 2:2. The researcher used 16 blocks of participants and assigned participants to the experimental arm and the control arm by randomly selecting one of six possible permutations of the treatment among four participants, EECC, ECEC, ECCE, CEEC, CECE, and CCEE. In

the last block, CCEE, two participants were added as extra numbers for an equal number of participants in each treatment arm. Then, central allocation concealment was performed by a research assistant who was not involved in the trial. The participants in the experimental and control arms were pregnant women living with a smoking family member in a community in Suphanburi province. The participants in each arm lived in a different community without contact across arms.

2) Quantitative research instruments

1. Demographic data form for pregnant women was developed by the researcher. It consisted of gap-filling questions and multiple-choice questions about age, education level, occupation, monthly income, history of pregnancy, smoking family members, areas with SHS exposure, frequency of SHS exposure, and number of smoking family members.

2. Demographic data form for smoking family members was developed by the researcher. It consisted of gap-filling questions and multiple-choice questions about age, education level, occupation, monthly income, history of pregnancy, areas for smoking, and frequency of smoking.

3. Knowledge about SHS questionnaire was developed by the researcher. It consisted of questions about the definition of SHS, symptoms and consequences of exposure to SHS, harmful substances in SHS, diseases and health problems caused by SHS, laws related to the protection of non-smokers and the 2019 Family Development and Protection Act. The questions had dichotomous true-false response choices.

For a correct answer, the respondent received 1 point.

For an incorrect answer, the respondent received 0 point.

The interpretation of the knowledge about SHS score was based on the recommendations of Bloom (1956) into three levels as follows:

Mean score	Level of knowledge about SHS
81-100% of total score	Low
61-80% of total score	Moderate
0-60% of total score	High

4. SHS self- preventive behavior questionnaire consisted of questions about pregnant women's avoidance of SHS exposure. Items were rated on a 3-point rating scale as follows:

Rating	Positive items	Negative items
Practice regularly	2	0
Practice sometimes	1	1
Never practice	0	2

The score of each item was summed and calculated to obtain a mean score. The score interpretation was based on the recommendations of Best (1997) using the formula as follows:

$$\text{Class interval} = \frac{Max\ score - Min\ score}{No.\ of\ classes}$$

From calculation: $\text{Class interval} = \frac{2-0}{3}$

$\text{Class interval} = 0.67$

The mean score was interpreted into three levels as follows:

Mean score	Level of SHS self-preventive behavior
0.00- 0.67	Low
0.68-1.35	Moderate
1.36 - 2.00	High

5. Self-efficacy for SHS self-prevention questionnaire consisted of all positive items rated on a 5-point scale as follows: 5 (high ability), 4 (moderate ability), 3 (not sure), 2 (little ability), and 1 (no ability). The score interpretation was based on the recommendations of Bloom (1956) into three levels as follows:

Mean score	Level of self-efficacy for SHS self-prevention
80% or higher	Low
60-79% or higher	Moderate
60% or lower	High

6. Urinary nicotine level record form for pregnant women was developed by the researcher. It was used before and after receiving the program, and for follow-up after the program ends to record the level of urinary nicotine. It had a dichotomous response choice: urinary nicotine detected and no urinary nicotine detected.

Urinary nicotine test kit was used to measure the level of urinary cotinine. When the urine sample is dropped onto the Sample (S) region, the urine sample moves along the test pad, carrying with it the cotinine antibody that is labelled with certain substances. As the urine sample moves along the test pad, the cotinine antibody that is labelled with certain substances will bind with the cotinine coated on the Test (T) region. A purple line will appear in the Test (T) region. Some of the cotinine antibody that is labelled with certain substances will then bind with the anti-immunoglobulin substance coated on the control (C) region. A purple line will also appear in the Control (C) region. The

appearance of a purple line in the Test (T) region and a purple line in the control (C) region indicates that no urinary cotinine is detected.

The results can be interpreted as follows:

Detection of cotinine (positive, urinary cotinine ≥ 100 ng/mL) means that the person has been exposed to tobacco smoke (approximately within the last 4 days before the specimen is taken). Such exposure can be either firsthand or secondhand smoke. The positive result of urinary cotinine can also indicate the amounts of tobacco smoke exposure.

No detection of cotinine (negative) means that the person has not been exposed to tobacco smoke.

3) Instruments for procedure

3.1 The self-prevention program from exposure to SHS based on social cognitive theory (SCT) consisted of a set of activities developed by the researcher to promote participants' learning, and enhance understanding and ability to apply what they had learned into practice. It was guided by the SCT (Bandura, 1986) focusing on 1) observational learning, 2) self-efficacy, and 3) self-regulation. The program lasted 12 weeks and its contents focused on the prevention of SHS, harms of SHS exposure, and laws related to SHS.

3.2 Manual of SHS self-prevention for pregnant women was developed by the researcher based on the literature review. It was examined by the research advisory team and a panel of experts, including two physicians specialized in obstetric practice, one nurse in antenatal care, one nurse in community practice, and one staff in tobacco unit. They examined the appropriateness and content validity. The manual was revised following the suggestions in order to fit with the context of pregnant women. The content, pictures, and the language of the manual were easy to understand, interesting, and consistent with the content of the program. The manual helped to increase pregnant women's understanding about SHS and skills of SHS self-prevention that could be applied in their daily life and recommend to other people. The contents of the manual were about the general information of SHS, harms of SHS, skills in SHS self-prevention, and laws related to SHS.

The manual was given to pregnant women in the experimental arm in the 1st week for revision because the content of the manual was consistent with the content of the program. Pregnant women in the experimental arm were asked to bring the manual with them in every session of the program.

3.3 PowerPoint presentation included knowledge about SHS encompassing harms of SHS to pregnant women.

3.4 Video multimedia to enhance self-efficacy included an interview with a role model.

4) Instruments for data collection

4.1 Demographic data questionnaire was developed by the researcher to obtain information about age, education, religion, marital status, income sufficiency, and comorbidity.

4.2 SHS self-prevention record form for pregnant women was developed by the researcher to record the avoidance of SHS at home while living with smoking family members.

Intervention protocol

The program in this study consisted of activities as follows:

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
1 (40 minutes)	To build rapport with the participants, inform objectives of the study, and assess the SHS knowledge, SHS self-preventive behavior, self-efficacy for SHS self-prevention, and urinary nicotine level before receiving the program.	The researcher performed as follows: - Give self-introduction and build rapport with participants. Ask pregnant women and their smoking family members to sign an informed consent form to participate in every session of the program. - Inform the activity objectives and schedule to participants; set up a Line group to share information about SHS. - Assess participant's SHS knowledge, SHS preventive behavior, self-efficacy for SHS prevention, and urinary nicotine level before receiving the program (pre-test)	-Questionnaires for SHS knowledge, SHS self-preventive behavior, self-efficacy for SHS self-prevention - Urinary nicotine test kit	-	Hospital
2 (50 minutes)	- To educate participants about SHS self-prevention, harms of SHS exposure, and laws related to SHS - To encourage participants to set short-term goals (1	The researcher performed as follows: - Assess current smoking behavior of family members and regular smoking area in the participant's house - Educate participants about SHS self- prevention, harms of SHS exposure, and laws related to SHS using	- SHS self-prevention record form - Role play cards for SHS self-prevention skills - Information sheet about harms of SHS	Self-regulation	Participant's home

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
	week) and long-term goals (their life in the future), and choose the preferred methods for SHS self-prevention.	PowerPoint presentation and manual of SHS self-prevention for pregnant women. The activities followed three steps of self-regulation as follows: 1. Self- observation: Teach participants and their family members observe the area in the house designated for smoking whether it is appropriate and distant from the pregnant women' s room or living space. Train participants how to use the SHS self-prevention record form with an emphasis on promoting participant' s learning and experiences in self-observation of their daily life. Ask participants to set goals for behavior change and take action. Set a reward and ask participants to observe their behaviors. 2. Judgment process: Provide activities for goal setting to allow participants to have autonomy in decision-making and taking action, which will allow participants to persevere to achieve the goal for avoiding SHS based on their own ability or desire. Ask participants to compare their actual and expected SHS self- prevention behavior. This activity will include	- Goal setting activity		

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		short-term goal setting (Week 2-6, totaling 5 weeks), and long-term goal setting (Week 4). 3. Self-reaction: Provide activities to increase participant's awareness of goal setting by asking them to explore their own ability to achieve the goals, observe, and record to monitor their actual SHS self-preventive behavior in their daily life for 1 week before using the information to make a decision. Ask participants to share their progress and give reward for participants who can achieve the goals. Discuss about the physical, psychological, and social benefits of behavior changes. - Ask participants to set short-term goals (1 week) and long-term goals (their life in the future), and choose the preferred methods for SHS self-prevention. - Provide SHS self-prevention record form and explain how to use it.			
3 (45 minutes)	- To raise participant's awareness of the harms of SHS using the role model. - To encourage participants to set short-term goal (1	The researcher performed as follows: - Greet participants and ask about the knowledge and behaviors in the past week.	- Video multimedia of a role model - Reflection activity	Observational learning	Participant's home

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
	week) for SHS self-prevention. - To encourage smoking family members' involvement and to give emotional support to promote their ability to avoid smoking in the vicinity of pregnant women.	- Show a video multimedia about harms of SHS and pregnant women's who experienced impacts of SHS. Have participants reflect on their long-term goal. This activity followed the processes of observational learning as follows: - Attention Process: Participants paid attention to observe the behavior of the role model because learning will not occur without attention. The role model had appropriate characteristics that would attract participants' attention. The role model shared her experience of miscarriage caused by SHS exposure. Pregnant women and their smoking family members reflected on this experience to raise their awareness. Pregnant women were trained to observe the smoking behavior of their family members such as areas of smoking, numbers of cigarettes smoked, family leisure time, and time of smoking. - Retention process: Pregnant women reflected on the harms of SHS and raise the family members' awareness of smoking in the vicinity of pregnant women, and make an agreement regarding smoking.			

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		- Production process: There was a weekly follow-up activity via Line application to give information support in case participants cannot deal with problems related to SHS avoidance by themselves. - Motivation Process: The researcher and smoking family members built sincere rapport with pregnant women to create trust and sense of security. The researcher understood and listened attentively with warmth and friendliness to allow the participants to feel that they are wanted and belong to the society. The researcher and smoking family members gave emotional support to pregnant women for SHS self-prevention, and provided recommendations for correct and incorrect behavior as appraisal support. - Give individual counselling in case participants cannot solve problems by themselves. - Ask participants to set a short-term goal (1 week). - Encourage involvement of smoking family members and give emotional support to pregnant women to help pregnant women feel that they are able to dissuade their family members to smoke near them.			

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		- Review SHS self-prevention record form, and give encouragement and suggestions.			
4 (60 minutes)	- To encourage participants to observe smoking behavior of their family members. - To train SHS self-prevention skills for pregnant women and smoking family members. - To encourage participants to set short-term goals (1 week) for SHS self-prevention.	The researcher performed as follows: - Greet participants and ask about SHS self-prevention in the past week. - Give encouragement and praise participants for the progress, behavior change, and their ability to prevent themselves from SHS. - Ask participants to observe the smoking behavior of their family members such as areas of smoking, numbers of cigarettes smoked, family leisure time, and time of smoking. Ask participants to observe whether the area designated for smoking is appropriate and distant from pregnant women's room or living space. Train participants to use SHS self-prevention record form with an emphasis on promoting participant's learning and experiences in self-observation of their daily life. - Give training for SHS self-prevention skills for pregnant women and their smoking family members by training participants to solve problems by themselves with an involvement of family members.	- Worksheet for area arrangement activity - Worksheet for observation training - Worksheet for SHS self-prevention skill training	Observational learning	Online using Line meeting

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		Train participants to solve problems or overcome barriers in different situations related to SHS self-prevention. Allow participants to have autonomy in making a decision. Give suggestions and recommend potential solution in case participants cannot solve problems on their own to promote participants' ability to solve problems effectively. Provide demonstration and ask participants to give return demonstration in avoiding SHS exposure. Give the manual of SHS self-prevention for revision to improve understanding and ability to avoid SHS. - Give recommendations and feedback for correct and incorrect behaviors. - Give individual counselling in case participants cannot solve problems by themselves. - Ask participants to set a short-term goal (1 week).			
5 (50 minutes)	- To encourage participants to write about the problems and barriers related to SHS self-prevention. - To increase social support by giving encouragement,	The researcher performed as follows: - Greet participants and ask about SHS self-prevention in the past week. - Give explanation about testing nicotine to assess the level of urinary cotinine of pregnant women and give individual counselling.	- PowerPoint presentation about urinary cotinine testing - Video multimedia about urinary cotinine testing	- Understanding - Self-efficacy	Online using Line meeting

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
	advice and recommendations for SHS self-prevention. - To encourage participants to set short-term goals (1 week) for SHS self-prevention.	- Ask participants to write about the problems and barriers related to SHS self-prevention. - Give encouragement and praise participants for the progress, behavior change, and their ability to prevent themselves from SHS. - Give recommendations and feedback for correct and incorrect behaviors. - Give individual counselling in case participants cannot solve problems by themselves. - Ask participants to set a short-term goal (1 week). - Review participant's SHS self-prevention record form. Give encouragement and feedback.			
6 (50 minutes)	- To increase self-efficacy for SHS self-prevention. - To increase social support by giving encouragement, advice and recommendations for SHS self-prevention. - To encourage participants to set short-term goals (1	The researcher performed as follows: - Greet participants and ask about SHS self-prevention in the past week. - Provide activities to increase self-efficacy as follows: 1. Mastery experience (Week 2-6, totaling 5 sessions): This was the most effective way to enhance self-efficacy. When pregnant women could perform SHS self-prevention successfully, they would develop a confidence in their own ability. The researcher provided education and training for SHS self-	- PowerPoint presentation - Video multimedia - Pregnant women role models -Worksheet for skill training - Manual of SHS self-prevention for pregnant women	Self-efficacy	Participant's home

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
	week) for SHS self-prevention.	prevention skills. Participants reflected on their prior experience in SHS self-prevention and see that they could perform SHS self-prevention successfully and will not see past failure as their incapability. 2. Role model (Week 5): Pregnant women observed and learned from a role model who had an experience of miscarriage or infant with low birth weight caused by SHS exposure from smoking family members, as well as another role model who was a pregnant woman without smoking family members. Video multimedia of the role models showed the role models' effort to prevent SHS exposure. When participants saw health behavior and success of the role models, they would also feel that they were able to perform SHS self-prevention successfully. - Give encouragement and praise participants for the progress, behavior change, and their ability to prevent themselves from SHS. - Give recommendations and feedback for correct and incorrect SHS preventive behaviors. - Give individual counselling in case participants cannot solve problems by themselves.			

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		- Follow-up with participants' short-term goal (1 week). - Ask participants to analyze the problems and barriers related to SHS self-prevention and solutions.			
7 (30 minutes)	- To increase self-efficacy for SHS self-prevention.	The researcher performed as follows: - Conduct telephone follow-up with participants for individual counselling. - Give verbal persuasion for participants to reflect on their prior experience, benefits of SHS self-prevention, and consequences of SHS exposure to themselves and their family to help participants believe in their ability to perform SHS self-prevention successfully. Ask participants to identify barriers to SHS avoidance and the solutions. Give suggestions and encouragement, as well as verbal persuasion from others and the researcher that they can do it in order to increase their confidence. - Give emotional arousal to increase self-efficacy and encourage positive emotions by arranging friendly, happy, and casual atmosphere. - Follow-up with participants' short-term goal.	- Manual of SHS self-prevention for pregnant women	Self-efficacy	Online using Line meeting

Week	Objective	Activity	Content/Material	Theoretical concept	Setting
		- Listen to concerns and problems. Give verbal reinforcement.			
8 (30 minutes)	- To assess the level of SHS knowledge, SHS self-preventive behavior, self-efficacy for SHS self-prevention, and urinary nicotine after receiving the program (post-test).	The researcher performed as follows: - Assess the level of SHS knowledge, SHS self-preventive behavior, and self-efficacy for SHS self-prevention. - Assess urinary nicotine level of pregnant women.	- Questionnaires of SHS knowledge, SHS self-preventive behavior, and self- efficacy for SHS self-prevention - Urinary nicotine test kit	-	hospital
12 (30 minutes)	- To assess the level of SHS knowledge, SHS self-preventive behavior, self-efficacy for SHS self-prevention, and urinary nicotine after receiving the program (post-test).	The researcher performed as follows: - Assess the level of SHS knowledge, SHS self-preventive behavior, and self-efficacy for SHS self-prevention. - Assess urinary nicotine level of pregnant women.	- Questionnaires of SHS knowledge, SHS self-preventive behavior, and self- efficacy for SHS self-prevention - Urinary nicotine test kit	-	hospital

Validity and reliability

Validity of quantitative instruments

The researcher examined the validity of the self-prevention program from exposure to secondhand smoke (SHS) for pregnant women and their smoking family members, the materials used in the program, the manual of SHS self-prevention using a panel of five experts. The experts included one expert in SCT, two obstetricians, and two experts in tobacco smoke. All the instruments were revised following the expert suggestions.

The instruments for data collection, including the SHS knowledge questionnaire, SHS self-preventive behavior questionnaire, and self-efficacy for SHS self-prevention questionnaire, were examined by a panel of five experts. The experts included one expert in SCT, two obstetricians, and two experts in tobacco smoke. In this study, the S-CVI was 0.87, which was higher than the minimum acceptable value of ≥ 0.80 (Polit & Beck, 2008).

Reliability of quantitative instruments

The researcher examined the reliability of the SHS knowledge questionnaire, SHS self-preventive behavior questionnaire, and self-efficacy for SHS self-prevention questionnaire with 20 pregnant women who had similar characteristics to the study sample (Polit & Beck, 2010). The Cronbach's alpha coefficient was 0.87 and 0.93 for SHS self-preventive behavior questionnaire, and self-efficacy for SHS self-prevention questionnaire, respectively, which were higher than the minimum acceptable level of ≥ 0.70 (Polit & Beck, 2006). The Kuder-Richardson-20 (KR-20) was 0.80 for the SHS knowledge questionnaire.

Protection of human rights

This research was approved by the Research Ethics Committee of the Faculty of Public Health, Chiang Mai University (ET034/2566), and the Research Ethics Committee of the Suphanburi Public Health Office (YM016/2566). After obtaining approval, the researcher initiated data collection process by informing the district public health office, the directors of the hospital, involved hospital staff, and eligible participants of the

research details, including the objectives, data collection process, protection of subject rights, program activities, time required for the research project, and risks and benefits from participation. The researcher advertised about the research project by herself by distributing flyers at the hospitals to promote about the research project to potential participants based on the inclusion criteria. Those who were interested in participating contacted the researcher via the telephone number given in the flyers. Appointments were made for further participation in the program. The participants were informed that they had the right to voluntarily participate in the study and withdraw from the study at any time without any effect. The participants were informed that the data would be kept confidential without any identification of each subject. Code numbers were assigned to each participant and participant's names were not presented in any publication or presentation about this study. Results were presented as aggregate data for research purposes only. Data were stored in a secure place and destroyed after the completion of this study. After the eligible participants agreed to participate in the research, they signed a consent form. To obtain consent, the researcher approached the potential participants in person and wore a casual attire rather than a public health staff uniform. The researcher informed the potential participants that all the activities in the program were for research purposes, not treatment.

Data Collection Procedure

Qualitative and quantitative data were collected after receiving approval from the Research Ethics Committee of the Faculty of Public Health, Chiang Mai University, and the Research Ethics Committee of the Suphanburi Public Health Office. The researcher performed the following steps:

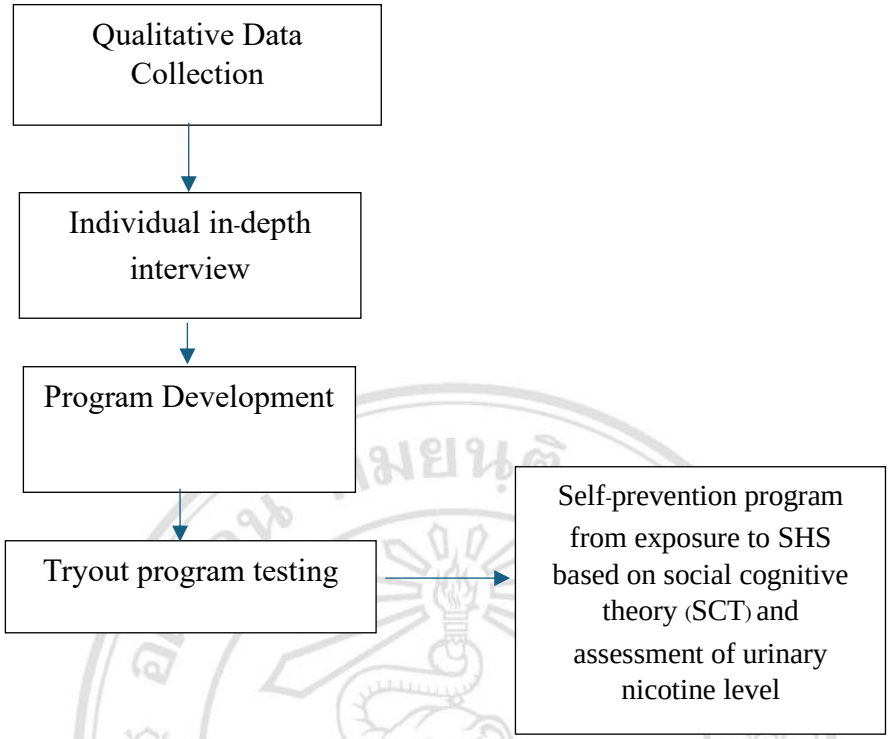


Figure 3.2 Data Collection Process

1. The researcher met with the director of the health promoting hospital to inform about the research project and ask for permission to conduct research.

2. The researcher developed research instruments for data collection, including the structured in-depth interview guide for administrative staff and staff in charge of tobacco work in the provincial health office and hospital, the structured in-depth interview guide for pregnant women, and the structured in-depth interview guide for smoking family members. Then, these instruments were examined for content validity by a panel of experts.

3. The researcher conducted an in-depth interview with 9 staffs in antenatal care (1 administrative deputy director, 4 physicians in obstetric practice and 4 nurses in antenatal care). The interview was conducted face to face in an office of the administrative staff, and in an office of the staff in antenatal care of a hospital. The interview took approximately 40 minutes per person. The interview employed open-ended questions to elicit opinion about the smoking-related policy for pregnant women, and the needs for the self-prevention program from exposure to SHS for pregnant women, as well as relevant suggestions. This information was used for the development of the program.

4. The researcher conducted a structured in-depth interview with 17 pregnant women in Suphanburi province. The interview was conducted face-to-face in a health education room of the hospital. It took approximately 30 minutes per person, using open-ended questions about the problems related to smoking family members, barriers to avoiding SHS exposure, the 2019 Family Development and Protection Act about household smoking ban, Parent School scheme by the Ministry of Public Health, measurement of nicotine, and the needs for the self-prevention program from exposure to SHS for pregnant women, as well as relevant suggestions. This information was used as a part of the program development.

5. The researcher conducted a structured in-depth interview with 14 smoking family members in Suphanburi province. The interview was conducted face-to-face in a health education room of the hospital for approximately 30 minutes per person. It consisted of open-ended questions about the amount of family member's smoking, areas for smoking in the house, the 2019 Family Development and Protection Act about household smoking ban, harms and impacts of smoking in the presence of pregnant women, barriers to smoking cessation and reduction, and the needs for the self-prevention program from exposure to SHS for pregnant women and smoking family members. This information was used as a part of the program development.

6. The researcher used the information obtained from the interviews with staff in antenatal care and tobacco unit, pregnant women, and smoking family members to develop the program. The program was examined for content validity by a panel of experts and revised following the expert suggestions.

7. The research tested the program with 10 pregnant women who had similar characteristics to the study sample, and revised the program as appropriate according to the test results before implementing with the actual sample.

8. The researcher approach the potential participants to explain about the information of the research project. If they were interested in participating in the research, the researcher screened them based on the inclusion criteria. The eligible participants who met the inclusion criteria and were willing to participate in the study signed a consent form.

9. The researcher made an appointment with the participants for data collection. Data collection was divided into two arms, including control arm and experiment arm, as follows:

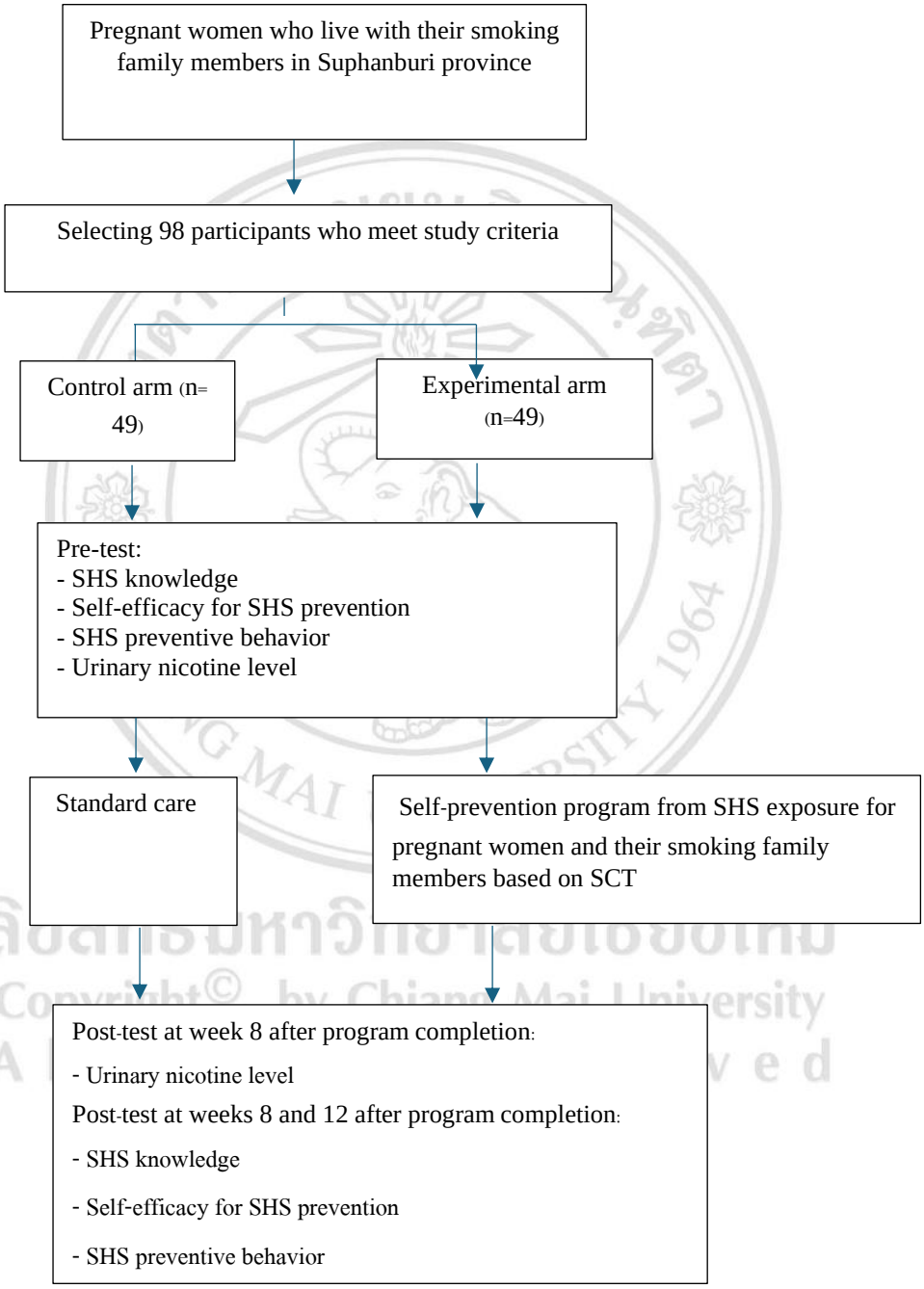


Figure 3.3 Protocol Randomized Controlled Trial

Control arm

The researcher performed the following steps:

1. The research assistant performed a pretest of knowledge, self-efficacy for SHS self-prevention, self-preventive behavior of SHS exposure, and urinary nicotine level of pregnant women.

2. The participants received standard care from antenatal staff.

3. The research assistant performed a post-test of knowledge, self-efficacy for SHS self-prevention, and self-preventive behavior of SHS exposure of pregnant women at 8 and 12 weeks after the end of the program, as well as assessed the urinary nicotine level of pregnant women at 8 weeks after the end of the program.

Experimental arm

The researcher performed the following steps:

1. The research assistant performed a pretest of knowledge, self-efficacy for SHS self-prevention, self-preventive behavior of SHS exposure, and urinary nicotine level of pregnant women before the program.

2. The participants received the program. The activities of the 12-week program followed the details in the intervention protocol as described above.

3. The research assistant performed a post-test of knowledge, self-efficacy for SHS self-prevention, and self-preventive behavior of SHS exposure of pregnant women at 8 and 12 weeks after the end of the program, as well as assessed the urinary nicotine level of pregnant women at 8 weeks after the end of the program.

Data Analysis Procedure

The researcher analyzed the data collected from the sample using statistical program. The details are as follows:

Qualitative data analysis

The researcher analyzed qualitative data from the in-depth interviews with staff, pregnant women, and smoking family members using thematic analysis in 7 steps: 1) listen to the participants' stories repeatedly; 2) transcribe the interviews verbatim in the Thai language; 3) read and reread the transcriptions several times for comprehensive

understanding; 4) code the data; 5) categorize the codes into sub-themes; 6) identify related sub-themes within themes; and 7) examine and enhance the themes and sub-themes in light of the literature and research questions (Sandelowski, 2000). The findings were used for program development.

Quantitative data analysis

1. The researcher analyzed demographic data, knowledge about SHS, self-efficacy for SHS self-prevention, self-preventive behavior of SHS exposure, and urinary nicotine level using mean, standard deviation, frequency, and percentage.

2. The researcher analyzed difference demographic data of two groups using Chi-square test

3. The researcher compared knowledge, self-efficacy for SHS self-prevention, self-preventive behavior of SHS exposure, and urinary nicotine level between the pregnant women who received the program and those who received standard care, as well as between before and after the program using repeated measure ANOVA.

CHAPTER 4

Results and Discussion

This chapter presents the qualitative and quantitative results, as well as discussion.

Qualitative Results

The qualitative part was conducted using in-depth interviews with 9 staffs in antenatal care (ANC), 17 pregnant women, and 14 smoking family members. The findings were used to develop the SHS self-prevention program of pregnant women with smoking family members.

For the staffs in ANC, their age ranged from 28-58 years. Almost all of them held a Bachelor's degree. They were physicians (n=5) and nurses (n=4). Of the physicians, one was the Deputy Director of Health Promotion; one was the Director of Obstetrics and Gynecology Department ANC; three were ANC attending physicians. Of the nurses, one was the head of ANC while three were ANC nurses. Their monthly income ranged from 20,000 to 120,000 THB. The duration of working in ANC ranged from 3 to 30 years. They were all non-smokers (Table 4.1).

Table 4.1 Description of the Characteristics of the ANC Staffs (n=9)

ID	Age (years)	Education	Occupation	Position	Monthly income	Duration of working in ANC (years)	Smoking status
1	52	Master degree	Physician	Deputy Director of Health Promotion	80,000	5	Non-smoker

Table 4.1 (continued)

ID	Age (years)	Education	Occupation	Position	Monthly income	Duration of working in ANC (years)	Smoking status
2	54	Bachelor degree	Physician	Director of Obstetrics and Gynecology Department	90,000	20	Non-smoker
3	48	Bachelor degree	Physician	ANC attending physician	70,000	18	Non-smoker
4	58	Bachelor degree	Physician	ANC attending physician	120,000	25	Non-smoker
5	30	Bachelor degree	Physician	ANC attending physician	45,000	3	Non-smoker
6	58	Bachelor degree	Nurse	Head of ANC	60,000	30	Non-smoker
7	48	Bachelor degree	Nurse	ANC nurse	50,000	15	Non-smoker
8	43	Bachelor degree	Nurse	ANC nurse	40,000	12	Non-smoker
9	28	Bachelor degree	Nurse	ANC nurse	20,000	3	Non-smoker

For the pregnant women, their age ranged from 18 to 33 years. They had elementary (n=4), junior high school (n=4), senior high school (n=6), and Bachelor's degree (n=3). Regarding occupation, they were general laborers (n=7), merchant (n=3), farmers (n=2), student (n=1), and unemployed (n=5). For employed participants, their monthly personal income ranged from 8,000 to 30,000 THB. Most of them had one

smoking family member (n=13) while four had two smoking family members. The smoking family member was the husband (n=13), and the father (n=4) (Table 4.2).

Table 4.2 Description of the Characteristics of the Pregnant Women (n=17)

ID	Age (years)	Education	Occupation	Monthly personal income (THB)	Number of family smokers	Family smoker
1	20	Elementary	Merchant	8,000	1	Husband
2	18	Elementary	Unemployed	-	1	Husband
3	19	Elementary	Unemployed	-	1	Husband
4	27	Junior high school	Unemployed	-	2	Husband and father
5	25	Vocational certificate	Merchant	15,000	1	Husband
6	18	Senior high school	Farmer	13,000	1	Husband
7	27	Senior high school	General laborer	14,000	2	Husband and father
8	30	Junior high school	General laborer	10,000`	1	Husband
9	17	Senior high school	Student	-	2	Husband and father
10	26	Elementary	General laborer	30,000	1	Husband
11	18	Junior high school	Unemployed	-	1	Husband
12	28	Bachelor's degree	General laborer	18,000	1	Husband
13	24	Bachelor's degree	General laborer	20,000	1	Husband

Table 4.2 (continued)

ID	Age (years)	Education	Occupation	Monthly personal income (THB)	Number of family smokers	Family smoker
14	33	High vocational certificate	General laborer	15,000	1	Husband
15	29	Junior high school	Merchant	25,000	2	Husband and father
16	31	Bachelor's degree	General laborer	30,000	1	Husband
17	25	Senior high school	Farmer	15,000	1	Husband

For the smoking family members, their age ranged from 18 to 38 years. They had elementary (n=4), junior high school (n=5), and senior high school (n=5). Regarding occupation, they were general laborers (n=5), farmers (n=4), and business owner (n=5). Their monthly personal income ranged from 8,000 to 46,000 THB. The number of smoked units per day, they were lower than 10 (n=9), and more than 10 (n=5). Regarding the duration of smoking, they were 1-5 years (n=7), 6-10 years (n=4), and more than 10 years (n=3) (Table 4.3).

Table 4.3 Description of the Characteristics of the Smoking Family Members (n=14)

ID	Age (years)	Education	Occupation	Monthly income (THB)	Type of tobacco smoked	Number of smoked unit / day	Duration of smoking (years)
1	30	Senior high school	General laborer	10,000	handrolled cigarettes/ cigarettes	5 cigarettes	8
2	38	High vocational certificate	Farmer	20,000	cigarettes	10 cigarettes	20

Table 4.3 (continued)

ID	Age (years)	Education	Occupation	Monthly income (THB)	Type of tobacco smoked	Number of smoked unit / day	Duration of smoking (years)
3	37	Elementary	General laborer	10,000	handrolled cigarettes	20 cigarettes	5
4	22	Elementary	Military	8,000	cigarettes	10 cigarettes	10
5	23	Junior high school	Transport Driver	30,000	cigarettes	10 cigarettes	5
6	18	Junior high school	General laborer	10,000	cigarettes	7 cigarettes	3
7	18	Elementary	Window cleaner	10,000	cigarettes	2 cigarettes	3
8	32	Senior high school	Farmer	15,000	cigarettes	7 cigarettes	13
9	31	Senior high school	Business owner	20,000	cigarettes	1 pack	10
10	25	Junior high school	Farmer	46,000	cigarettes	10 cigarettes	8
11	28	Junior high school	General laborer	12,000	cigarettes	1 pack	14
12	25	Junior high school	Lorry driver	18,000	E-cigarettes	1 cigarette	5
13	18	Elementary	Farmer	12,000	cigarettes	10 cigarettes	4
14	25	Vocational certificate	General laborer	15,000	cigarettes	4 cigarettes	3

The qualitative findings from in-depth interview with staffs in antenatal care, pregnant women, and smoking family members revealed five themes: unclear understanding of SHS; influences shaping perceptions related to SHS; attempt to prevent

SHS exposure; barriers to prevention of SHS exposure; and needs related to prevention of SHS exposure.

Theme 1: Unclear understanding of secondhand smoke

The majority of the pregnant women and smoking family members mentioned an unclear understanding of SHS in terms of non-recognition of SHS, misperception of SHS, and unawareness of harms from SHS.

Non-recognition of SHS

When talking about their knowledge of SHS, around a quarter of pregnant women said they had never heard of it before and had no idea what it was. They did not know how harmful SHS was.

"What is secondhand smoke? Is it dangerous? I'm not sure." (Pregnant woman 2)

"I've never heard of secondhand smoke before. Is it dangerous?" (Pregnant woman 11)

"I don't know about secondhand smoke. What is it?" (Pregnant woman 4)

Not only was SHS unrecognized among pregnant women, some smoking family members also disclosed a lack of understanding of SHS by stating that they did not know what it was.

"I don't know what secondhand smoke is. I'd like to know too. Can you please explain what it is?" (Smoking family member 12)

Moreover, some pregnant women and smoking family members did not clearly know about the harmful substances in SHS. Some of them could identify certain common substances such as nicotine, but did not know about the consequences of SHS.

"What substances are in secondhand smoke? All I know is there's nicotine but is nicotine released from secondhand smoke?" (Pregnant woman 2)

"Secondhand smoke is dangerous but I don't know what the consequences are." (Smoking family member 5)

When asked about the consequences of SHS on the unborn baby, the pregnant women stated that they did not know how the harmful substances might affect the unborn baby. For example, one said:

"What are the substances in secondhand smoke? How can they harm an unborn baby?" (Pregnant woman 6)

Consistently, pregnant women's unrecognition of SHS was also mentioned by the ANC staff who revealed that many pregnant women under their care had inadequate knowledge of SHS, particularly about what SHS was and the harmful consequences of SHS.

"Some pregnant women still don't know the meaning of secondhand smoke and don't recognize it. They don't know about the dangers of secondhand smoke." (ANC physician 1)

"Pregnant women themselves do not know anything about secondhand smoke. They don't understand what I mean. I had to sit and explain for a long time." (ANC physician 3)

Misperception of SHS

Misperception of SHS was reflected through the participants' view of SHS as other types of smoke that they encountered in their daily life. A quarter of the pregnant women thought that SHS was comparable to other forms of smoke they saw on a regular basis, such as smoke from burning objects, car exhaust, or particulate matter with a diameter of 2.5 millimeters or smaller (PM2.5).

"What does secondhand smoke look like? Is it like the smoke that's coming out of the car's exhaust?" (Pregnant woman 8)

"Secondhand smoke is like smoke from burning. When I smell it, I can't breathe." (Pregnant woman 3)

"I think secondhand smoke is like other kinds of smoke in general…like PM2.5" (Pregnant woman 7)

Another misperception was that the participants judged the harms of smoking by considering the smoke that was emitted. For example, smoking family members believed that e-cigarettes were safer than regular cigarettes because they produce no odor.

"I smoke e-cigarettes. They don't smell bad. They smell good and have little smoke." (Smoking family member 12)

"I smoke e-cigarettes…Better than regular cigarettes and doesn't smell bad." (Smoking family member 13)

Unawareness of harms from SHS

The negative effects of SHS were viewed by pregnant women as less severe than those experienced by smokers. They reasoned that since the smoke did not enter their lungs directly, there would be less negative health effects. One pregnant women mentioned:

"*The harms from secondhand smoke may be different from the harms for the smokers. I don't smoke so it may be less harmful. I think pregnant women who smoke are more affected than those who don't smoke or those who are exposed to secondhand smoke from their husband."* (Pregnant woman 12)

Another pregnant woman thought that exposure to SHS was not serious because she could swing her hands to prevent the smoke from entering her lungs.

"I don't think secondhand smoke is a problem to me because I'm not the one who smokes. The harms wouldn't be too serious. It should be fine. I wouldn't get affected like people who smoke. The smokers inhale the smoke directly into their lungs, but I can swing my hands to push the smoke away so the smoke doesn't get into my lungs." (Pregnant woman 4)

Likewise, an ANC staff voiced a concern that pregnant women were not aware of the harms from SHS because they were not the smokers.

"I once asked about my husband's smoking. Some pregnant women don't feel worried because they don't smoke themselves. So I thought that the patient definitely had no understanding of cigarette smoke at all." (ANC nurse 3)

Many participants, including pregnant women and smoking family members, believed that the unborn baby would not be affected by SHS because they associated the harms to the smell, which could not reach the baby. They believed that the unborn baby was safe inside the womb. They would be fine as long as they could not smell the odor of SHS.

"Secondhand smoke may not affect the baby because the baby is in the womb. How can the baby smell anything? They baby may be affect by what I eat, but the smell can't get to the baby." (Pregnant woman 9)

"...But my baby should be fine because he is in the belly, not born yet. My girlfriend would be more at risk because she's getting the full amount of smoke." (Smoking family member 12)

"Secondhand smoke can cause lung cancer, especially to my girlfriend. But the baby should be fine because he doesn't have a nose yet." (Smoking family member 6)

Due to their husbands' frequent travel and overnight stays for work, two pregnant women believed they were immune to the negative effects of SHS because their spouses smoked while they were away.

"My boyfriend smokes but we rarely see each other. He likes to smoke while working but doesn't smoke when he's with me. He smokes in front of the house. When he's done smoking, he walks in. So it would not have any effect on me." (Pregnant woman 14; husband works in logistics)

"I don't think my boyfriend's smoking is a problem for my pregnancy because we don't see each other much. He smokes when he goes to work on a farm." (Pregnant woman 17; husband works in farming)

Theme 2: Influences shaping perceptions related to SHS

The perceptions of SHS and its harms were shaped by various influential sources, including their own personal experience, laypeople, healthcare providers, and mass media.

Personal experience

Personal experience was frequently mentioned, particularly by the pregnant women, as a source that influenced their views of SHS. Some pregnant women based their views of the harms from SHS on the health effects on their previous pregnancy, which caused them to fear the adverse consequences of SHS.

"When I was pregnant with my first child, my ex-boyfriend and I smoked because at that time I was a teenager and didn't think anything of it. But my first child is not healthy at all. He gets sick a lot and has asthma. So we quit smoking. When I found out I was pregnant this time, I'm afraid my baby would have health problems like my first child." (Pregnant woman 13)

Another pregnant woman shared her boyfriend's fear that smoking would harm current pregnancy like the first pregnancy.

"My boyfriend doesn't smoke near me now because he's afraid the baby would end up with health problems like our first child." (Pregnant woman 9)

Although most personal experiences as stated above caused fears of SHS exposure, some personal experiences led to confidence to continue exposure to SHS and neglect the harms because there were no overt health consequences from SHS.

"My father has smoked since I was born and still smokes until now. I don't see anything wrong with my health. So I don't care about cigarette smoke." (Pregnant woman 10)

Laypeople

In addition to the personal experiences, participants based their understanding of SHS upon the stories shared by people close to them. About a quarter of the pregnant women reported that their perceptions of SHS were influenced by friends, family, and acquaintances.

A pregnant woman revealed that her friend's miscarriage led her to believe that SHS could harm the unborn baby.

"One of my friends had miscarriage. She said her boyfriend usually blew cigarette smoke to her belly. He said the baby liked it. Then, the baby stopped moving. I think the miscarriage could have been caused by cigarette smoke." (Pregnant woman 16)

Another pregnant woman mentioned that her female relative had a baby who was born with low birth weight and had health issues that require hospitalization, which was caused by SHS exposure.

"There is someone close to me…She's my relative. Her boyfriend smoke a pack of cigarettes daily while she was pregnant. Her baby was born with low birth weight and needed to be in the NICU [neonatal intensive care unit] on a ventilator for months. Seemed like the baby had problems with his lungs." (Pregnant woman 12)

Healthcare providers

A few pregnant women revealed that their views of SHS occasionally stemmed from the history taking performed by the medical professionals and the advice they gave on avoiding SHS. This made it possible for them to discover that SHS was hazardous to a developing fetus.

Two pregnant women particularly mentioned that the nurses at antenatal clinic influenced their perception of SHS. They said:

"I think cigarette smoke affects pregnancy because a nurse asked me about the history of smoking and gave me advice about my boyfriend's smoking that he should not smoke near me. Otherwise, the baby will be in danger and may be born with disability, or have asthma or allergies." (Pregnant woman 13)

"The nurses the hospital where I got antenatal care for my first child once said that cigarette smoke was dangerous for unborn babies." (Pregnant woman 9)

This information is consistent with the findings from the ANC staffs who shared that they performed screening for risks of SHS exposure during ANC visits.

"At ANC screening, we discuss secondhand smoke with the pregnant women. We tell them that it is harmful." (ANC nurse 1)

"We screen pregnant women at the first ANC visit. We ask them whether their partner smokes or not." (ANC nurse 4)

Mass media

The mainstream media, including social media video clips and television advertising, also provided information about SHS and its negative effects. Commercials on television helped to raise the pregnant women's awareness on the harms of SHS on the non-smokers.

"I saw on TV [television] commercials that the harms of being exposed to cigarette smoke from others were equally the same as those faced by the smokers themselves." (Pregnant woman 3)

Moreover, video clips on social media were beneficial in elaborating the harms of SHS on the fetus, specifically about miscarriage.

"I think secondhand smoke is harmful. From the clips I've seen, it can cause miscarriage." (Pregnant woman 7)

"I've heard from social media that secondhand smoke can cause miscarriage if exposed in the first months of pregnancy, and can cause the child to die in their sleep." (Pregnant woman 10)

Theme 3: Attempt to prevent SHS exposure

Almost all of the pregnant women tried to prevent themselves and their unborn baby from exposure to SHS through two main methods, including avoidance and taking action to intervene with smoking. Smoking family members also attempted to prevent SHS from their pregnant partners through avoidance.

Avoidance

The majority of pregnant women did not ask the family smokers to quit, despite their desire to do so, out of concern that it would generate tension within the family. Therefore, they made the decision to keep their distance from the smoking family members in order to preserve their relationship.

"I chose to walk away when my husband smokes. I don't want to tell him not to smoke. I don't want it to turn into an argument. I do whatever makes him happy. I don't want to cause tension." (Pregnant woman 10)

"I walk away from him. Don't want to tell him not to smoke because we'll end up fighting." (Pregnant woman 5)

Meanwhile, the smoking family members also tried to smoke far away from the pregnant women such as smoking outside the house or smoking in a living room without the pregnant women's presence.

"I smoke away from my girlfriend because she doesn't like cigarette smoke. I don't smoke in the house. I go outside the house." (Smoking family member 3)

"Most of the time, I smoke in the living room, or outside the house... not indoors." (Smoking family member 5)

Taking action to intervene with smoking

Attempts to prevent SHS exposure were not only limited to avoidance but also a more proactive approach by taking action to intervene with smoking. About a quarter of the pregnant women occasionally asked smokers to cut back on their smoking, smoke farther away from them, or shower before entering the house.

"I can smell the cigarette so I tell him to reduce smoking. I also tell him to leave the room, not to get near me, and take a shower. I don't like cigarette smell. It's very strong." (Pregnant woman 5)

"When he wants to smoke, I tell him to smoke somewhere else. He does what I ask for. He would smoke in front of the house. On some days, he doesn't even smoke at home." (Pregnant woman 12)

Theme 4: Barriers to prevention of SHS exposure

Despite efforts to keep away from SHS, most of the pregnant women stated that they faced a variety of obstacles in their attempts to avoid being exposed to SHS, including having no time to seek information, lack of health education coverage on SHS, powerlessness, smoker's disbelief of SHS consequences, limited space, and social triggers.

No time to seek information

Having no time to seek information about SHS emerged as another barrier. A few of the pregnant women shared that they were too busy to look for information about SHS because they had to work hard to make ends meet.

"If I were a stay-at-home mom, I would have more time to search for information about what's best for my baby. But I have to work every day. I don't even have time to use my phone." (Pregnant woman 15)

"Nurses told me that secondhand smoke was harmful to the baby, but I had to work. I was busy so I didn't look for more information. " (Pregnant woman 9)

Pregnant women mentioned that they were too tired from work to search for information about SHS. For instance, one shared:

"I don't have time to learn about secondhand smoke or cigarettes. I have to work and I come home very tired." (Pregnant woman 10)

Lack of health education coverage on secondhand smoke

Another barrier was the lack of health education coverage on secondhand smoke. According to many pregnant women, the topics of antenatal health education mostly addressed the usage of condoms and substance misuse. However, the health education did not cover SHS and its prevention.

"The health education doesn't emphasize cigarette smoke or prevention of its exposure. They focus only on abused substances and condom use." (Pregnant woman 11)

"Does cigarette smoke have anything to do with pregnancy? They don't mention this in parent education class." (Pregnant woman 15)

Furthermore, a participant disclosed that she was unsure if non-smokers were protected by the law, suggesting that non-smokers' legal rights and protections are not well addressed.

"Is there any legal protection for those who don't smoke? If there is, it'd be great because my boyfriend respects the law. He's afraid of the police." (Pregnant woman 14)

Powerlessness

A significant proportion of the pregnant women felt powerless in making their requests fulfilled when it came to asking a family smoker to stop smoking. The smoking family members refused to listen to what the pregnant women said about SHS and many of them continued to smoke despite pregnant women's requests.

"My boyfriend's smoking is the main problem to my pregnancy. It's easy for me to ask others not to smoke in the home, but when it's my boyfriend, I can't get him to listen to me. He never believes in anything I say. He said I'm not well educated so I know little." (Pregnant woman 7)

As shared by a pregnant woman, the smoking family members were more likely to listen to the doctors' advice on SHS.

"For my husband…when the doctor tells him not to smoke in the home or near me, he believes the doctors and does it. He believes others, not me." (Pregnant woman 10)

A smoking family member congruently reflected disbelief in what pregnant women said, but he preferred to believe the doctors who were knowledgeable.

"If my girlfriend tell me about the harms of smoking, I won't listen or believe her. But if the doctors tell me, I'll believe the doctors because they are well educated." (Smoking family member 8)

Smoker's disbelief of SHS consequences

Despite pregnant women's effort to keep their unborn baby safe from SHS, their smoking family members disagreed and refused to cooperate. Due to the disbelief in the effects of SHS on non-smokers, the smoking family members did not see the necessity to give up smoking. They thought that the effects of cigarette smoke would only harm the smokers only.

"My husband thinks the smokers will get the consequences of cigarette smoke, not me or my unborn baby. He says it's his lungs, not my lungs." (Pregnant woman 12)

"My boyfriend says he's the one who smokes, so the smoke will get into his lungs only. He says the one who is affected is the smoker. He says the smoke will blow away. It won't get inhaled into my lungs." (Pregnant woman 15)

Limited space

Another significant barrier that prevented some of the pregnant women from totally avoiding SHS exposure was limited living space. Many participants lived in a one-bedroom apartment, making it impossible to smoke in a separate room.

"We live in a rented studio apartment so we have limited space. My husband has to smoke indoors." (Pregnant woman 13)

As her residence had limited space, a pregnant woman said that her husband did not smoke outdoor because he thought it would bother the neighbors who lived next door.

"We live in a studio apartment with limited space, so my husband has to smoke in home. He doesn't want to bother our neighbors with the smell. Our apartments are right next to each other. None of our neighbors smoke." (Pregnant woman 2)

Social trigger

Some pregnant women elaborated that many of their family members smoked. As a result, living with others who smoke triggered the smoking family member to continue smoking and made it even more difficult for pregnant women to intervene.

"At home, many family members smoke. Besides my husband, my father also smokes. Now we all live together, so it's like everyone smokes. I can't forbid them. When they see each other, they hang out, drink, and smoke." (Pregnant woman 6)

When many household members smoker, pregnant women ended up getting scolded when they tried to intervene with the smokers. For example, one said:

"All of my male relatives smoke, so I can't forbid them. They always smoke when they see each other. I'm the one who gets scolded when I complain and try to ask them not to smoke." (Pregnant woman 15)

The family members were also tempted to smoke when going to public smoking areas or attending social events where others smoke.

"There're always people smoking everywhere we go, so my boyfriend can't resist the temptation to smoke." (Pregnant woman 10)

"When his colleagues visit and hang out at our home, they always drink and smoke, right in front of our home. They don't care if I'm around." (Pregnant woman 13)

Theme 5: Needs related to prevention of SHS exposure

To facilitate prevention of SHS, various needs were mentioned, including the needs for health education about SHS and prevention, inclusion of smoking family members, and peer support group.

Health education about SHS and prevention

Approximately half of the pregnant women needed to learn more about the potential effects of SHS on pregnancy outcomes, as one said,*"I really want to know what consequences of secondhand smoke are on the baby."* (Pregnant woman 5) In particular, they voiced the need for innovative media for health education on various social media and online platforms in forms of video clips and picture-based to facilitate better understanding.

"TikTok. I like to watch video clips about pregnancy and harmful drugs that could affect the baby. I like to read comic books. I prefer to look at pictures because they make me understand better." (Pregnant woman 6)

" I want health education to include pictures and disseminated via Line application so I can access them whenever I want." (Pregnant woman 9).

The pregnant women emphasized that health education should be based on non-medical terms for laypeople's understanding.

"I want the media to be easy to understand. I'm not well educated so I don't understand difficult terms." (Pregnant woman 10)

Additionally, ANC staffs mentioned that health education about SHS and prevention should be brief with summary of the main points.

" Health education should be animated and a short video clip. Make the patients realize what the negative effects of smoking are and what effect it has on the unborn baby" (ANC physician 1)

Both pregnant women and smoking family members agreed that the health education materials should have interesting contents, and distributed via online platforms and applications.

"I prefer YouTube, but the clips should be short, under 10 minutes. It'd be boring with too much content." (Pregnant woman 1)

"The information should be sent via Line. I like pictures. The content doesn't have to be a lot." (Smoking family member 10)

Inclusion of smoking family members

The ANC staffs, pregnant women, and smoking family members expressed the need to include the smoking family members in health education about SHS in order to improve the family smokers' understanding of harms of SHS and proper practices for preventing exposure.

The ANC staffs believed that including family members in health education would improve the mutual understanding between pregnant women and smoking family members on SHS prevention.

"Involving family members will bring more benefits. If you bring family members, they can listen and understand as well. Sometimes women don't dare to tell their husbands directly because they are afraid. If they come together, they will be able to do it correctly." (ANC physician 2)

As stated by pregnant women, allowing the smoking family members in health education would help them develop better understanding of the harms of SHS and how prevent SHS exposure.

"I want doctors to teach and explain about the harms of cigarette smoke. I want my boyfriend to come as well so he'll be able to do it right. I want him to join every session of health education." (Pregnant woman 16)

"I want my husband to attend health education so he'll know that he shouldn't smoke near pregnant women. He'll be able to ask questions if he doesn't understand anything. If secondhand smoke is harmful, then I think my husband should be involved in the discussions with health providers." (Pregnant woman 17)

Smoking family members also voiced the enthusiasm to be included in health education so that they would know how to behave to prevent SHS. For example, one said:

"I think for me, I'd like to come and listen as well, so I will be able to behave correctly." (Smoking family member 3)

Moreover, inclusion of family members in health education was believed to lead to success in smoking cessation.

"I believe it'll be beneficial if my boyfriend comes to health education on smoking. He wanted to quit smoking, but he couldn't." (Pregnant woman 6)

Peer support group

Pregnant women and smoking family members needed a peer support group—possibly through internet and social media platforms such as Line application—where they could talk about their experiences related to SHS or exchange useful health information.

"I want to have a group where we can share our experiences or health information via Line application, so we can learn more about the harms of secondhand smoke." (Pregnant woman 11)

"I want to listen to others' experiences. It's not boring. We can also join a group chat on Line application, so we can ask each other questions whenever we want." (Pregnant woman 8)

A pregnant woman further elaborated her needs that the peer support group should be a small group.

"There should be a group where we can share our experiences about smoking and pregnancy...not a big group... a small group" (Smoking family member 11)

Quantitative Results

The objective of this study was to examine the effect of before and after implementing the self-prevention program from SHS exposure for pregnant women and their smoking family members. This chapter presents two main parts. In the first part, the study results are shown. In the second part, there is a discussion of the study findings.

The quantitative results are presented in five parts as follows:

Part I: Demographic data of the participants

Part II: Comparison of knowledge about SHS of pregnant women and their smoking family members between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members

Part III: Comparison of self-efficacy of pregnant women and their smoking family members between before and after receiving the self- prevention program from SHS exposure for pregnant women and their smoking family members

Part IV: Comparison of the self- preventive behavior from SHS of pregnant women between before and after receiving the self- prevention program from SHS exposure for pregnant women and their smoking family members

Part V: Comparison of the urinary nicotine level of pregnant women between before and after receiving the self- prevention program from SHS exposure for pregnant women and their smoking family members

Part I: Demographic data of the participants

In this study, there were 98 pregnant women who participated in the pretest-posttest randomized controlled trial (RCT) to examine the effect of the program. They were randomly assigned into two arms. One arm (49 participants) received the self-prevention program from exposure to SHS for pregnant women and their smoking family members while the other arm (49 participants) received standard care. The age of the participants in the experimental arm ranged from 18 to 38 years with a mean age of 26.57 years (SD = 5.094), and almost half of them were in the age group of younger than 25 years (44.9%). In the control arm, the age of participants ranged from 18 to 42 years with a mean age of 26.95 years (SD = 6.800), and 49.0% were younger than 25 years. The majority of the participants in the control and experimental arms had secondary education (83.7%, and 71.4% respectively). In terms of occupational status, over half of the participants were employees (55.1% and 67.3% respectively). The monthly income varied from 2,500 to 50,000 THB in the control arm and 2,000 to 30,000 THB in the experimental arm. About 49.0% of the control arm and 42.9% of the experimental arm earned less than 10,000 THB per month. In terms of the number of children, more than half of both arms had first pregnancy (69.4% in the control arm and 63.3% in the experimental arm).Additionally, most of the participants had expanded family (57.1% in the control group and 69.4% in the experimental arm). Regarding smoking within the family, in the control arm, families with more than one smoker were most common, accounting for 65.3%. In contrast, the experimental group predominantly reported only one smoking family members, at a rate of 63.3%. Husbands were reported as the primary

smokers by more than half of the participants (57.1% in the control arm and 61.2% in the experimental arm). For the frequency of smoking (days per week), smoking occurred on more than three days weekly in both the control and experimental arms, with 73.5% and 61.2% respectively. Testing of the difference of demographic data between the control group and the experimental group using t-test and Fisher' Exact Test showed no significant differences. Therefore, the control and experimental arms were similar in terms of demographic data. (Table 4.4)

Table 4.4 Demographic Variables of the Control and the Experimental Arms

Demographic Characteristics	Control (49)		Experimental		X^2	p-value
	n	%	n	%		
Age (years)						
Min-Max	18-42		18-38		3.046	0.385
Mean (SD)	26.95(6.800)		26.57(5.094)			
-Under 20	12	24.5	7	14.3		
-21-25	12	24.5	15	30.6		
-25-30	9	18.4	14	28.6		
-31 and over	16	32.7	13	26.5		
Education level					2.837	0.242
-Primary school	3	6.1	8	16.3		
-Secondary school	41	83.7	35	71.4		
-Bachelor's degree	5	10.2	6	12.2		
Occupation					2.333	0.311
-Unemployed/ housewife	21	42.9	14	28.6		
-Employee	27	55.1	33	67.3		
-Merchant/ self-employed	1	2.0	2	4.1		
Monthly income (THB)					0.854	0.837
Min-Max	(2,500-50,000)		(2,000-30,000)			
Mean (SD)	11,797.95(7144.57)		12,636.74(6144.57)			

Table 4.4 (continued)

Demographic Characteristics	Control (49)		Experimental		X^2	p-value
	n	%	n	%		
-Lower than 10,000	24	49.0	21	42.9		
-10,000-15,000	17	34.7	19	38.8		
-15,001-20,000	4	8.2	6	12.2		
-More than 20,000	4	8.2	3	6.1		
Number of children					1.065	0.302
-First pregnancy	34	69.4	31	63.3		
-1-3	15	30.6	18	36.7		
Type of family					1.581	0.209
-Single family	21	42.9	15	30.6		
-Expanded family	28	57.1	34	69.4		
Number of smoking family members					0.411	0.521
-One	17	34.7	31	63.3		
-Two or more	32	65.3	18	36.7		
Smoking family members					1.450	0.221
-Husband	28	57.1	30	61.2		
-Others (e.g., father, uncle)	21	42.9	19	38.8		
Frequency of smoking (days per week)					1.670	0.196
-Less than three days	13	26.5	19	38.8		
-Three days or more	36	73.5	30	61.2		

Note. [c] = Chi-square test

Part II: Comparison of knowledge about SHS of pregnant women and their smoking family members between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members

For knowledge about SHS, the possible scores ranged from 0 to 15, and mean scores were categorized into three levels (low, moderate, and high).

At baseline, the mean score of knowledge about SHS was at a moderate level in the experimental arm ($\bar{x}$ = 10.57, SD = 0.232) and in the control arm ($\bar{x}$ = 10.43, SD = 0.307).

At 8 and 12 weeks after the program ended, the mean scores of knowledge about SHS of the experimental arm improved, maintaining at a high level ($\bar{x}$= 12.73, SD = 0.238; $\bar{x}$= 13.15, SD = 14.073 respectively). In contrast, the mean scores of knowledge about SHS of the control arm remained at a moderate level ($\bar{x}$=10.53, SD = 0.238; $\bar{x}$= 10.57, SD = 0.232, respectively) (Table 4.5).

Table 4.5 Mean, Standard Deviation, Range, and Level of Knowledge about SHS Scores at Baseline, 8, and 12 Weeks after the Program Ended in the Control and the Experimental Arms

Knowledge about SHS Scores	Possible Score	Control arm (n=49)			Experimental arm (n=49)		
		Min-Max	$\bar{x}$ (SD)	Level	Min-Max	$\bar{x}$ (SD)	Level
Baseline	0-15	5-14	10.43 (0.307)	Moderate	5-14	10.57 (0.232)	Moderate
At 8 weeks after program ended	0-15	5-14	10.53 (0.238)	Moderate	11-15	12.73 (0.238)	High
At 12 weeks after program ended	0-15	5-14	10.57 (0.232)	Moderate	11-15	13.15 (14.073)	High

Comparisons of Knowledge about Second-Handed Smoke Between Group and Time of Measurement

From the results, there were significant differences in the mean scores of knowledge about SHS between the experimental arm and control arm, and between each point of measurement in each arm ($F = 40.604$, $p = < .001$). Moreover, the time-group interaction was also significant ($F = 31.707$, $p = < .001$) (Table 4.6).

Table 4. 6 The Difference in Knowledge about SHS between the Control and the Experimental Arms at Each Point of Measurement

Variables	SS	df	MS	F^r	p-value	η^2
Knowledge about SHS						
Within subject						
Time	77.680	1.538	50.506	40.604	$<.001^{r**}$	.297
Time x group	60.660	1.538	39.440	31.707	$<.001^{r**}$	
Error	183.660	147.65	1.244			
Between subject						
Group	100.685	1	100.685	37.210	$<.001^{r**}$	.279
Error	259.760	96	2.706			

Note. ^{r} = Repeated Measures ANOVA. *p < .05, **p < .01

Multiple pairwise comparisons between each point of measurement were carried out using the Bonferroni test. In the experimental arm, significant differences in knowledge about SHS score were found between baseline ($\bar{x}=10.57$, $SD=0.232$) and 8 week after the program ended ($\bar{x}=12.735$, $SD=0.238$), between baseline $\bar{x}=10.57$, $SD=0.232$) and 12 weeks after the program ended ($\bar{x}=13.612$, $SD=0.232$), between 8 week after program end and 12 weeks after program end. Unlike the experimental arm, the control arm had no significant differences in the scores of knowledge about SHS between each point of measurement at baseline ($\bar{x}=10.43$, $SD=0.307$), and 8 weeks ($\bar{x}$=10.53, SD=0.238), and 12 weeks after the program ended ($\bar{x}$=10.57, SD=0.232) (Table 4.7).

Table 4.7 Multiple Pairwise Comparisons of Knowledge about SHS Scores between the Control and the Experimental Arms at Each Point of Measurement

Knowledge about SHS	Base line (1)	At 8 weeks after program (2)	At 12 weeks after program (3)	p-value [b]		
	$\bar{x}$ (SD)	$\bar{x}$ (SD)	$\bar{x}$ (SD)	(1)VS (2)	(1) VS (3)	(2) VS (3)
Control arm	10.43 (0.307)	10.53 (0.238)	10.57 (0.232)	1.000	1.000	1.000
Experimental arm	10.57 (0.232)	12.735 (0.238)	13.612 (0.232)	<.001**	<.001**	<.001**

Note. [b] = Bonferroni test, **p<.01

(1) = Baseline, (2) = At 8 weeks after program, (3) At 12 weeks after program

After that, the scores of knowledge about SHS at each point of measurement between control and experimental arms were compared using independent sample t-test. From results, there was no significant difference at baseline between the experimental and control arms (t= .366, p=.738). However, the scores were significantly different between the experimental and control arms at 8 weeks (t=6.557, p = <.001), and 12 weeks after the program ended (t=9.260, p = <.001) (Table 4.8)

Table 4. 8 Means Differences of Knowledge about SHS Between the Control and Experimental Arms at Each Point of Measurement

Knowledge about SHS	Control arm (n = 49)	Experimental arm (n = 49)	t	p-value
	$\bar{x}$ (SD)	$\bar{x}$ (SD)		
Baseline	10.43 (0.307)	10.57 (0.232)	.366	.738
At 8 weeks after program ended	10.53 (0.238)	12.73 (0.238)	6.557	<.001**

Table 4.8 (continued)

Knowledge about SHS	Control arm (n = 49)	Experimental arm (n = 49)	t	p-value
	x̄ (SD)	x̄ (SD)		
At 12 weeks after program ended	10.57 (0.232)	13.15 (14.073)	9.260	<.001**

Note. t = Independent sample t-test, **p <. 01

Part III: Comparison of self-efficacy of pregnant women and their smoking family members between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members

At baseline, the mean score of self-efficacy for SHS self-prevention was at a moderate level (x̄ = 56.77, SD = 1.32) in the experimental arm and (x̄ = 56.29, SD = 1.32) in the control arm.

At weeks 8, and 12 after the program ended, the mean scores of self-efficacy for SHS self-prevention increased to 67.67 (SD = 0.98), and 69.55 (SD = 0.95) respectively in the experimental arm. In contrast, the control arm scores remained unchanged, with the mean scores of 56.14 (SD = 0.98), and 55.86 (SD = 0.95) respectively (Table 4.9).

Table 4.9 Mean, Standard Deviation, Range, and Level of Self-efficacy for SHS Self-Prevention Scores at Baseline, and 8, and 12 Weeks after the Program Ended in the Control and the Experimental Arms

Self-efficacy for SHS self-prevention	Possible Score	Control arm (n=49)			Experimental arm (n=49)		
		Min-Max	x̄ (SD)	Level	Min-Max	x̄ (SD)	Level
Baseline		39-73	56.29 (1.32)	Moderate	32-75	56.77 (1.32)	Moderate
At 8 weeks after program ended		39-73	56.14 (0.98)	Moderate	55-75	67.67 (0.98)	High

Table 4.9 (continued)

Self-efficacy for SHS self-prevention	Possible Score	Control arm (n=49)			Experimental arm (n=49)		
		Min-Max	$\bar{x}$ (SD)	Level	Min-Max	$\bar{x}$ (SD)	Level
At 12 weeks after program ended		39-73	55.86 (0.95)	Moderate	55-75	69.55 (0.95)	High

Comparisons of Self-Efficacy for SHS Self-Prevention Between Group and Time of Measurement

The analysis showed significant differences in self-efficacy for SHS self-prevention scores between the experimental and control groups and across time points ($F = 41.797$, $p < .001$), with a significant time-group interaction ($F = 46.472$, $p < .001$) (Table 4.10)

Table 4.10 The Difference in Self-Efficacy for SHS Self-Prevention between the Control and the Experimental Arms at Each Point of Measurement

Variables	SS	df	MS	F^r	p-value	η^2
Self-efficacy for SHS self-prevention						
Within subject						
Time	2210.333	1.536	1438.881	41.797	$<.001^{r**}$	.303
Time x group	2457.571	1.536	1599.828	46.472	$<.001^{r**}$	.326
Error	5076.762	147.47	34.426			
Between subject						
Group	1800.00	1	1800.00	43.619	$<.001^{**}$	.312
Error	3961.556	96	41.266			

Note. ^{r} = Repeated Measures ANOVA. *p < .05, **p < .01

Multiple pairwise comparisons using the Bonferroni test showed significant improvements in self-efficacy of SHS self-prevention within the experimental arm. The increases were observed from baseline ($\bar{x}$=56.78, SD=1.32) to 8 weeks after the program

ended ($\bar{x}$=67.67, SD=0.98), and from baseline to 12 weeks after the program ended ($\bar{x}$=69.55, SD=0.95). Also, a significant improvement was observed between 8 weeks after program ended and 12 weeks after program ended.

Regarding the control arm, there were no significant differences in the scores of self-efficacy for SHS self-prevention between each point of measurement at baseline ($\bar{x}$=56.29, SD=1.32), and 8 weeks ($\bar{x}$=56.14, SD=0.98), and 12 weeks ($\bar{x}$=55.86, SD=0.95) after the program ended (Table 4.11).

Table 4.11 Multiple Pairwise Comparisons of Self-efficacy for SHS self-prevention Scores between the Control and the Experimental Arms at Each Point of Measurement

Self-efficacy for SHS self-prevention	Base line (1)	At 8 weeks after program (2)	At 12 weeks after program (3)	p-value [b]		
	$\bar{x}$ (SD)	$\bar{x}$ (SD)	$\bar{x}$ (SD)	(1)VS (2)	(1) VS (3)	(2) VS (3)
Control arm	56.29 (1.32)	56.14 (0.98)	55.86 (0.95)	1.000	1.000	1.000
Experimental arm	56.78 (1.32)	67.67 (0.98)	69.55 (0.95)	<.001**	<.001**	.028*

Note. [b] = Bonferroni test, *p<.05, **p<.01

(1) = Baseline, (2) = At 8 weeks after program, (3) At 12 weeks after program

After that, the scores of self-efficacy for SHS self-prevention at each point of measurement between control and experimental arms were compared using independent sample t-test. The findings showed no significant difference at baseline between the experimental and control arms (t= .263, p=.793). However, the scores were significantly different between the experimental and control arms at 8 (t=-8.266, p =<.001), and 12 (t=-10.201, p=<.001) weeks after the program ended (p < .01) (Table 4.12).

Table 4.12 Means Differences of Self-efficacy for SHS self-prevention Between the Control and Experimental Arms at Each Point of Measurement

Self-efficacy for SHS self-prevention	Control arm (n = 49) $\bar{x}$ (SD)	Experimental arm (n = 49) $\bar{x}$ (SD)	t	p-value
Baseline	56.29 (1.32)	10.57 (0.232)	.263	.793
At 8 weeks after program ended	56.14 (0.98)	12.73 (0.238)	8.266	. <.001**
At 12 weeks after program ended	55.86 (0.95)	13.15 (14.073)	10.201	<.001**

Note. t = Independent sample t-test, *p < .05, **p <. 01

Part IV: Comparison of the self-preventive behavior from SHS of pregnant women between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members

For SHS self-preventive behavior, the possible mean scores ranged from 0 to 2, and the mean scores were categorized into three levels (low, moderate, and high).

At baseline, the mean score of SHS self-preventive behavior was at a moderate level in the experimental arm ($\bar{x}$ = 1.32, SD = 0.32) and in the control arm ($\bar{x}$ = 1.31, SD = 0.33).

At weeks 8, and 12 after the program ended, the mean scores of SHS self-preventive behavior of the experimental arm improved to a high level ($\bar{x}$= 1.63, SD = 0.29; $\bar{x}$=1.81, SD = 0.22 respectively). In contrast, the mean scores of SHS self-preventive behavior of the control arm remained at a moderate level ($\bar{x}$=1.37, SD = 0.28; $\bar{x}$=1.31, SD = 0.31 respectively) (Table 4.13).

Table 4. 13 Mean, Standard Deviation, Range, and Level of SHS Self- Preventive Behavior Scores at Baseline, and 8, and 12 Weeks after the Program Ended in the Control and the Experimental Arms

SHS self-preventive behavior scores	Control arm (n=49)			Experimental arm (n=49)		
	Min-Max	$\bar{x}$ (SD)	Level	Min-Max	$\bar{x}$ (SD)	Level
Baseline	0.33-2.00	1.31 (0.33)	Moderate	0.33-2.00	1.32 (0.32)	Moderate
At 8 weeks after program ended	0.33-2.00	1.37 (0.28)	Moderate	1.00-2.00	1.63 (0.29)	High
At 12 weeks after program ended	0.33-2.00	1.31 (0.31)	Moderate	1.33-2.00	1.81 (0.22)	High

Comparisons of SHS Self- Preventive Behavior Between Group and Time of Measurement

From the results, there were significant differences in the mean scores of SHS self- preventive behavior between experimental arm and control arm, and between each point of measurement in each arm ($F = 28.644$, $p = < .001$). Moreover, the time- group interaction was also significant ($F = 31.802$, $p = < .001$) (Table 4.14).

Table 4. 14 The Difference in SHS Self- Preventive Behavior between the Control and the Experimental Arms at Each Point of Measurement

Variables	SS	df	MS	F^r	p-value	η^2
SHS self-preventive behavior						
Within subject						
Time	3.015	1.627	1.853	28.644	$<.001^{r**}$	.230
Time x group	3.347	1.627	2.058	31.802	$<.001^{r**}$	.249
Error	10.104	156.178	.065			

Table 4.14 (continued)

Variables	SS	df	MS	F^r	p-value	η^2
Between subject						
Group	1.748	1	208.086	4048.280	$<.001^{r**}$	.262
Error	4.935	96	.051			

Note. ^{r} = Repeated Measures ANOVA. *p < .05, **p < .01

Multiple pairwise comparisons between each point of measurement using the Bonferroni test showed significant score improvement in the experimental arm. Significant differences in SHS self- preventive behavior score were found between baseline ($\bar{x}$=1.32, SD=0.32) and 8 weeks after the program ended ($\bar{x}$=1.64, SD=0.29), between baseline and 12 weeks after the program ended ($\bar{x}$=1.81, SD=0.22), and between 8 weeks after program ended and 12 weeks after program ended.

In the control arm, there were no significant differences in the scores of SHS self-preventive behavior between each point of measurement at baseline ($\bar{x}$=1.31, SD=0.33), and 8 weeks ($\bar{x}$=1.37, SD=0.28), and 12 weeks ($\bar{x}$=1.31, SD=0.31) after the program ended (Table 4.15).

Table 4.15 Multiple Pairwise Comparisons of SHS Self- Preventive Behavior Scores between the Control and the Experimental Arms at Each Point of Measurement

SHS self-preventive behavior	Baseline (1)	At 8 weeks after program (2)	At 12 weeks after program (3)	p-value [b]		
	$\bar{x}$ (SD)	$\bar{x}$ (SD)	$\bar{x}$ (SD)	(1)VS (2)	(1) VS (3)	(2) VS (3)
Control arm	1.31 (0.33)	1.37 (0.28)	1.31 (0.31)	1.000	1.000	1.000
Experimental arm	1.32 (0.32)	1.64 (0.29)	1.81 (0.22)	$<.001^{**}$	$<.001^{**}$	$<.001^{**}$

Note. [b] = Bonferroni test, $^{**}p<.01$

(1) = Baseline, (2) = At 8 weeks after program, (3) At 12 weeks after program

After that, the scores of SHS self-preventive behavior at each point of measurement between control and experimental arms were compared using independent sample t-test. From results, there was no significant difference at baseline between the experimental and control arms (t= -.208, p=.836). However, the scores were significantly different between the experimental and control arms at 8 (t=-4.612, p=<.001), and 12 (t=-9.283, p=.000) weeks after the program ended (p < .01) (Table 4.16).

Table 4.16 Means Differences of SHS Self-Preventive Behavior Between the Control and Experimental Arms at Each Point of Measurement

SHS self-preventive behavior	Control arm (n = 49) $\bar{x}$ (SD)	Experimental arm (n = 49) $\bar{x}$ (SD)	t	p-value
Baseline	1.31 (0.33)	1.32 (0.32)	-.208	.836
At 8 weeks after program ended	1.37 (0.28)	1.63 (0.29)	4.612	<.001**
At 12 weeks after program ended	1.31 (0.31)	1.81 (0.22)	9.283	<.001**

Note. t = Independent sample t-test, **p <. 01

Part V: Comparison of the urinary nicotine level of pregnant women between before and after receiving the self-prevention program from SHS exposure for pregnant women and their smoking family members

The scores of urinary nicotine level at each point of measurement between control and experimental arms were compared using independent sample t-test. The results showed no significant difference in urinary nicotine levels between the experimental and control arms at baseline (t= -.267, p=.790). However, the scores were significantly different between the experimental and control arms at 8 weeks after the program ended (t=-5.246, p= <.001).

When comparing urinary nicotine levels within the same groups before and after the experiment using paired sample t-tests, the findings showed no significant difference in the control group at baseline (t = 1.755, p = .084). However, in the experimental arms,

the scores were significantly different between baseline and 8 weeks after the program ended (t=-5.484, p= <.001) (Table 4.17).

Table 4. 17 Means Differences of Urinary Nicotine Level Between the Control and Experimental Arms at Each Point of Measurement

Urinary nicotine level	Control arm (n = 40)	Experimental arm (n = 40)	t	p-value
	$\bar{x}$ (SD)	$\bar{x}$ (SD)		
Baseline	95.16(44.17)	92.57(42.85)	-.267	.790[t]
At 8 weeks after program ended	95.06(44.18)	53.01(24.86)	-5.246	<.001[t**]
	t =1.775 p=.084[p]	t = 5.484 p=<.001[P**]		

Note. P = Paired sample test, **p <. 01 (within group)
t = Independent sample t-test, **p <. 01 (between groups)

Discussion

The discussion is presented based on the research objectives: 1) to study the situations and needs for the self-prevention program from exposure to SHS for pregnant women; and 2) to examine the effect of before and after implementing the self-prevention program from SHS exposure for pregnant women and their smoking family members.

1) The situations and needs for the self-prevention program from exposure to SHS for pregnant women

The qualitative findings from in-depth interview with staffs in antenatal care, pregnant women, and smoking family members revealed five themes.

The first theme was unclear understanding of SHS, which reflected the participants' unclear understanding of SHS in terms of what SHS was, the substances in SHS, or the consequences of SHS on the fetus. The finding was in line with other studies where pregnant women in Vietnam (Vu et al., 2020) and India (Yavagal et al., 2021) were unaware of the health risks SHS posed to unborn children. Due to their lack of awareness of the dangers of secondhand smoke exposure, pregnant women were negligent about the effects of prenatal exposure on both themselves and the growing fetus (Artzi-Medvedik, Mohamed, & Chertok, 2022). Consistently, Xia et al. (2021) found that the expectant fathers were dubious about how SHS would affect the developing fetus. They were unable to quite comprehend how the SHS might endanger the health of a fetus that was in the mother's womb. They believed that medical practitioners overstated the detrimental consequences of smoking and SHS on health. Because knowledge and awareness play a major role in influencing pregnant women's behaviors in preventing exposure to SHS at home, this lack of awareness highlights the need for additional initiatives to increase the understanding of the consequences of SHS among both pregnant women and smoking family members (Oktalia, 2023).

The second theme was influences shaping perceptions related to SHS. Many sources influenced the participants' perceptions about SHS. To ascertain the health consequences of SHS on the fetus, participants drew on their personal experiences from prior pregnancies. The media, laypeople, and healthcare professionals were among the other key sources of information regarding SHS. Congruently, Tantanokit, Sansiriphun, Sripichyakan, and Klunklin (2023) found that pregnant women in Thailand formed their opinions on hazardous chemicals by considering the results of their prior pregnancies, the stories of friends' children illness, and medical advice. However, it is important to highlight that certain personal experiences with prior pregnancies where there were no overt negative effects while being around SHS may have contributed to underestimating the negative effects of SHS (Artzi-Medvedik et al., 2022). Thus, pregnant women's ability to assess the validity of information from a variety of sources, especially those that are not from professionals, must be strengthened.

The third theme was the attempt to prevent SHS exposure. The participants tried to prevent SHS exposure by avoiding it and intervening with smoking. This finding was aligned with other studies that avoidance (withdrawing from smoking situations) (Artzi-

Medvedik et al., 2022) and proactive measures (establishing a no-smoking policy at home) were pregnant women's popular strategies to prevent SHS exposure (Pookpan et al., 2021). It is interesting to note that due to the need to preserve positive family dynamics and their concern that addressing the smokers might cause an argument, many pregnant women made the decision to avoid the smokers, which was also similar to pregnant women in Egypt who were concerned about disagreements and fights with their husbands, so they did not ask their husband to stop smoking (Hassanein, Langley, Bogdanovica, & Murray, 2022). This practice might be explained by the Asian context where the fear of endangering relationships was a reason why pregnant women did not confront their husband about smoking (Ayuningtyas, Tuinman, Prabandari, & Hagedoorn, 2021). This implies that health professionals should support pregnant women's strategies for addressing their husbands' smoking while also emphasizing the value of preserving marital stability in the Thai setting (Mornsaeng, Sripichyakan, Sansiriphun, & Chaloumsuk, 2024).

The fourth theme was barriers to prevention of SHS exposure. The pregnant women reported that they faced several challenges when attempting to prevent SHS exposure. The majority of the participants did not have time to look up information regarding secondhand smoking because they were working and needed to work hard to support their families. Another obstacle that prevented them from distancing themselves from their partner's smoking was the small amount of living space at home. Furthermore, pregnant women's ability to reduce SHS exposure was limited because the health information that was given did not address SHS or the legal protection of non-smokers. Additionally, powerlessness and smoker's disbelief of SHS consequences emerged as important barriers. These obstacles are not uncommon in the Asian context, where women report regular exposure to SHS, are expected to give in to their husbands, and are less likely to influence their partners' or male family members' smoking habits (Mornsaeng et al., 2024). Therefore, encouraging pregnant women to feel empowered to make decisions about smoking at home would be a good first step toward lowering exposure.

The last theme was the needs related to prevention of SHS exposure. The participants, especially pregnant women, needed to receive concise, easily understood health information about secondhand smoke and prevention that made use of cutting-edge

media, such social media and the internet. Pregnant women consistently expressed a desire to learn about lowering their SHS exposure and asked for tailored, easily accessible, and useful health education on this topic (Artzi-Medvedik et al., 2022). The participants also emphasized the importance of including smoking family members in health education, arguing that pregnant women are not the only ones who must be understanding and willing to help prevent SHS exposure; partners in particular must also be willing to do so. As a result, health education and interventions should involve smoking husbands in order to increase their knowledge of their duty to participate in the care and protection of the fetus by cutting back on or giving up smoking. The final need was for a peer support group in which pregnant women could talk about their experiences with SHS. Pregnant women provided a helpful support system since they understood and could relate to what they were going through (Weiland et al., 2022). Pregnant women may be inspired to carry out their endeavor if they have the chance to observe or learn about other women's experiences battling SHS.

From these qualitative findings of situations and needs for the self-prevention program from exposure to SHS for pregnant women, it indicates that the success of the program relies not only on the pregnant women, but also on the smoking family members. Both pregnant women and smoking family members need to be included in the intervention to enhance their knowledge and awareness of SHS and its consequences on the fetus. Pregnant women need to be supported by health professionals to enhance their belief in their own ability to prevent SHS at home. At the same time, smoking family members need to engage in health education and counselling to reduce their smoking habit. These findings offered useful input to inform the development of the self-prevention program from SHS exposure in this study.

2) The effect of before and after implementing the self-prevention program from SHS exposure for pregnant women and their smoking family members

In this study, 98 people at risk to stroke met the inclusion criteria, with 49 participants assigned to the experimental arm to receive the self-prevention program from SHS exposure for pregnant women and their smoking family members and 49 participants assigned to the control arm to receive standard care. There were no significant differences in the demographic characteristics between the experimental and control arms. Moreover,

no significant differences were found in the mean scores of knowledge about SHS, self-efficacy, self-preventive behavior from SHS, and urinary nicotine level at baseline between the experimental and control arms. The discussion of findings are based on the research hypotheses for each program outcome as follows:

Effect of the self-prevention program on knowledge about SHS

The findings showed that after receiving the program, the knowledge about SHS of pregnant women and their smoking family members was higher than before receiving the program. This finding supported the research hypothesis.

The participants in the experimental arm received health education about SHS self-prevention, harms of SHS exposure, and laws related to SHS. This might directly led to a better understanding of SHS. Consistently, a previous health education program where pregnant women received information about the definition of SHS exposure, the adverse effects of SHS exposure for both the mother and the fetus, the benefits of a smoke-free environment, and how to decrease their exposure to SHS led to higher score of knowledge in the intervention group, compared to the control group ($p < 0.001$) (Abu-Baker et al., 2022). Moreover, the program incorporated various educational materials and media to enhance knowledge, including the manual of SHS self-prevention for pregnant women and PowerPoint presentation. The contents of the manual were about the general information of SHS, harms of SHS, skills in SHS self-prevention, and laws related to SHS. The content, pictures, and the language of the manual were easy to understand, and interesting, which helped to increase pregnant women's understanding about SHS. Congruently, a previous intervention provided brochures to pregnant women after completion of the educational session to guide for pregnant women to avoid SHS exposure. Health education comprising lecture presentation and brochure distribution was effective in improving knowledge of SHS among pregnant women (Abu-Baker et al., 2022). This finding was also in line with another intervention that included teaching media such as videos and educational materials about the harm of SHS, which contributed to better knowledge of SHS among pregnant women (Hamadneh & Hamadneh, 2023). Moreover, the finding echoes a study by Lee (2008) who found that a program based on SCT, which included an information booklet of SHS, was effective in increasing pregnant women's knowledge of SHS.

Effect of the self-prevention program on self-efficacy

The findings showed that after receiving the program, the self-efficacy of pregnant women and their smoking family members was higher than before receiving the program. This finding supported the research hypothesis and was consistent with a previous program that led to increased self-efficacy in SHS among pregnant women (Chi et al., 2016).

A possible explanation for this significant increase in self-efficacy is that the program was developed based on the SCT (Bandura, 1977) that focuses on increasing a person's self-efficacy through four sources: 1) mastery experience that are personal experiences of managing efforts toward performance accomplishments; 2) vicarious experiences by witnessing others' success; 3) emotional arousal that occurs when someone contemplates doing something provides clues as to the likelihood of success or failure; and 4) verbal persuasion that involves telling the persons that they can perform the behavior (Bandura, 2004).

For mastery experience, the participants in the experimental arm were provided with education and training for SHS self-prevention skills. Participants reflected on their prior experience in SHS self-prevention and saw that they could perform SHS self-prevention successfully. When pregnant women could perform SHS self-prevention successfully, they would develop a confidence in their own ability. Interpretations of past successes can reinforce self-beliefs, which improve self-efficacy (Waddington, 2023). This finding is aligned with a previous self-efficacy enhancement program where pregnant women were taught skills related to SHS refusal, which led to higher self-efficacy in SHS (Chi et al., 2016). Moreover, the findings resonates a previous study, in which pregnant women participated in a program involving demonstrations of health behavior skills, which contributed to an increase in self-efficacy to perform recommended health behaviors (Al-Hashmi, Hodge, Nandy, Thomas, & Brecht, 2019).

For vicarious experience, the participants observed and learned from a role model who had an experience of miscarriage or infant with low birth weight caused by SHS exposure from smoking family members. Video multimedia of the role models showed the role models' effort to prevent SHS exposure. When participants saw health behavior and success of the role models, they would also feel that they were able to perform SHS self-prevention successfully. Activities involving role modelling and observation can

provide opportunities for individuals to build their own self-efficacy by watching others perform tasks successfully (Waddington, 2023). The use of a role model who was a pregnant woman with similar characteristics to the participants was particularly inspiring. Consistently, a previous self-efficacy enhancement program where pregnant women were taught skills related to SHS refusal, which led to higher self-efficacy in SHS (Chi et al., 2016).

For verbal persuasion, the participants received verbal persuasion to reflect on their prior experience, benefits of SHS self- prevention, and consequences of SHS exposure to themselves and their family to help participants believe in their ability to perform SHS self- prevention successfully. In addition, the participants were asked to identify barriers to SHS avoidance and the solutions. They received encouragement that they can do it in order to increase their confidence. Likewise, positive encouragement received by pregnant women from other people like healthcare providers, family, partners, or peers increased women's self-efficacy to decrease smoking exposure (Chi et al., 2015).

Lastly, for emotional arousal, positive emotions were encouraged by arranging friendly, happy, and casual atmosphere during activities. According to Waddington (2023), positive and constructive self- efficacy beliefs can be fostered by ensuring that participants' emotions are duly considered during activities, and that efforts are taken to detect and minimize the discomforts and anxieties.

Effect of the self-prevention program on self-preventive behavior from SHS

The findings showed that after receiving the program, the self-preventive behavior from SHS of pregnant women was higher than before receiving the program. This finding supported the research hypothesis. The program was guided by the SCT (Bandura, 1977). According to SCT, human behavior is conceptualized based on the triadic reciprocal determinism as a result of interactions among personal factors such as biological properties, beliefs, expectation, emotions, and thoughts; environmental factors such as social influences, and the behavior itself (Bandura, 1977).

To increase positive beliefs (personal factors), the program included a process of knowledge acquisition or learning through observational learning that was governed by four components: 1) attention by paying attention to what the model is doing; 2) retention;

3) production; and 4) motivation (Bandura, 1971). For attention process, participants paid attention to observe the behavior of the role model who shared her experience of miscarriage caused by SHS exposure. For retention process, pregnant women reflected on the harms of SHS, raised the family members' awareness of smoking in the vicinity of pregnant women, and make an agreement regarding smoking. This helped transforming and restructuring the information conveyed by modeled events into rules and conceptions for memory representation. For production process, there was a weekly follow-up activity via Line application to give information support in case participants could not deal with problems related to SHS avoidance by themselves, allowing the participants to maintain appropriate courses of action to prevent SHS. For motivation process, the researcher and smoking family members built sincere rapport with pregnant women to create trust and sense of security, listened attentively with warmth and friendliness to allow the pregnant women to feel that they are wanted and belong to the society. This served as positive reinforcement and incentives to perform the SHS preventive behaviors. The involvement of family members is crucial to pregnant women's action to prevent SHS because family members are significant social influences based on SCT that affect persons' behaviors (Bandura, 1977) . Consistently, observational learning strategies are important contributors that lead to the performance of health preventive behaviors in general population (Carrignon et al., 2022).

Moreover, the program focused on increasing pregnant women's self-efficacy through four sources, including mastery experience, vicarious experiences, emotional arousal, and verbal persuasion (Bandura, 2004). This aspect of the program was designed to address the issue emerged from the qualitative in-depth interview findings that pregnant women mentioned feeling powerless and lacking confidence in making their requests fulfilled when it came to asking a family smoker to stop smoking. After individuals have personal experiences of managing efforts toward performance accomplishments (mastery experience), see people similar to themselves succeed (vicarious experiences), are well-rested and relaxed before attempting a new behavior (emotional arousal), and receive strong encouragement, they will have more confidence to induce the efforts toward behavior change (Bandura, 2004). Consistently, research showed that self-efficacy was a powerful factor influencing SHS avoidance behaviors (Lee, Ahn, & Lee, 2018; Prathumsuwan et al., 2019).

In addition, the program incorporated self-regulation that consisted of three sub-processes: 1) self-observation; 2) judgment process; and 3) self-reaction (Bandura, 1986). In this study, to facilitate self-observation, pregnant women and their family members observed the area in the house designated for smoking whether it was appropriate and distant from the pregnant women's room or living space, and set a goal for SHS prevention. For judgment process, pregnant women had autonomy in decision-making and taking action to achieve the goal for avoiding SHS based on their own ability or desire. Likewise, in a previous program, non-smoking women were guided to decide how they could reduce exposure to SHS, as applicable to their own home, which led to better attitude and empowerment to prevent SHS exposure (Alagiyawanna, Rajapaksa-Hewageegana, & Gunawardena, 2017). For self-reaction, pregnant women explored their own ability to achieve the goals, observe, and record to monitor their actual SHS self-preventive behavior in their daily life, as well as discussed about the physical, psychological, and social benefits of behavior changes. Self-regulation allows people to control and direct their actions to achieve the goals by being actively involved in developing functional patterns of thinking and behaving in response to environmental conditions in order to attain personal goals. People with self-regulation can actively monitor the performance environment, develop functional task strategies, skillfully implements those plans, and monitor the results (Bandura, 1986).

Furthermore, the development of the program in this study was informed by the qualitative findings from in-depth interviews with pregnant women who voiced their situations and needs related to SHS at home. This helped to develop the program with a focus on what the pregnant women actually faced and needed in order to achieve SHS preventive behaviors. Similarly, another program that was designed based on the findings from discussions to identify the problems faced by the women in relation to being exposed to SHS was effective in increasing women's empowerment to prevent SHS exposure (Alagiyawanna, Rajapaksa-Hewageegana, & Gunawardena, 2017). Additionally, the qualitative findings in the present study revealed that the barrier to SHS prevention was that the family members did not see the need to quit smoking because they thought that only the smokers themselves would be affected by cigarette smoke. However, involving the smoking family members in the program where they were educated about the harms of SHS could enlighten them, allowing them to see that SHS also affect pregnant women

and the fetus. Similarly, studies showed that involvement of the smoking family members in an intervention had a positive effect on decreasing the exposure to secondhand smoke at home among pregnant women (Bayrami et al., 2022; Soltani et al., 2019). Another study supported that educational interventions resulted in greater awareness of the harms of exposure to smoking and increased sensitivity of women to reduce exposure to SHS at home, which might be induced by the level of knowledge, attitude, self-efficacy, and practices of men (Yu et al., 2017).

Overall, the finding on the effectiveness of the program on improving self-preventive behavior from SHS was in line with a study by Lee (2008) who found that a program based on SCT, which included advice by the obstetrician, an information booklet, access to support via a telephone hotline and follow-up reinforcement over the telephone, was effective in increasing the likelihood of pregnant women's assertive action when exposed to SHS in the family. Moreover, the finding was congruent with another study by Hamadneh and Hamadneh (2023) who found that after the intervention, the percentage of pregnant women were exposed to indoor SHS became significantly lower (53%). The percentage of women who used to move elsewhere if they were in a place while other people smoked cigarettes went up to 70.37% after the intervention. The percentage of women who moved from the place where people smoked water pipes also increased to 84.0%.

Effect of the self-prevention program on urinary nicotine level

The findings showed that after receiving the program, the urinary nicotine level of pregnant women was lower than before receiving the program. This finding supported the research hypothesis.

The significant reduction in the urinary nicotine level of pregnant women might be due to their SHS preventive behaviors that increased after participation in the program. In this study, the pregnant women in the experimental arm had a high level of self-preventive behaviors from SHS at 4 and 8 weeks after the program ended ($\bar{x}$= 1.63, SD = 0.29; $\bar{x}$=1.81, SD = 0.22 respectively). They performed self-preventive behaviors from SHS both inside and outside the house by walking away, refusing to be in smoke-filled situation, not allowing people to smoke in their presence, avoiding going to places where people regularly smoke, asking smokers to stop smoking, breathing in as little SHS as

possible, wearing a medical mask, and washing clothes to eliminate SHS. These self-preventive behaviors helped to create a smoke-free environment that is effective in protecting exposure from SHS exposure (Arfaeinia et al., 2023). Nicotine enters people's bodies when they are exposed to tobacco smoke from nearby smokers (Paci et al., 2018). This means that with better SHS self-preventive behaviors, the participants in the experimental arm were less exposed to SHS, as evidenced by their lower levels of urinary nicotine at 8 weeks after the program (mean urinary nicotine = 53.01 ng/mL) when compared to the control arm (mean urinary nicotine = 95.06 ng/mL). In this study, detection of cotinine (positive, urinary cotinine ≥ 100 ng/mL) means that the person has been exposed to tobacco smoke (approximately within the last 4 days before the specimen is taken). This suggests that the urinary cotinine level of the experimental arm was much lower that the detection cut-off point, which implies that the program was effective in reducing SHS exposure.

The finding is in line with another study where educational intervention could lead to a significant reduction in SHS exposure among pregnant women measured through urinary cotinine level, which is a metabolite of nicotine. The intervention contributed to 81% decrease in cotinine level. In addition, there was a significant decrease in mean cotinine level, from 2.69 ± 0.63 to 1.13 ± 0.25 ng/mL in pre-and post-interventional tests, respectively ($p = 0.018$) (Hamadneh & Hamadneh, 2023).

CHAPTER 5

Conclusion and Recommendations

This chapter illustrates summary of the study, findings and conclusion, implications of findings, limitations of the study, and recommendations for further research.

Summary of the Study

This study employed a mixed methods design with qualitative and quantitative approaches. The qualitative part was conducted using in-depth interviews with 9 staffs in antenatal care, 17 pregnant women, and 14 smoking family members. The findings were used to develop the SHS self-prevention program of pregnant women with smoking family members. For the quantitative part, a randomized controlled study was conducted. Participants were 98 pregnant women with no more than 16 weeks gestational age who lived in Suphanburi province with a smoking family member. Participants were assigned into an experimental arm (n= 49) or a control arm (n= 49) using permuted block randomization. The experimental arm received the self-prevention program from SHS exposure for pregnant women and their smoking family members based on SCT while the control arm received usual care. Qualitative data were collected using structured in-depth interview guide for pregnant women, for smoking family member, and for staffs. Quantitative data were collected using Demographic Data Forms for Pregnant Women and for Smoking Family Members, Knowledge about SHS Questionnaire, SHS Self-Preventive Behavior Questionnaire, Self- Efficacy for SHS Self- Prevention Questionnaire, and Urinary Nicotine Level Record Form. Qualitative data were analyzed using thematic analysis. Quantitative data were analyzed using descriptive statistics, and compared using Chi-square test and repeated measures ANOVA.

Findings and Conclusion

The qualitative findings from in-depth interview with staffs in antenatal care, pregnant women, and smoking family members revealed five themes: unclear understanding of SHS; influences shaping perceptions related to SHS; attempt to prevent SHS exposure; barriers to prevention of SHS exposure; and needs related to prevention of SHS exposure.

The quantitative findings showed that:

1. After receiving the program, the knowledge about SHS of pregnant women and their smoking family members was higher than before receiving the program.

2. After receiving the program, the self-efficacy of pregnant women and their smoking family members was higher than before receiving the program.

3. After receiving the program, the self-preventive behavior from SHS of pregnant women was higher than before receiving the program.

4. After receiving the program, the urinary nicotine level of pregnant women was lower than before receiving the program.

Implications of Findings

1. The findings provide evidence to support the use of social cognitive theory to guide the development of a program to promote pregnant women's knowledge, self-efficacy, and self-preventive behaviors from SHS exposure.

2. The self-prevention program from SHS exposure can be applied by nurses, public health and incorporated into routine care to plan for activities for pregnant women with smoking family members to perform self-preventive behaviors from SHS exposure.

3. Policy-makers can use the findings to plan for actions to prevent SHS exposure among pregnant women with smoking family members and increase awareness of the harms of SHS on pregnant women and fetus. The findings can be integrated in the Parent School health education regarding the prevention of SHS exposure during pregnancy such as giving knowledge on the harmful substances in SHS, particularly nicotine, the

exposure pathways, and consequences of SHS, as well as access to self-screening of SHS exposure using urinary nicotine tests.

4. Since the findings emphasize the importance of including the smoking family members in the program, nurses and other healthcare providers can plan for activities to include the smoking family members, which will lead to a greater awareness in reducing SHS exposure among pregnant women.

Limitations

This study was conducted with pregnant women and smoking family members in a province in central Thailand, which might limit the generalizability of findings to other contexts. Moreover, there was a limitation in the budget to assess urinary nicotine of pregnant women, which was costly. As a result, in this study, urinary nicotine was assessed at baseline and at two time points after the program ended, not three time points as previously planned. Another limitation was a difficulty in conducting individual home visits, which might increase the workload of healthcare providers.

Recommendations for Further Research

1. Further research is recommended to develop and examine the effectiveness of a program to promote self-preventive behaviors from SHS among pregnant women in different settings, such as those in urban and rural areas.

2. Further research is recommended to use the research and development (R&D) approach to develop a program to promote self-preventive behaviors from family members of SHS among pregnant women, with an emphasis on the use of up-to-date application such as Tiktok to reduce the length of the program.

3. Follow-ups should be conducted from pregnancy until the postnatal period. The behaviors of family members who participate in the program should be assessed.

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APPENDICES

APPENDIX A

Ethical Approval

เอกสารเลขที่ ET034/2566
Document No. ET034/2023

หนังสือรับรองการพิจารณาจริยธรรมโครงการวิจัย
Certification of Approval

รับรองโดย
Issued By
คณะกรรมการจริยธรรมการวิจัยคณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่
Committee of Research Ethics, Faculty of Public Health, Chiang Mai University

โครงการวิจัย:	ประสิทธิผลของโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่สมาชิกในครอบครัวสูบบุหรี่
Title of Project:	Effectiveness of the Secondhand Smoke Self-Prevention Program of Pregnant Women with Smoking Family Members
หัวหน้าโครงการวิจัย:	นางสาวสุนิสา จันทร์แสง
Principal Investigator:	Miss Sunisa Chansaeng
สังกัดหน่วยงาน:	คณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่
Affiliation:	Faculty of Public Health, Chiang Mai University

คณะกรรมการได้พิจารณาและให้ความเห็นชอบในประเด็นจริยธรรมต่อโครงการวิจัยนี้
ในวันที่ 30 เดือน สิงหาคม พ.ศ. 2566 ถึง 29 เดือน สิงหาคม พ.ศ. 2568
The Committee has reviewed and approved this project on 30 August 2023 to 29 August 2025

.....
ผู้ช่วยศาสตราจารย์ ดร. จักรกฤษณ์ วังราษฎร์
Assistant Professor Dr.Jukkrit Wungrath
ประธานคณะกรรมการจริยธรรมการวิจัยคณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่
Committee of Research Ethics in Faculty of Public Health, Chiang Mai University

.....
ศาสตราจารย์เกียรติคุณ นายแพทย์สุวัฒน์ จริยาเลิศศักดิ์
Emeritus Professor Suwat Chariyalertsak, MD., Dr.PH.
คณบดีคณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่
Dean of Faculty of Public Health, Chiang Mai University

โรงพยาบาลเจ้าพระยายมราช สุพรรณบุรี
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โทร. 0-35514-999
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คณะกรรมการจริยธรรมการวิจัยในคน โรงพยาบาลเจ้าพระยายมราช จังหวัดสุพรรณบุรี

เอกสารรับรองโครงการวิจัย

หมายเลข YM016/2566

ชื่อโครงการภาษาไทย : ประสิทธิผลของโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่สมาชิกในครอบครัวสูบบุหรี่

ชื่อโครงการภาษาอังกฤษ: Effectiveness of the Secondhand Smoke Self-Prevention Program of Pregnant Women with Smoking Family Members.

หัวหน้าโครงการ: นางสาวสุนิสา จันทร์แสง

สถานที่ทำวิจัย : โรงพยาบาลเจ้าพระยายมราช จังหวัดสุพรรณบุรี

เอกสารที่รับรอง :

1. แบบเสนอโครงการวิจัยเพื่อขอรับการพิจารณาจากคณะกรรมการจริยธรรมการวิจัยในคน
2. โครงร่างการวิจัย
3. แบบบันทึกผลการวิจัย
4. ประวัติผู้วิจัย

ต่ออายุครั้งที่ () : .....

วันหมดอายุ : 30 มิถุนายน 2567

คณะกรรมการจริยธรรมการวิจัยในคน โรงพยาบาลเจ้าพระยายมราช จังหวัดสุพรรณบุรี ดำเนินการให้การรับรองโครงการวิจัยตามแนวทางหลักจริยธรรมการวิจัยในคนที่เป็นสากล

ลงนาม .....
(นายแพทย์ชาติชาย สามัคคีนิชย์)
ประธานคณะกรรมการจริยธรรมการวิจัยในคน
30 มิ.ย. 66
วันที่

ลงนาม .....
(นายแพทย์อิทธิพล จรัสโอฬาร)
ผู้อำนวยการโรงพยาบาลเจ้าพระยายมราช
30 มิ.ย. 66
วันที่

APPENDIX B

The data collection tools

เลขที่.....

แบบสอบถาม

เรื่อง ประสิทธิผลของโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองของหญิงตั้งครรภ์ที่สมาชิกในครอบครัวสูบบุหรี่

<u>คำชี้แจง</u> แบบสอบถามชุดนี้มีวัตถุประสงค์ เพื่อศึกษาประสิทธิผลก่อนและหลังการใช้โปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์และสมาชิกในครอบครัวที่สูบบุหรี่

แบบสอบถามชุดนี้มี 4 ส่วน ประกอบด้วย

1.แบบสอบถามข้อมูลทั่วไปของหญิงตั้งครรภ์

2.แบบสอบถามความรู้เรื่องควันบุหรี่มือสอง

3.แบบสอบถามการรับรู้สมรรถนะแห่งตนในการป้องกันควันบุหรี่มือสอง

4.แบบสอบถามพฤติกรรมการป้องกันตนเองจากควันบุหรี่มือสอง

ข้อมูลที่ได้จากการตอบแบบสอบถามชุดนี้ ผู้วิจัยขอรับรองว่าจะถูกเก็บข้อมูลไว้ใช้เฉพาะในการศึกษาวิจัยเท่านั้น ไม่มีการนำเสนอผลในรายบุคคลและไม่มีผลต่อหน้าที่การงานของท่านแต่อย่างใด หากมีข้อสงสัยใดเกี่ยวกับงานวิจัยครั้งนี้ ผู้วิจัยยินดีตอบและให้ซักถามข้อสงสัยได้ตลอดการศึกษา และผู้วิจัยขอขอบคุณทุกท่านที่ให้ความร่วมมือในการตอบแบบสอบถามเป็นอย่างดี

นางสาวสุนิสา จันทร์แสง
นักศึกษาปริญญาเอก สาธารณสุขศาสตรดุษฎีบัณฑิต
คณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่
ผู้วิจัย

ส่วนที่ 1 แบบสอบถามข้อมูลทั่วไป

คำชี้แจง โปรดใส่เครื่องหมาย ✓ ในช่องหรือเติมข้อความในช่องว่างที่ตรงกับความเป็นจริงของท่านเพียงข้อเดียว

1.อายุ.....ปี

2.ระดับการศึกษา

☐ 1. ไม่ได้รับศึกษา ☐ 2. ประถมศึกษา

☐ 3. มัธยมศึกษา / ปวช. ☐ 4. อนุปริญญา / ปวส.

☐ 5. ปริญญาตรี ☐ 6. สูงกว่าปริญญาตรี

3. อาชีพ

☐ 1. ไม่ได้ทำงาน/แม่บ้าน ☐ 2. ข้าราชการ/รัฐวิสาหกิจ

☐ 3. รับจ้าง ☐ 4. ค้าขาย/ธุรกิจส่วนตัว

☐ 5.เกษตรกรรม ☐ 6. อื่นๆ.....

ระบุ.....

4. รายได้ต่อเดือน.....บาท/เดือน

5. ประวัติการตั้งครรภ์

จำนวนบุตร.....คน แท้ง.....คน

-กรณีเคยมีบุตรมาก่อน

☐ **คลอดก่อนกำหนด.....คน**

☐ **คลอดตามกำหนด.....คน**

6.ลักษณะของครอบครัวที่อยู่อาศัยเป็นแบบใด

☐ **ครอบครัวเดี่ยว**

☐ **ครอบครัวขยาย**

7.จำนวนสมาชิกที่สูบบุหรี่ในครอบครัว.....คน

ผู้สูบบุหรี่ในครอบครัว ระบุ.....

8.สถานที่ที่ได้รับควันบุหรี่

☐ **ในบ้าน ระบุ.....**

☐**นอกบ้าน ระบุ.....**

9.ความถี่ในการรับควันบุหรี่.....ต่อสัปดาห์

ส่วนที่ 2 แบบสอบถามความรู้เรื่องควันบุหรี่มือสอง

คำชี้แจง โปรดใส่เครื่องหมาย √ ลงในช่องที่ท่านคิดว่าถูกต้องที่สุด โดยเลือกเพียงคำตอบเดียวในแต่ละข้อ

ข้อที่	ความรู้เรื่องควันบุหรี่มือสอง	ใช่	ไม่ใช่	ไม่ทราบ
1.	ควันบุหรี่มือสองเป็นส่วนผสมของควันจากปลายบุหรี่ที่ติดไฟและควันที่ผู้สูบบุหรี่พ่นออกมา			
2.	ตราบใดที่ฉันไม่สูบบุหรี่ การได้รับควันบุหรี่มือสองในระยะยาวจะไม่เป็นอันตรายต่อสุขภาพของฉันและทารกในครรภ์			
3.	ควันบุหรี่มือสองมีสารอันตรายและสารก่อมะเร็งหลายชนิด			
4.	การสูบบุหรี่ในบ้าน ถือว่าเป็นการกระทำความรุนแรงในครอบครัวโดยเจตนาให้เกิดอันตรายแก่สุขภาพ ซึ่งมีความผิดอาญาตามพระราชบัญญัติส่งเสริมการพัฒนาและคุ้มครองสถาบันครอบครัว พ.ศ.2562			
5.	การที่หญิงตั้งครรภ์ได้รับควันบุหรี่มือสองเพิ่มความเสี่ยงต่อการตั้งครรภ์หลายประการ เช่น การคลอดก่อนกำหนด ความผิดปกติของทารกในครรภ์ รวมทั้งภาวะทารกคลอดตาย			
6.	ผู้ที่ไม่สูบบุหรี่ที่สัมผัสควันบุหรี่มือสองสูดดมสารก่อมะเร็งหลายชนิดเช่นเดียวกับผู้สูบบุหรี่			
7.	การได้รับควันบุหรี่มือสองอาจทำให้เกิดผลกระทบต่อสุขภาพในทันที เช่น ระคายเคืองตา จมูก และคอ ปวดศีรษะ คลื่นไส้ และเวียนศีรษะ รวมทั้งผลกระทบระยะยาว เช่น มะเร็งปอด โรคหลอดเลือดหัวใจ และการเสียชีวิตด้วยโรคหัวใจ			
8.	หากมีผู้สูบบุหรี่ในครอบครัว สมาชิกในครอบครัวที่ไม่สูบบุหรี่คนอื่นๆ อาจเป็นมะเร็งปอดได้			
9.	ควันบุหรี่มือสองไม่เป็นอันตรายต่อทารกในครรภ์			
10.	ผู้ใดฝ่าฝืนสูบบุหรี่ในที่ห้ามสูบตามกฎหมาย มีโทษปรับไม่เกิน 2,000 บาท			
11.	ผู้ไม่สูบบุหรี่ต้องได้รับการปกป้องจากการสัมผัสกับควันบุหรี่มือสองภายในบ้าน ที่โรงเรียน และในที่ทำงาน			

ข้อที่	ความรู้เรื่องควันบุหรี่มือสอง	ใช่	ไม่ใช่	ไม่ทราบ
12.	สำหรับประเทศไทย ผู้ไม่สูบบุหรี่ได้รับการคุ้มครองจากควันบุหรี่มือสองภายใต้พระราชบัญญัติคุ้มครองสุขภาพของผู้ไม่สูบบุหรี่ พ.ศ. 2535 และ พระราชบัญญัติส่งเสริมการพัฒนาและคุ้มครองสถาบันครอบครัว พ.ศ. 2562			
13.	การสูบบุหรี่ในรถยนต์ส่วนบุคคลไม่ผิดกฎหมาย			
14.	ควันบุหรี่มือสองมีผลทำให้ทารกแรกคลอดจะมีน้ำหนักตัวและความยาวน้อยกว่าปกติ และพัฒนาการทางสมองช้ากว่าปกติ			
15.	การได้รับควันบุหรี่มือสองมีผลทำให้หญิงตั้งครรภ์คลอดก่อนกำหนด			

ส่วนที่ 3 แบบสอบถามการรับรู้สมรรถนะแห่งตนในการป้องกันควันบุหรี่มือสอง

คำชี้แจง โปรดใส่เครื่องหมาย √ ลงในช่องระดับความคิดเห็นที่ท่านคิดว่าถูกต้องที่สุด โดยเลือกเพียงคำตอบเดียวในแต่ละข้อ

คำอธิบาย

มากที่สุด	หมายถึง	มีการปฏิบัติงานในกิจกรรมนั้นทุกครั้ง
มาก	หมายถึง	มีการปฏิบัติงานในกิจกรรมนั้นเกือบทุกครั้ง
ปานกลาง	หมายถึง	มีการปฏิบัติงานในกิจกรรมนั้นประมาณครึ่งหนึ่งของกิจกรรม
น้อย	หมายถึง	มีการปฏิบัติงานในกิจกรรมนั้นเป็นบางครั้ง
ไม่ได้ปฏิบัติ	หมายถึง	ไม่เคยมีการปฏิบัติงานในกิจกรรมนั้นเลย

ข้อที่	การรับรู้สมรรถนะ	ระดับการปฏิบัติ				
		มากที่สุด	มาก	ปานกลาง	น้อย	ไม่ได้ปฏิบัติ
1.	ท่านสามารถปฏิเสธที่จะอยู่ในสถานการณ์ที่เต็มไปด้วยควันบุหรี่					
2.	ท่านสามารถร้องขอให้ผู้ที่สูบบุหรี่ในบ้านหยุดสูบบุหรี่ได้					
3.	ท่านสามารถร้องขอให้ผู้ที่สูบบุหรี่ในบ้านออกไปสูบบุหรี่นอกบ้านได้					
4.	ท่านสามารถเดินหนีผู้ที่สูบบุหรี่ในบ้านได้ทันที					
5.	ท่านสามารถหลีกเลี่ยงการอยู่ในบริเวณที่มีสมาชิกในบ้านสูบบุหรี่อยู่ได้					
6.	ท่านสามารถร้องขอให้ผู้ที่สูบบุหรี่ไม่สูบบุหรี่ขณะที่ท่านอยู่ด้วยได้					
7.	ท่านสามารถป้องกันตัวเองและทารกในครรภ์จากควันบุหรี่มือสองได้					
8.	ท่านสามารถขอให้ผู้สูบบุหรี่ไปสูบบุหรี่ในห้องอื่น					
9.	ท่านสามารถหลีกเลี่ยงการไปสถานที่ที่มีคนสูบบุหรี่เป็นประจำ					
10.	ท่านสามารถตั้งกฎเกณฑ์เกี่ยวกับการสูบบุหรี่ในบ้าน					
11.	ท่านสามารถสวมหน้ากากอนามัยเมื่อไม่สามารถหลีกเลี่ยงการอยู่ใกล้ผู้สูบบุหรี่ได้					

ข้อที่	การรับรู้สมรรถนะ	ระดับการปฏิบัติ				
		มากที่สุด	มาก	ปานกลาง	น้อย	ไม่ได้ปฏิบัติ
12.	ท่านสามารถทำให้บ้านของท่านปลอดบุหรี่ได้					
13.	ท่านสามารถแนะนำคนในครอบครัวให้ป้องกันตนเองจากควันบุหรี่มือสอง					
14.	ท่านสามารถทำให้สมาชิกในครอบครัวไม่สูบบุหรี่ภายในบ้านได้					
15.	ท่านสามารถหลีกเลี่ยงควันบุหรี่มือสองจากคนภายในครอบครัวได้ทันทีไม่ว่าจะอยู่ในสถานที่ใด					

ส่วนที่4 แบบสอบถามพฤติกรรมการป้องกันตนเองจากควันบุหรี่มือสอง

คำชี้แจง โปรดใส่เครื่องหมาย √ ลงในช่องระดับความคิดเห็นที่ท่านคิดว่าถูกต้องที่สุด โดยเลือกเพียงคำตอบเดียวในแต่ละข้อ

คำอธิบาย ปฏิบัติเป็นประจำ หมายถึงมีการปฏิบัติงานในกิจกรรมนั้นทุกครั้ง
ปฏิบัติบางครั้ง หมายถึง มีการปฏิบัติงานในกิจกรรมนั้นบางครั้ง
ไม่ได้ปฏิบัติ หมายถึงไม่เคยมีการปฏิบัติงานในกิจกรรมนั้นเลย

ข้อที่	การรับรู้สมรรถนะ	ระดับการปฏิบัติ		
		ปฏิบัติเป็นประจำ	ปฏิบัติบางครั้ง	ไม่ได้ปฏิบัติ
1.	ระหว่างตั้งครรภ์ ท่านหลีกเลี่ยงการเข้าใกล้ผู้สูบบุหรี่			
2.	ท่านเดินหนีเมื่อมีคนสูบบุหรี่			
3.	ท่านตั้งกฎเกณฑ์เกี่ยวกับการสูบบุหรี่ในบ้าน			
4.	ท่านซักเสื้อผ้าที่เปื้อนควันบุหรี่			
5.	ท่านสวมหน้ากากอนามัยเมื่อไม่สามารถหลีกเลี่ยงการอยู่ใกล้ผู้สูบบุหรี่ได้			
6.	ท่านขอให้สมาชิกในครอบครัวชำระล้างร่างกายหรือเปลี่ยนเสื้อผ้าหลังจากสูบบุหรี่			
7.	ท่านพยายามสูดควันบุหรี่เข้าไปให้น้อยที่สุด			
8.	ท่านไม่อนุญาตให้คนสูบบุหรี่ต่อหน้าท่าน			
9.	ท่านปฏิเสธที่จะอยู่ในสถานการณ์ที่เต็มไปด้วยควันบุหรี่			
10.	ท่านหลีกเลี่ยงการไปสถานที่ที่มีคนสูบบุหรี่เป็นประจำ			
11.	ท่านขอให้คนอื่นหยุดสูบบุหรี่เมื่อพวกเขาสูบบุหรี่ใกล้ตัวท่าน			
12.	ท่านขอให้ผู้สูบบุหรี่ไปสูบบุหรี่ในห้องอื่น			
13.	ถ้ามีการสูบบุหรี่ภายในบ้านท่านจะเปิดบ้าน ประตู หน้าต่างให้อากาศถ่ายเทได้สะดวก			
14.	ท่านยอมให้สามี ญาติ หรือเพื่อน สูบบุหรี่ในบ้านได้			
15.	ท่านไม่อนุญาตให้คนในครอบครัวหรือบุคคลอื่นสูบบุหรี่ในรถยนต์ของท่านได้			

Semi-structured interview guide for pregnant women

Date.....

About the participant:

1. Age .....years
2. Education.....
3. Occupation.....
4. Monthly income.....baht
5. Number of smoking family members ..... Please identify who .....

Interview questions

1. What are health promotion activities offered by the antenatal clinic for pregnant women and their husbands?
2. What is secondhand smoke in your opinion?
3. In your opinion, what are the harms of cigarette smoke or secondhand smoke?
4. What are the effects of secondhand smoke from your family member(s) on your pregnancy? How do you prevent yourself from exposure to secondhand smoke?
5. What should health education for prevention of secondhand smoke exposure include? Who should be involved in the health education?
6. What should health education materials for prevention of secondhand smoke exposure be like?

แบบสัมภาษณ์เชิงลึกสำหรับสมาชิกในครอบครัวที่สูบบุหรี่

วันที่.....เดือน.....พ.ศ.....

คำชี้แจง แบบสัมภาษณ์นี้มีวัตถุประสงค์เพื่อสอบถามประเด็นปัญหาของการฝากครรภ์ และความต้องการในการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์ พร้อมทั้งให้เสนอข้อคิดเห็นเกี่ยวกับสื่อ เนื้อหา ลักษณะของกิจกรรมที่จะใช้ในการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสอง ข้อมูลที่ได้จากการสัมภาษณ์จะเป็นประโยชน์ต่อการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์

แบ่งเป็น 2 ส่วน ได้แก่

ส่วนที่ 1 ข้อมูลทั่วไป

ส่วนที่ 2 แนวคำถามสนทนากลุ่ม

ส่วนที่ 1 ข้อมูลทั่วไป

โปรดเติมคำตอบในช่องว่าง และทำเครื่องหมาย √ ลงในช่อง ( ) หน้าข้อความที่เป็นคำตอบ

1.เพศ

( )1.ชาย ( ) 2.หญิง

2.อายุ .....ปี

3.ระดับการศึกษาสูงสุด

( ) 1.ปริญญาตรี ( ) 2.ปริญญาโท ( ) 3.ปริญญาเอก

4.สถานภาพสมรส

( )1. โสด ( ) 2. คู่ ( ) 3. หย่าร้าง

( ) 4. แยกกันอยู่ ( ) 5. หม้าย

5.อาชีพ

( )1. รับราชการ/รัฐวิสาหกิจ ( ) 2. เกษตรกรรม ( ) 3. รับจ้าง

( ) 4. ค้าขาย ( ) 5. อื่นๆ.....

6.ท่านสูบบุหรี่

6.1.ระยะเวลาในการสูบบุหรี่.....ปี ช่วงเวลาที่สูบบุหรี่.....

6.2.ชนิดของบุหรี่.....

6.3.ปริมาณมวนบุหรี่ที่สูบ.....ต่อวัน

6.4.สถานที่สูบบุหรี่ในบ้าน.....

ส่วนที่ 2 แนวคำถามการสัมภาษณ์เชิงลึก

1.ท่านคิดว่าการสูบบุหรี่มีประโยชน์หรือมีโทษอย่างไรกับตนเองหรือคนในครอบครัว

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2.ท่านเคยเข้าร่วมกับคลินิกฝากครรภ์ที่มีการจัดกิจกรรมการส่งเสริมสุขภาพให้แก่หญิงตั้งครรภ์และสามีหรือไม่อย่างไร

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3.ท่านรู้จักหรือเคยได้ยินเกี่ยวกับควันบุหรี่มือสอง หรือไม่อย่างไร

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4.ท่านคิดว่าบุหรี่กับควันบุหรี่มือสอง มีอันตรายหรือส่งผลต่อการตั้งครรภ์อย่างไร

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5.หญิงตั้งครรภ์กับการสัมผัสควันบุหรี่มือสองขณะตั้งครรภ์คิดว่ามีความเสี่ยงหรือไม่อย่างไร

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6.ท่านคิดว่าการนำสมาชิกในครอบครัวเข้าไปร่วมฟังในการจัดกิจกรรมคิดว่าควรหรือไม่อย่างไร

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7.การสอนสุขศึกษาสำหรับหญิงตั้งครรภ์และสมาชิกในครอบครัวที่สูบบุหรี่ในเรื่องการป้องกันตนเองจากควันบุหรี่มือสองอยากให้มีการสอนในเรื่องใดบ้างอย่างไร

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แนวคำถาม

สำหรับกลุ่มบุคลากรและผู้เกี่ยวข้องในงานฝากครรภ์(แพทย์และพยาบาลวิชาชีพ)

วันที่.....เดือน.....พ.ศ.....

คำชี้แจง แนวคำถามการสนทนานี้มีวัตถุประสงค์เพื่อสอบถามประเด็นปัญหาของการให้บริการในคลินิกฝากครรภ์ และความต้องการในการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์ พร้อมทั้งให้เสนอข้อคิดเห็นเกี่ยวกับสื่อ เนื้อหา ลักษณะของกิจกรรมที่จะใช้ในการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสอง ข้อมูลที่ได้จากการสนทนาจะเป็นประโยชน์ต่อการจัดทำโปรแกรมการป้องกันตนเองจากควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์

แบ่งเป็น 2 ส่วน ได้แก่

ส่วนที่ 1 ข้อมูลทั่วไป

ส่วนที่ 2 แนวคำถามสนทนากลุ่ม

ส่วนที่ 1 ข้อมูลทั่วไป

โปรดเติมคำตอบในช่องว่าง และทำเครื่องหมาย √ ลงในช่อง ( ) หน้าข้อความที่เป็นคำตอบ

1.เพศ

( )1.ชาย ( ) 2.หญิง

2.อายุ .....ปี

3.ระดับการศึกษาสูงสุด

( ) 1.ปริญญาตรี ( ) 2.ปริญญาโท ( ) 3.ปริญญาเอก

4.รายได้ต่อเดือน(บาท)

( )1. 15,000-24,999 บาท ( )3. 35,000-44,999 บาท

( )2. 25,000-34,999 บาท ( )4. มากกว่า 45,000 บาทขึ้นไป

5.ระยะเวลาในการรับผิดชอบงานฝากครรภ์.....ปี

6.ท่านสูบบุหรี่

( ) 1.สูบบุหรี่ ( ) 2.ไม่สูบบุหรี่

7.อาชีพของท่าน.....

ส่วนที่ 2 แนวคำถามการสนทนากลุ่ม

1.สภาพการดำเนินงานในคลินิกฝากครรภ์ในหน่วยงานของท่านในปัจจุบันเป็นอย่างไร

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2.ทางคลินิกฝากครรภ์มีการจัดกิจกรรมการส่งเสริมสุขภาพให้แก่ท่านและสามีอย่างไร

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3.ท่านคิดว่าการบริหารจัดการในหญิงตั้งครรภ์กับการได้รับควันบุหรี่มือสองมีความสำคัญหรือไม่อย่างไร

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3.การสอนสุขศึกษาสำหรับหญิงตั้งครรภ์ในเรื่องการป้องกันตนเองจากควันบุหรี่มือสองควรสอนเรื่องใดบ้างอย่างไร

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4.หญิงตั้งครรภ์กับการสัมผัสควันบุหรี่มือสองขณะตั้งครรภ์คิดว่ามีความเสี่ยงหรือไม่อย่างไร

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5.ท่านคิดว่าการนำสมาชิกในครอบครัวเข้าไปร่วมฟังในการจัดกิจกรรมคิดว่าควรหรือไม่อย่างไร

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6.การสอนสุขศึกษาสำหรับหญิงตั้งครรภ์และสมาชิกในครอบครัวที่สูบบุหรี่ในเรื่องการป้องกันตนเองจากควันบุหรี่มือสองอยากให้มีการสอนในเรื่องใดบ้างอย่างไร

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APPENDIX C

Demographic data of the participant(Qualitative)

Table 1 Description of the Characteristics of the ANC Staffs (n=9)

ID	Age (years)	Education	Occupation	Position	Monthly income	Duration of working in ANC (years)	Smoking status
1	52	Masters' degree	Physician	Deputy Director of Health Promotion	80,000	5	Non-smoker
2	54	Bachelor's degree	Physician	Director of Obstetrics and Gynecology Department	90,000	20	Non-smoker
3	48	Bachelor's degree	Physician	ANC attending physician	70,000	18	Non-smoker
4	58	Bachelor's degree	Physician	ANC attending physician	120,000	25	Non-smoker
5	30	Bachelor's degree	Physician	ANC attending physician	45,000	3	Non-smoker
6	58	Bachelor's degree	Nurse	Head of ANC	60,000	30	Non-smoker
7	48	Bachelor's degree	Nurse	ANC nurse	50,000	15	Non-smoker
8	43	Bachelor's degree	Nurse	ANC nurse	40,000	12	Non-smoker
9	28	Bachelor's degree	Nurse	ANC nurse	20,000	3	Non-smoker

Table 2 Description of the Characteristics of the Pregnant Women (n=17)

ID	Age (years)	Education	Occupation	Monthly personal income (THB)	Number of family smokers	Family smoker
1	20	Elementary	Merchant	8,000	1	Husband
2	18	Elementary	Unemployed	-	1	Husband
3	19	Elementary	Unemployed	-	1	Husband
4	27	Junior high school	Unemployed	-	2	Husband and father
5	25	Vocational certificate	Merchant	15,000	1	Husband
6	18	Senior high school	Farmer	13,000	1	Husband
7	27	Senior high school	General laborer	14,000	2	Husband and father
8	30	Junior high school	General laborer	10,000`	1	Husband
9	17	Senior high school	Student	-	2	Husband and father
10	26	Elementary	General laborer	30,000	1	Husband
11	18	Junior high school	Unemployed	-	1	Husband
12	28	Bachelor's degree	General laborer	18,000	1	Husband
13	24	Bachelor's degree	General laborer	20,000	1	Husband

Table 2 (continued)

ID	Age (years)	Education	Occupation	Monthly personal income (THB)	Number of family smokers	Family smoker
14	33	High vocational certificate	General laborer	15,000	1	Husband
15	29	Junior high school	Merchant	25,000	2	Husband and father
16	31	Bachelor's degree	General laborer	30,000	1	Husband
17	25	Senior high school	Farmer	15,000	1	Husband

Table 3 Description of the Characteristics of the Smoking Family Members (n=14)

ID	Age (years)	Education	Occupation	Monthly income (THB)	Type of tobacco smoked	Number of smoked unit / day	Duration of smoking (years)
1	30	Senior high school	General laborer	10,000	handrolled cigarettes/ cigarettes	5 cigarettes	8
2	38	High vocational certificate	Farmer	20,000	cigarettes	10 cigarettes	20
3	37	Elementary	General laborer	10,000	handrolled cigarettes	20 cigarettes	5
4	22	Elementary	Military	8,000	cigarettes	10 cigarettes	10
5	23	Junior high school	Transport Driver	30,000	cigarettes	10 cigarettes	5

Table 3 (continued)

ID	Age (years)	Education	Occupation	Monthly income (THB)	Type of tobacco smoked	Number of smoked unit / day	Duration of smoking (years)
6	18	Junior high school	General laborer	10,000	cigarettes	7 cigarettes	3
7	18	Elementary	Window cleaner	10,000	cigarettes	2 cigarettes	3
8	32	Senior high school	Farmer	15,000	cigarettes	7 cigarettes	13
9	31	Senior high school	Business owner	20,000	cigarettes	1 pack	10
10	25	Junior high school	Farmer	46,000	cigarettes	10 cigarettes	8
11	28	Junior high school	General laborer	12,000	cigarettes	1 pack	14
12	25	Junior high school	Lorry driver	18,000	E-cigarettes	1 cigarette	5
13	18	Elementary	Farmer	12,000	cigarettes	10 cigarettes	4
14	25	Vocational certificate	General laborer	15,000	cigarettes	4 cigarettes	3

APPENDIX D

List of Experts

1. Asst. Prof. Dr. Paranee Vatanasomboon
   Faculty of Public Health, Mahidol University
2. Asst. Prof. Dr. Lakkana Termsirikulchai
   the director of the Tobacco Control Research and Knowledge Management Center at Mahidol University
3. Assoc. Prof. Dr. Punpilai Sriarporn
   Faculty of Nursing, Chiang Mai University
4. Asst. Prof. Dr. Sineenart Chautrakarn
   Faculty of Public Health, Chiang Mai University
5. Assoc. Prof. Dr.Roengrudee Patannavanit
   Faculty of Medicine Ramathibodi Hospital, Mahidol University

APPENDIX E
GUIDELINE BOOKS

คู่มือ

การป้องกันควันบุหรี่บุหรี่มือสองสำหรับหญิงตั้งครรภ์

จัดทำโดย

สุนิสา จันทร์แสง

วราภรณ์ บุญเชียง

วรางคณา นาคเสน

คณะสาธารณสุขศาสตร์ มหาวิทยาลัยเชียงใหม่

คำนำ

หญิงตั้งครรภ์ได้รับควันบุหรี่มือสองเพิ่มความเสี่ยงต่อการตั้งครรภ์หลายประการเช่นการคลอดก่อนกำหนดความผิดปกติของทารกในครรภ์ รวมทั้งภาวะทารกตายคลอด การดำเนินการตามมาตรการที่เข้มแข็งจะช่วยสนับสนุนให้คนสูบบุหรี่เลิกบุหรี่ ลดนักสูบหน้าใหม่ และลดการได้รับควันมือสอง

คู่มือการป้องกันควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์เล่มนี้ประกอบด้วยความรู้เกี่ยวกับควันบุหรี่มือสอง อันตรายจากการได้รับควันบุหรี่มือสอง ทักษะในการป้องกันตนเองจากควันบุหรี่มือสอง และกฎหมายหรือพรบ.ที่เกี่ยวข้องกับการได้รับควันบุหรี่มือสอง ผู้จัดทำรวบรวมข้อมูลจากตำรางานวิจัยที่เกี่ยวข้องและข้อเสนอแนะจากกลุ่มบุคลากรทางการแพทย์เชี่ยวชาญทางด้านหญิงตั้งครรภ์ จนได้ข้อสรุปที่มีคุณค่าอย่างยิ่งในการพัฒนาคู่มือหญิงตั้งครรภ์ที่ได้อ่านคู่มือเล่มนี้จะมีองค์ความรู้ในการป้องกันและทักษะการหลีกเลี่ยงควันบุหรี่มือสอง ทำให้เกิดภาวะที่ดีขณะตั้งครรภ์

สารบัญ

“การสูบบุหรี่จะเกิดควันบุหรี่ 2 แบบ คือ ควันบุหรี่ ที่สูบเข้าปอดหรือที่พ่นออกมาและควันบุหรี่ที่ออกมาจากการเผาไหม้บุหรี่ ซึ่งควันบุหรี่ที่ออกมาเรียกว่า ควันบุหรี่มือสอง (Secondhand Smoke : SHS) ส่วนผู้ที่ไม่สูบบุหรี่แต่ได้รับควันเข้าไปจากผู้สูบบุหรี่จะถูกเรียกว่า ผู้สูบบุหรี่มือสอง (Secondhand Smoker) ซึ่งมีโอกาสได้รับอันตรายจากพิษภัยบุหรี่ได้เท่ากับหรืออาจจะมากกว่าผู้ที่สูบบุหรี่”

ความรู้ทั่วไปเกี่ยวกับควันบุหรี่มือสอง

ควันบุหรี่มือสอง หมายถึง ควันที่เกิดจากการเผาไหม้ที่ปลายบุหรี่หรือยาสูบชนิด อื่นๆ หรือควันที่ถูกพ่นออกมาจากผู้สูบบุหรี่ ดังนั้นการสัมผัสควันบุหรี่มือสอง หมายถึง ผู้ที่ไม่ได้สูบบุหรี่ แต่ได้รับควันบุหรี่จากสิ่งแวดล้อมหรือจากผู้สูบบุหรี่ที่อยู่ใกล้ โดยผู้ที่สัมผัสควันบุหรี่มือสองได้รับอันตรายจากพิษภัยบุหรี่และเกิดโรค เช่น มะเร็งปอด โรคหลอดเลือด หัวใจ ได้เช่นเดียวกับผู้สูบบุหรี่โดยสามารถประเมินการได้รับสัมผัสควันบุหรี่มือสองได้จากการตรวจวัดระดับสารโคตินีน ซึ่งเป็นสารที่เกิดจากย่อยสลายของสารนิโคตินในควันบุหรี่ที่ตรวจพบได้จากเลือดและปัสสาวะ

สารประกอบและสารพิษในควันบุหรี่

ควันบุหรี่มีอยู่ ประกอบด้วยสารพิษที่เป็นของเสียที่เกิดจากการเผาไหม้ และสารพิษที่เกิดจากการรวมตัวกันของควันบุหรี่จากการเผาไหม้ยาสูบ ซึ่งเป็นสารก่อมะเร็งมากกว่า 40 ชนิด สารพวกอนุมูลอิสระคาร์บอนมอนนอกไซด์ ทาร์ เบนซิน นิโคติน สารน้ำมันดิน สารกัมมันตรังสี เบนซินไพรินและสารอื่นๆ อีกมากมาย ทั้งที่ลอยอยู่ในอากาศหรือตกค้างแทรกซึมเข้าไปจับกับ เสื้อผ้า ข้าวของเครื่องใช้ในบ้าน และร่างกายของมนุษย์ เช่น ผิวหนัง เส้นผม หรือซับออกมาพร้อมกับปัสสาวะ

นิโคติน

เป็นสารที่พบได้ในใบสูบ มีลักษณะคล้ายน้ำมันและไม่มีสี นิโคติน สามารถออกฤทธิ์โดยตรงที่สมอง ทำให้ผู้สูบมีความรู้สึกที่เป็นสุข สบายใจ ติดบุหรี่แล้วเลิกได้ยาก นิโคตินที่เข้าสู่ร่างกาย ส่วนใหญ่จะไปจับที่ปอด และบางส่วนถูกดูดซึมเข้ากระแสเลือด โดยจะไปมีผลต่อการหลั่งสารอิพิเนฟรินจากต่อมหมวกไต ทำให้มีความดันโลหิตสูง หัวใจเต้นแรงเร็วกว่าปกติ และไม่เป็นจังหวะ และเส้นเลือดแดงหดตัว เป็นต้น เมตาบอลิซึมของนิโคตินส่วนใหญ่จะเกิดที่ตับ และประมาณร้อยละ 70 ของนิโคตินในกระแสโลหิตจะถูกเมตาบอไลซ์ เปลี่ยนเป็นโคตินิน

ทาร์

มีลักษณะคล้ายน้ำมันดิบ เกิดจากการเผาไหม้ของใบยาสูบ กระดาษมวน และส่วนประกอบอื่นๆในบุหรี่ ทาร์มีสีน้ำตาลประกอบด้วยสารที่เป็นอันตรายหลายชนิดผสมรวมกัน เช่น เบนโซพัยรีน ซึ่งเป็นสารก่อมะเร็ง นอกจากนี้ละอองของเหลวของทาร์จะเข้าไปติดอยู่ตามทางเดินหลอดลมและถุงลมปอด โดยประมาณร้อยละ 50 ของทาร์จะไปจับอยู่ที่ปอด และเมื่อทาร์รวมตัวกับฝุ่นต่างๆที่หายใจเข้าไปก็จะขังอยู่ในถุงลมปอด ทำให้เกิดการระคายเคืองทางเดินหายใจ ไอเรื้อรังและมีเสมหะ ซึ่งจะเป็นสาเหตุของการเกิดโรคหลอดลมอุดกั้นเรื้อรัง รวมทั้งโรคมะเร็งปอดและมะเร็งที่อวัยวะอื่นๆ เป็นต้น

คาร์บอนมอนอกไซด์

เป็นก๊าซที่ไม่มีสี ไม่มีกลิ่น เกิดจากการเผาไหม้ของใบยาสูบอย่างไม่สมบูรณ์ ในควันบุหรี่ จะประกอบไปด้วยก๊าซคาร์บอนมอนอกไซด์ ประมาณร้อยละ 2- 6 ก๊าซนี้จะแย่งจับกับฮีโมโกลบิน ในเม็ดเลือดแดงได้ดีกว่าออกซิเจนประมาณ 200 เท่า ดังนั้นร่างกายของผู้ที่สูบบุหรี่จึงได้รับออกซิเจนน้อยลง การสำเลียงออกซิเจนไปให้อวัยวะต่างๆลดลง มีผลทำให้หัวใจต้องทำงานหนักเพิ่มขึ้น เพื่อให้เลือดนำออกซิเจนไปเลี้ยงส่วนต่างๆของร่างกายได้เพียงพอ และถ้าได้รับก๊าซนี้จำนวนมาก จะทำให้เกิดอาการมึนงง คลื่นไส้ และเหนื่อยง่าย นอกจากนี้ในหญิงตั้งครรภ์ที่สูบบุหรี่หรือได้รับควันบุหรี่ พบว่าทารกได้รับออกซิเจนน้อย และเด็กที่เกิดมาจะมีการเจริญเติบโตที่ไม่สมบูรณ์ทั้งทางร่างกาย สติปัญญา และพฤติกรรม

ไนโตรเจนไดออกไซด์

เป็นก๊าซที่ทำลายเยื่อบุหลอดลมส่วนปลายและถุงลม ทำให้ผนังถุงลมโป่งพอง ถุงลมในปอดลดจำนวนลง ส่งผลให้การทำงานของปอดลดลง ซึ่งมีผลต่อการแลกเปลี่ยนก๊าซ ทำให้ร่างกายได้รับออกซิเจนไม่เพียงพอ เหนื่อยหอบง่ายและเป็นสาเหตุของการเกิดโรคถุงลมโป่งพอง ซึ่งเป็นโรคที่เรื้อรังและผู้ป่วยจะทรมานมาก

ไฮโดรไซยาไนด์

เป็นก๊าซที่ทำลายเยื่อบุหลอดลมส่วนต้น ซึ่งบริเวณนี้จะทำหน้าที่คอยช่วยดักสิ่งแปลกปลอมต่างๆไม่ให้เข้าสู่ทางเดินหายใจ ซึ่งผลของการได้รับก๊าซชนิดนี้จะทำให้ผู้สูบบุหรี่เกิดอาการไอ มีเสมหะและหลอดลมอักเสบเรื้อรัง

สารอนุมูลอิสระ

กระบวนการเผาไหม้ของใบยาสูบทำให้เกิดสารพวกอนุมูลอิสระเป็นจำนวนมาก โดยสารอนุมูลอิสระชนิดต่างๆ สามารถทำให้เกิดกระบวนการต่างๆในร่างกาย เช่น กระตุ้นเม็ดเลือดขาว การสร้างสารกระตุ้นคลีโมดิคเปบไทด์ การกระตุ้นระบบคอมพลีเมนต์ และการเปลี่ยนแปลงไขมันบางชนิด ไปเป็นไขมันชนิดที่ทำอันตรายต่อผนังหลอดเลือดแดงทำให้เกิดหลอดเลือดแดงแข็งตัว นอกจากนี้สารพวกอนุมูลอิสระยังทำให้เกิดโรคของระบบทางเดินหายใจ

สารกัมมันตรังสี

ในควันบุหรี่ ประกอบด้วยสารกัมมันตรังสีต่างๆ เช่น โพโลเนี่ยม 210 ที่มีรังสีแอลฟ่าและยังเป็นสารก่อมะเร็ง เช่น ทำให้เกิดมะเร็งปอด

อันตรายเกี่ยวกับควันบุหรี่มือสองสำหรับหญิงตั้งครรภ์และทารก

อันตรายจากควันบุหรี่มือสองต่อหญิงตั้งครรภ์

การที่คนท้องอยู่ในสิ่งแวดล้อมที่คนรอบข้างสูบบุหรี่ ฤทธิ์ของบุหรี่จะทำให้หลอดเลือดของแม่ท้องหดรัดตัวมากกว่าปกติ และเลือดมีการจับตัวกับออกซิเจนได้น้อยลง เลือดและออกซิเจนจึงไปเลี้ยงส่วนต่างๆ ของร่างกายทั้งแม่ท้องและลูกในครรภ์น้อยลง ส่งผลทำให้เกิดภาวะแทรกซ้อน และหญิงตั้งครรภ์ที่ดมควันบุหรี่ ยังผลส่งผลให้ไม่อยากอาหาร ทำให้ทานอาหารได้น้อยลง ทารกในครรภ์จึงได้รับสารอาหารน้อยลงตามไปด้วย จนอาจส่งผลให้เป็นโรคขาดสารอาหารได้ นอกจากนี้การสูดดมควันบุหรี่ตอนท้อง ยังส่งผลเสียอีกหลายอย่าง เช่น

1.เกิดครรภ์เป็นพิษ

ควันบุหรี่ จะทำให้คนท้องเกิดภาวะครรภ์เป็นพิษได้ ซึ่งก็มีความอันตรายทั้งต่อตัวคุณแม่ และลูกน้อยในครรภ์ เพราะสารพิษในบุหรี่ไปกระตุ้นให้เกิดอาการขึ้นมานั่นเอง

2.เป็นโรคหอบหืด

ควันบุหรี่ อาจทำให้คุณแม่เป็นโรคหอบหืดได้ และหากเป็นโรคหอบหืดอยู่แล้ว ก็จะยิ่งกระตุ้นให้อาการกำเริบขึ้นมาได้ง่ายกว่าเดิม ซึ่งก็ไม่ส่งผลดีทั้งต่อคุณแม่ และลูกน้อยในครรภ์เลย

3.แท้งหรือคลอดก่อนกำหนด

โดยเฉพาะในช่วงตั้งครรภ์ไตรมาสแรก จะมีโอกาสแท้งสูงที่สุด โดยมีความเสี่ยงต่อภาวะถุงน้ำคร่ำแตกก่อนกำหนด ตั้งครรภ์นอกมดลูก รกเกาะต่ำ รกลอกตัวก่อนกำหนด คุณแม่อาจเสี่ยงต่อการแท้งหรือคลอดลูกก่อนกำหนดได้ และลูกที่คลอดออกมาไม่สมบูรณ์

4.เป็นโรคมะเร็งปอด

ถึงแม้ว่าคุณแม่จะไม่ได้สูบบุหรี่เอง แต่แค่ได้รับควันบุหรี่เข้าไปก็เพิ่มความเสี่ยงต่อการเป็นโรคมะเร็งปอดได้ถึง 2 เท่า เพราะฉะนั้นควรระมัดระวังการอยู่ใกล้กับคนที่สูบบุหรี่อย่างเด็ดขาด

อันตรายจากควันบุหรี่ต่อทารกในครรภ์

มีงานวิจัยที่บ่งชี้ว่า ครอบครัวที่พ่อแม่สูบบุหรี่บนมือของลูกจะมีสารนิโคตินติดอยู่ แม้พ่อแม่จะไม่ได้สูบบุหรี่ใกล้ตัวลูกก็ตาม เพราะนิโคตินจากบุหรี่มักติดอยู่ตามสิ่งของ เสื้อผ้า หรือพื้นผิวของเครื่องเรือนภายในบ้าน เด็กๆ มักจะคลำ แตะ ลูบสิ่งของต่างๆ และเอานิ้วเข้าปาก ซึ่งหมายความว่าเด็กเหล่านั้นกำลังหยิบสารพิษเข้าปากนั่นเอง สารนิโคตินที่ลูกรับเข้าไปจะสามารถแพร่ถึงสมองได้ภายในเวลาเพียง 7 วินาที ซึ่งสมองส่วนที่ได้รับผลกระทบจากนิโคตินอย่างมาก คือสมองส่วนคอร์เทกซ์กลีบหน้าผากส่วนหน้า ซึ่งมีหน้าที่วางแผนหรือโปรแกรมพฤติกรรมเกี่ยวกับการรับรู้ที่ซับซ้อน เกี่ยวข้องกับบุคลิก การตัดสินใจ และการควบคุมประพฤติที่เกี่ยวข้องกับสังคม ซึ่งสิ่งเหล่านี้เป็นปัจจัยสำคัญต่อพัฒนาการของลูก

อีกเหตุผลที่พ่อแม่ไม่ควรสูบบุหรี่ก็คือ ลูกจะมีแนวโน้มสูบบุหรี่ตามพ่อแม่เมื่อโตขึ้น โดยสถาบันวิจัยประชากรและสังคม มหาวิทยาลัยมหิดล ได้ทำการวิเคราะห์ปัจจัยเสี่ยงที่ส่งผลต่อการสูบบุหรี่ของวัยรุ่น ซึ่งชี้ว่า บ้านที่มีการสูบบุหรี่ในบ้าน เด็กวัยรุ่นจะมีแนวโน้มที่จะสูบบุหรี่ถึง 3 เท่า และมีการวิจัยพบว่า วัยรุ่นที่มาจากครอบครัวที่ไม่มีการสูบบุหรี่ในบ้าน ระบุว่าจะไม่สูบบุหรี่แน่นอนในอนาคต ถึงร้อยละ 79

1. ลูกเติบโตและพัฒนาการช้า

ควันบุหรี่จะขัดขวางการลำเลียงออกซิเจนไปสู่ลูกน้อย ผ่านทางสายสะดือและรก เป็นผลให้ทารกในครรภ์ได้รับออกซิเจน ที่จำเป็นต่อการเจริญเติบโต และพัฒนาการไม่เพียงพอ ทำให้ลูกเติบโต และมีพัฒนาการที่ช้ากว่าปกติ เด็กจึงมักจะคลอดออกมาด้วยน้ำหนักที่ต่ำกว่าเกณฑ์ และไม่ค่อยสมบูรณ์มากนัก นอกจากนี้ยังส่งผลกระทบ ไปจนลูกเติบโตขึ้นอีกด้วยนั่นคือทำให้ลูกมีพัฒนาการทั้งทางร่างกาย และสมอง ที่ช้ากว่าเด็กทั่วไปในวัยเดียวกัน หรืออาจถึงขั้นมีความผิดปกติทางสมองได้ ซึ่งทำให้มีระดับสติปัญญาต่ำ โตขึ้นมีบุคลิกไม่อยู่นิ่ง เป็นเด็กสมาธิสั้น มีพัฒนาการทางอารมณ์และพฤติกรรมการเรียนรู้ไม่เหมาะสมกับวัย

2. เพิ่มโอกาสการไหลตาย

แม้ว่าลูกน้อยจะมีการเติบโตในครรภ์ที่ดีและคลอดออกมาปกติสมบูรณ์ทุกอย่าง แต่ก็ยังเสี่ยงต่อการไหลตายได้สูง เพราะระบบต่างๆในร่างกายมีการทำงานที่ผิดปกติ โดยที่คุณพ่อคุณแม่ไม่ทันสังเกต กว่าจะรู้ตัวก็เมื่อสายเกินไปแล้ว

3.พิการแต่กำเนิด

การที่คุณแม่สูดดมกลิ่นควันบุหรี่เข้าไป ในระหว่างตั้งครรภ์ ก็อาจทำให้ลูกน้อยเสี่ยงพิการตั้งแต่กำเนิดได้ เพราะควันบุหรี่จะทำลาย และหยุดยั้งการเจริญเติบโตของทารกในครรภ์ ทำให้พัฒนาการบางอย่างหยุดชะงัก ไปจนกระทั่งคลอดออกมา จึงทำให้ลูกมีภาวะพิการตั้งแต่กำเนิดได้ เชื่อว่าคุณพ่อคุณแม่คงไม่อยากให้ลูกพิการใช่ไหม เพราะฉะนั้นควรหลีกเลี่ยงควันบุหรี่อย่างเด็ดขาด

4.ร่างกายอ่อนแอ เจ็บป่วยบ่อย

โดยปกติทารกแรกเกิดจะมีภูมิคุ้มกันที่ต่ำอยู่แล้ว แต่เมื่อได้รับอันตรายจากสารพิษของควันบุหรี่ ตั้งแต่อยู่ในครรภ์ด้วย ก็จะทำให้ทารกคลอดออกมามีร่างกายที่อ่อนแอ และเจ็บป่วยได้ง่ายกว่าเด็กคนอื่น ๆ โดยเด็กบางคนอาจต้องอยู่ในตู้อบหลังคลอด นานเป็นเดือนเลยทีเดียว

5.มีความเสี่ยงที่ลูกจะเป็นออทิสติก

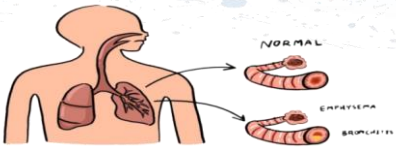
พัฒนาการถดถอย สำหรับทารกเพศหญิง เมื่อโตขึ้นอาจเกิดภาวะมีบุตรยาก เนื่องจากท่อนำไข่จะถูกสารเคมีจากบุหรี่ทำลาย

6.ป่วยเป็นโรคหืดหอบ

โดยเฉพาะเด็กที่มีคนในครอบครัวสูบบุหรี่ จะมีอาการไอมีเสมหะ หายใจมีเสียงวี๊ด และหายใจลำบาก มีโอกาสเป็นโรคหืดหอบมากกว่าเด็กที่อยู่ในครอบครัวที่ไม่สูบบุหรี่

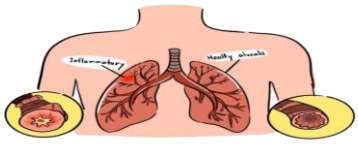
โรคที่เกิดจากการสัมผัสควันบุหรี่มือสอง

โรคปอดอุดกั้นเรื้อรัง



คือ โรคถุงลมโป่งพองเป็นภาวะที่ถุงลมปอดบริเวณปลายแขนงหลอดลมโป่งออก และเซลล์บุผนังถุงลมถูกทำลาย ส่วนใหญ่มีสาเหตุจากการสูบบุหรี่ และสูดควันบุหรี่มาเป็นเวลานาน นอกจากนี้ควันบุหรี่ ช่วยเสริมการทำลายเนื้อเยื่อปอด ผลที่สุดทำให้เกิดโรคถุงลมโป่งพอง

โรคปอดบวม



โรคปอดบวม หรือปอดอักเสบ คือ ภาวะติดเชื้อในปอด จาก 2 สาเหตุ คือ ปอดอักเสบจากการติดเชื้อ เช่น เชื้อไวรัส เชื้อแบคทีเรีย และเชื้อรา และปอดอักเสบที่ไม่ได้เกิดจากการติดเชื้อ เกิดจากการหายใจเอาสารที่ทำให้ระบบทางเดินหายใจระคายเคือง เช่น ฝุ่น สารเคมี โดยเฉพาะควันบุหรี่ มีอาการหายใจลำบาก ไม่สบายตัว บางกรณีอาจมีไข้ หรืออาการคล้ายเป็นหวัด เช่น ปวดศีรษะ หนาวสั่น ไอ และเจ็บคอ หากอาการรุนแรงอาจเจ็บหน้าอก อาเจียน และมีเสมหะปนเลือด

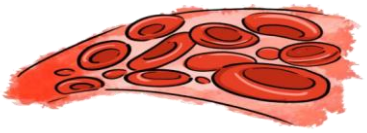
โรคหอบหืด

หอบหืดเป็นโรคที่มีการอักเสบเรื้อรังของทางเดินหายใจ ทำให้หายใจมีเสียงวี้ด หายใจไม่ออก แน่นหน้าอกและไอ ตอนกลางคืนและเช้ามืด อาการเหล่านี้เกี่ยวกับหลอดลมตีบและอากาศไม่พอหายใจการอักเสบของทางเดินหายใจเกิดจากการตอบสนองต่อสิ่งกระตุ้นจึงทำให้หลอดลม หดเกร็งคนที่เป็น หอบหืด มีความไวต่อสิ่งกระตุ้นหลายอย่าง เช่น การได้รับควันบุหรี่ การติดเชื้อในปอดเป็น หวัด ความเครียด และการออกแรงทำให้เกิดการอักเสบเรื้อรังของหลอดลมเป็นต้น

โรคหัวใจและหลอดเลือด

ควันบุหรี่จะสร้างความเสียหายแก่หลอดเลือด และทำให้ระบบไหลเวียนเลือดทำงานผิดปกติ ซึ่งอาจก่อให้เกิดโรคหัวใจ ภาวะหัวใจขาดเลือด หรือภาวะหัวใจหยุดเต้นที่ทำให้เสียชีวิตอย่างเฉียบพลันได้

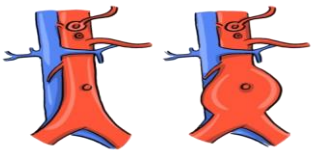
การกระตุ้นเกล็ดเลือด



ควันบุหรี่กระตุ้นให้เกล็ดเลือดเกาะกลุ่มและเกิดลิ่มเลือด ตรงบริเวณที่หลอดเลือดมีบาดแผล นอกจากผลกระทบโดยตรงของควันบุหรี่ต่อหน้าที่ของเกล็ดเลือดและการเกิดลิ่มเลือด แล้วเกล็ดเลือดยังทำให้ผนังด้านในของหลอดเลือดผิดปกติ โดยการส่งเสริมให้หลอดเลือดแข็งตัว ซึ่งนำไปสู่การเกิดลิ่มเลือดในหลอดเลือด

โรคหลอดเลือดแดงใหญ่โป่งพอง

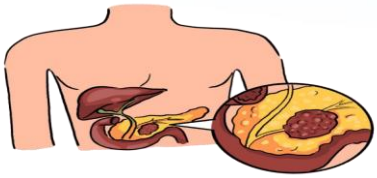
ควันบุหรี่กระตุ้นให้การหลั่งสารย่อยโปรตีน เช่น คอลลาเจน อีลาสติน ทำให้หลอดเลือดแดงอ่อนแอ และไวต่อการเกิดหลอดเลือดแดงแข็งตัว หรือความดันเลือดสูง หรือทั้งสองอย่าง ความดันเลือดสูง เป็นสาเหตุที่ทำให้หลอดเลือดแดงใหญ่ที่โป่งพองแตก มีอันตรายถึงแก่ชีวิต



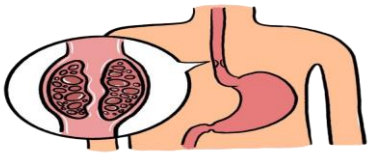
มะเร็งปอด

สารเคมีก่อมะเร็งที่มีความแรงมากที่สุดสารกลุ่มนี้ในควันบุหรี่ เช่น เบนโซไพรีน การได้รับสารชนิดนี้เป็นปัยจัยเสี่ยงต่อการเกิดมะเร็งปอด ผู้ที่ไม่ได้สูบบุหรี่แต่สูดดมควันบุหรี่เป็นประจำอาจเสี่ยงต่อการเกิดมะเร็งปอดได้มากกว่าคนทั่วไป โดยมีงานวิจัยที่เผยว่าผู้ที่อาศัยอยู่กับผู้ที่สูบบุหรี่มีโอกาสเป็นมะเร็งปอดมากกว่าคนปกติ 1.2-1.5 เท่า

มะเร็งตับอ่อน



มะเร็งตับอ่อนเป็นมะเร็งชนิดที่มีอัตราการเสียชีวิตสูง การพยากรณ์โรคไม่ดี อัตรา ผู้ป่วยรอดชีวิตเมื่อ 5 ปีมีเพียงร้อยละ 5 มะเร็งตับอ่อนเกิดกับผู้ที่มีอายุ 60-80 ปี การได้รับควันบุหรี่ เพิ่มความเสี่ยงของการเกิดมะเร็งตับอ่อนอีกเท่าตัว โดยที่ควันบุหรี่จะทำให้ยีนหลายชนิดกลายพันธุ์ ซึ่งทำให้โปรแกรมการตายของเซลล์ จึงเป็น สาเหตุของการเกิดโรคมะเร็ง



มะเร็งหลอดอาหาร

มะเร็งหลอดอาหารพบในผู้ที่มีอายุ 50 ปี ขึ้นไป ชายเป็นมากกว่าหญิง การสูบบุหรี่เป็นสาเหตุหนึ่งของการเกิดมะเร็งหลอดอาหาร เพราะในควันบุหรี่มีสารก่อมะเร็ง การรับประทานอาหารที่มีสารก่อมะเร็งร่วมกับการได้รับควันบุหรี่ ยิ่งเพิ่มความเสี่ยงต่อการเกิดมะเร็ง

มะเร็งกระเพาะอาหาร

มะเร็งกระเพาะอาหาร เป็นมะเร็งชนิดที่เป็นกันมากเป็นอันดับ 2 ทั่วโลก ชายเป็นมากกว่าหญิง การพยากรณ์โรคไม่ดี มีอัตราการรอดชีวิตเมื่อ 5 ปี ประมาณร้อยละ 20 สารอนุมูลอิสระในควันบุหรี่ทำอันตรายต่อดีเอ็นเอ จึงมีความเสี่ยงสูงที่จะเกิดเซลล์มะเร็ง

มะเร็งกล่องเสียง

ควันบุหรี่เป็นสาเหตุให้เซลล์ เยื่อบุกล่องเสียงเกิดการเปลี่ยนแปลงจนกระทั่งเป็นเซลล์ มะเร็ง ระดับความเสี่ยงขึ้นอยู่กับปริมาณควันบุหรี่ที่ได้รับ ถึงแม้ว่าจะเป็นระยะที่มะเร็งปรากฏชัดเจนแล้วก็ตาม หากหยุดสูบบุหรี่ เซลล์จะหยุดการเปลี่ยนแปลงเป็นเซลล์มะเร็งได้

มะเร็งไต

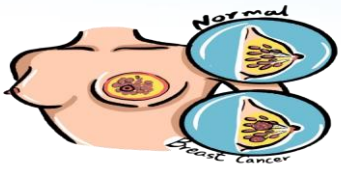
มะเร็งไตมักเกิดกับผู้มีอายุ 60 - 70 ปี ชายเป็นมากกว่าหญิง การได้รับควันบุหรี่ เป็นปัจจัยเสี่ยงที่สำคัญที่สุดของการเกิดมะเร็งไต ซึ่งมีอุบัติการณ์สูงกว่าคนที่ไม่สูบบุหรี่ การสูบซิการ์และกล่องยาเส้น มีความเสี่ยงเช่นเดียวกับการสูบบุหรี่

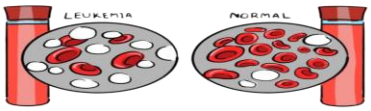
มะเร็งผิวหนัง

คนที่สัมผัสควันบุหรี่ มีความเสี่ยงเพิ่มขึ้นต่อการเป็นมะเร็งผิวหนังเมื่อเทียบกับคนไม่สูบบุหรี่ โดยมะเร็งผิวหนังชนิดสเควมัสเซลล์ เป็นผลที่เกิดจากควันบุหรี่กดภูมิคุ้มกัน

มะเร็งเต้านม

งานวิจัยบางส่วนพบว่าผู้หญิงที่สูดดมควันบุหรี่เป็นประจำอาจเสี่ยงต่อมะเร็งเต้านมมากกว่าคนทั่วไป





มะเร็งเม็ดเลือดขาว

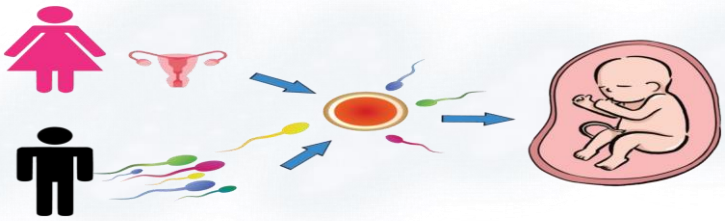
สารเบนซีนที่อยู่ในควันบุหรี่เป็นสารเคมีชนิดที่อาจเพิ่มความเสี่ยงในการเป็นมะเร็งเม็ดเลือดขาวได้

เบาหวาน

สารเคมีในควันบุหรี่ ให้เกิดการต้านอินซูลิน และเป็นโรคเบาหวานผู้ที่มีภาวะต้านอินซูลินจะไม่สามารถนำอินซูลินไปใช้ได้ ถึงแม้จะมีระดับอินซูลินในเลือดสูง ภาวะนี้จะทำให้ปริมาณของไขมันในอวัยวะต่าง ๆเปลี่ยนแปลง หรือโดยการเกิดพิษต่อเนื้อเยื่อตับอ่อนโดยตรง กลไกอื่นซึ่งเกิดขึ้นพร้อมกัน คือผู้ที่ไม่ออกกำลังกาย และคนอ้วนจะเพิ่ม อัตราเสี่ยงต่อการเกิดเบาหวาน กล่าวคือ การนำกลูโคสเข้าไปในเซลล์ไขมันและเซลล์กล้ามเนื้อผิดปกติไปในผู้ที่สูบบุหรี่ สารเคมีในควันบุหรี่มีผลโดยตรงคือขัดขวางการนำกลูโคสเข้าเซลล์ ผลทางอ้อมคือ ทำให้สารเคมีในเลือดเปลี่ยนแปลงหรือลดปริมาณเลือดไหลเวียนในหลอดเลือด จาก การทดลองโดยใช้เซลล์กล้ามเนื้อพบว่าการกระตุ้นการนำกลูโคสเข้าเซลล์กล้ามเนื้อโดยอินซูลิน ผิดปกติไปในผู้ที่สูบบุหรี่ซึ่งเป็นผลทางอ้อม ที่เกิดขึ้นจากการมีปริมาณกรดไขมันอิสระ และไขมันไตรกลีเซอไรด์ ในเลือดสูงกว่าปกติผู้ที่เป็นเบาหวานมีความเสี่ยงต่ออาการเกิดโรคหัวใจและจะเพิ่มความเสี่ยงมากขึ้น

การเป็นหมัน

1.ผลกระทบของควันบุหรี่กับภาวะเจริญพันธุ์ในหญิงเมื่อสามีหรือภรรยาสูบบุหรี่มีผลเสียต่อภาวะการมีบุตร ควันบุหรี่ทำอันตรายต่อรังไข่เรื่องการสูญเสียไข่ และหมดประจำเดือนเร็วขึ้นหลายปี สารประกอบในควันบุหรี่ความสัมพันธ์กับการแท้งบุตร การตั้งครรภ์นอกมดลูก หญิงตั้งครรภ์ที่สูบบุหรี่จะให้กำเนิดทารกที่มีน้ำหนักแรกเกิดน้อยและคลอดก่อนกำหนด มีอุบัติการณ์สูง ของทารกเสียชีวิตเฉียบพลัน ในบ้านที่มีคนสูบบุหรี่ จากการศึกษาทางระบาดวิทยา พบว่ามารดาที่สูบบุหรี่ในระหว่างตั้งครรภ์ทารกในครรภ์ที่ได้รับสารนิโคติน จะมีความเสี่ยงต่อการเกิดโรคไหลตายในทารกมากกว่าเด็กที่มารดาไม่ได้สูบบุหรี่ เด็กที่อยู่ในสิ่งแวดล้อมที่มีควันบุหรี่ มีความเสี่ยงต่อการเกิดไหลตายในทารกเช่นเดียวกัน



2. ผลกระทบของควันบุหรี่กับภาวะเจริญพันธุ์ในชายที่สูบบุหรี่ หรือได้รับควันบุหรี่จะมีจำนวนอสุจิลดลงทั้งจำนวนและการเคลื่อนที่อสุจิมีความผิดปกติทั้งรูปร่างและหน้ามากกว่าคนที่ไม่สูบบุหรี่จากผลการสำรวจจากโครงการสำรวจการบริโภคยาสูบในผู้ใหญ่ระดับโลก พ.ศ. 2552 และพ.ศ. 2554 คนไทยส่วนใหญ่ เชื่อว่าการได้รับควันบุหรี่มือสองก่อให้เกิดโรคร้ายแรงในคนที่ไม่สูบบุหรี่ และโรคที่คนไทยส่วนใหญ่เชื่อว่าเกิดจากการได้รับควันบุหรี่มือสองมากที่สุด คือ โรคมะเร็ง ปอด รองลงมา โรคหอบหืด/โรคปอดในเด็ก โรคถุงลมโป่งพอง ทารกแรกคลอดน้ำหนักตัวน้อยกว่าปกติ (< 2.5 กิโลกรัม) โรคหัวใจ และการคลอดก่อนกำหนด (28 -34 สัปดาห์) ตามลำดับ

หลีกเลี่ยงควันบุหรี่มือสองอย่างไรดี

สำหรับผู้ที่สูบบุหรี่ ควรตระหนักถึงผลกระทบที่อาจเกิดขึ้นกับคนในครอบครัว ไม่ควรสูบบุหรี่ภายในบ้าน เปลี่ยนเสื้อผ้าและล้างมือที่อาจปนเปื้อนสารเคมีจากควันบุหรี่ก่อนสัมผัสหรืออุ้มเด็กและทารก ทางที่ดีที่สุดในการป้องกันตัวเองให้ห่างไกลจากควันบุหรี่ คือหลีกเลี่ยงสถานที่ ๆ มีควันบุหรี่ และไม่อยู่ในบริเวณเขตสูบบุหรี่ ซึ่งจะช่วยให้คุณมีสุขภาพร่างกายที่ดีขึ้น

ทักษะในการป้องกันตนเองจากควันบุหรี่มือสอง

-มีการจัดเขตปลอดบุหรี่ในบ้าน เช่น ติดสติ๊กเกอร์เขตปลอดบุหรี่ มีการติดป้ายความรู้เรื่องอันตรายของควันบุหรี่มือสอง

-ให้สมาชิกในครอบครัวที่สูบบุหรี่ไปสูบนอกบริเวณบ้าน

-มีการสร้างข้อตกลงระหว่างการสูบบุหรี่ที่บ้านกับสมาชิกครอบครัว เช่น หลังจากสูบบุหรี่ต้องอาบน้ำ เปลี่ยนเสื้อผ้าทันที และให้เปิดหน้าต่างเพื่อให้อากาศถ่ายเท

-หากอยู่ในที่ชุมชนหรือหลีกเลี่ยงไม่ได้ต้องผ่านไปสถานที่ที่มีควันบุหรี่มือสองให้ใช้หน้ากากอนามัย

การตรวจหาระดับนิโคติน

"นิโคติน" เมื่อเข้าสู่ร่างกาย จะอยู่กับเรานานเท่าไหร่? และอะไรคือต้นเหตุของการติดบุหรี่จริงหรือ?

เมื่อไหร่ที่ได้ยินคำว่า "นิโคติน" เราก็จะนึกถึงบุหรี่เป็นอย่างแรก และเพียงอย่างเดียวเท่านั้น! แล้วเรารู้จักกันมากแค่ไหนว่า เมื่อสาร นิโคตินในบุหรี่เข้าสู่ร่างกายเราไปแล้ว มันจะอยู่กับเรานานเท่าไหร่? และนิโคตินคือสาเหตุของการติดบุหรี่จริงหรือ?

"**สารนิโคติน**" ไม่ได้อยู่แค่ในกระแสเลือดและปัสสาวะ ทันทีที่เราสูบบุหรี่เข้าไปอย่างที่รู้กันเบื้องต้น ว่าจะตรวจพบสารนิโคตินได้จากกระแสเลือดและปัสสาวะ

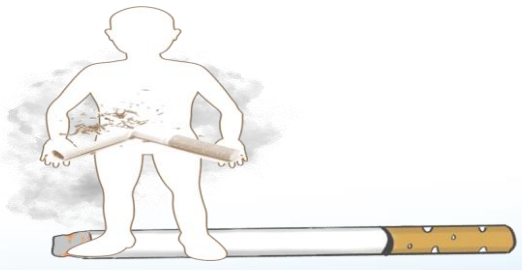
แต่ความจริงแล้ว " **นิโคติน**" สามารถกระจายเข้าสู่ร่างกายได้มากกว่านั้น ไม่ว่าจะเป็นเลือดหรือเส้นผม และเมื่อมีการสูดดมเข้าไป "**นิโคติน**" บางส่วนจะเปลี่ยนเป็น

"สารโคตินิน"

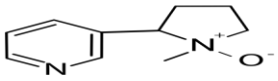
ซึ่งอยู่ในร่างกายมากกว่า

ทันทีที่เราสูบบุหรี่เข้าไป อย่างที่รู้กันเบื้องต้นว่าจะตรวจพบสาร นิโคตินในบุหรี่ ได้จากกระแสเลือด และปัสสาวะ แต่ความเป็นจริงแล้วนิโคตินสามารถกระจายเข้าสู่ร่างกายได้มากกว่านั้น โดยทางการแพทย์ตรวจสอบพบดังนี้

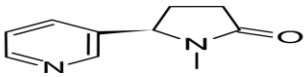
- **กระแสเลือด** – นิโคตินจะอยู่ในกระแสเลือดตั้งแต่วันแรกที่เราได้รับ และอยู่ได้นานถึง 3 วัน แต่เมื่อเปลี่ยนเป็นโคตินิน สารนี้จะอยู่ในกระแสเลือดนานถึง 10 วัน และจะค่อยๆ เจือจางลงไปเรื่อย ๆ
- **ปัสสาวะ** – ทั้งสารนิโคตินและโคตินิน สามารถตรวจพบได้ในปัสสาวะภายใน 3 – 4 วัน ทั้งนี้ขึ้นกับตัวบุคคลที่ได้รับสาร แต่ผู้ที่ได้รับควันจากบุหรี่โดยไม่ได้สูบเอง(บุหรี่มือสอง) กลับพบสารนี้ในปัสสาวะนานกว่าถึง 20 วัน
- **น้ำลาย** – โคตินินอยู่ในน้ำลายได้นานกว่านิโคติน และอยู่ได้มากกว่า 10 ชม.จนถึง 2 – 4 วัน
- **เส้นผม** – นิโคตินที่ถูกเปลี่ยนเป็นโคตินินจะถูกเลือดพาไปยังเนื้อเยื่อของอวัยวะทั่วร่างกาย รวมทั้งฝังลึกถึงเนื้อในของเส้นผม โดนส่วนใหญ่จะถูกพบมากที่สุดในบรรดาเด็กและผู้ที่ไม่ได้สูบบุหรี่ และอยู่นานถึง 30 วัน



จากข้อสังเกตเราจะเห็นได้ชัดว่า “นิโคติน”จะอยู่ในร่างเพียงระยะเวลาสั้นๆเท่านั้นแต่สิ่งที่อยู่กับร่างกายของผู้สูบบุหรี่มวนกลับเป็น “**สารโคตินิน**” มากกว่า



Nicotine N-oxyde



Cotinine

โคตินิน เป็นสารเมตาบอไลท์ของนิโคติน ภายหลังการสูบบุหรี่ นิโคตินในควันบุหรี่จะถูกดูดซึมเข้าสู่ร่างกายได้โดย ทางระบบทางเดินหายใจ เยื่อบุในช่องปากและผิวหนัง เมื่อนิโคตินเข้าสู่กระแสเลือด นิโคตินจะกระจายตัวไปออกฤทธิ์ที่อวัยวะต่างๆ เช่น สมอง ทางเดินอาหาร หัวใจและหลอดเลือด

เอกสารอ้างอิง

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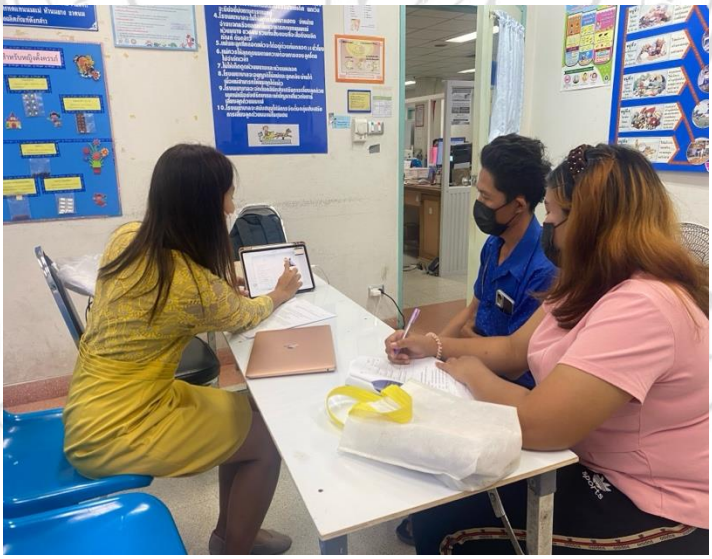
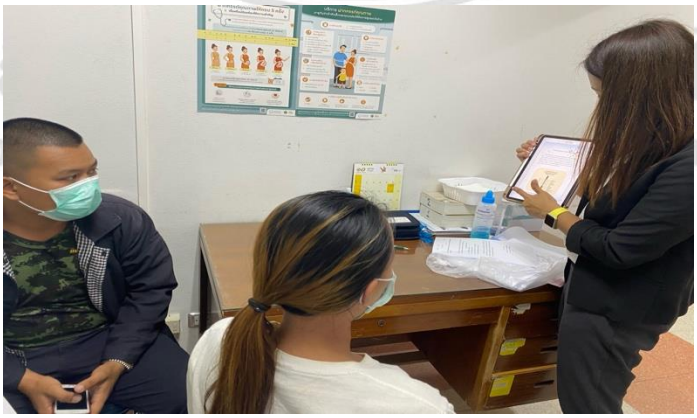
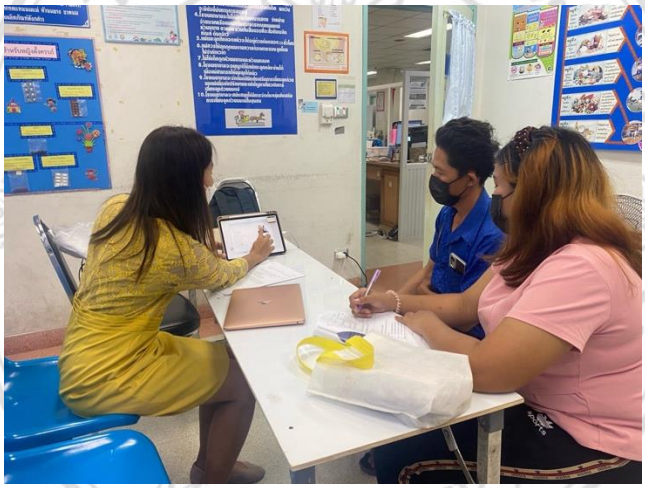
APPENDIX F

Activity pictures







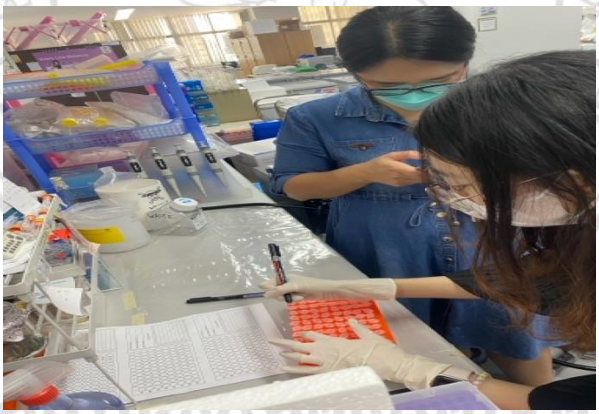


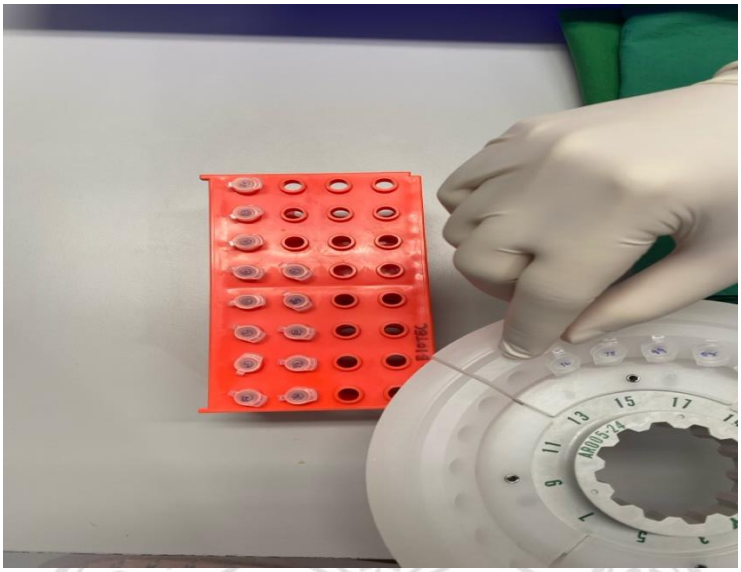


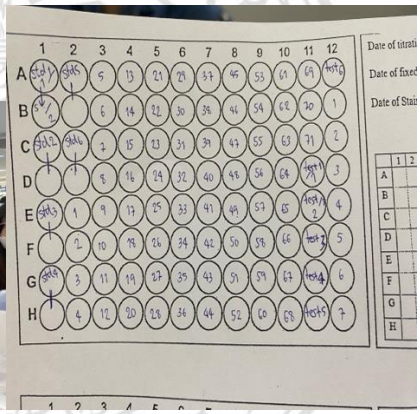


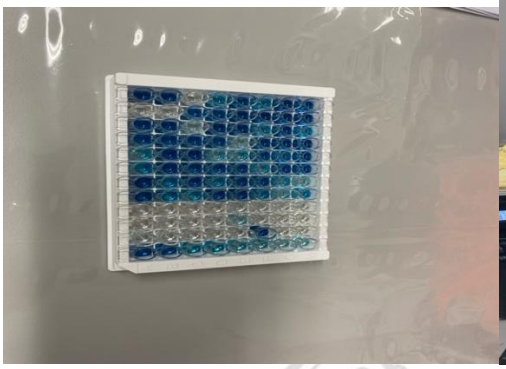

APPENDIX G

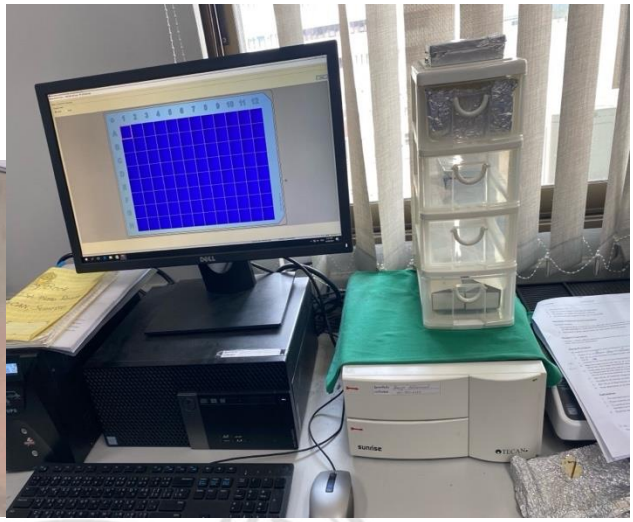
Cotinine ELiSA KIT

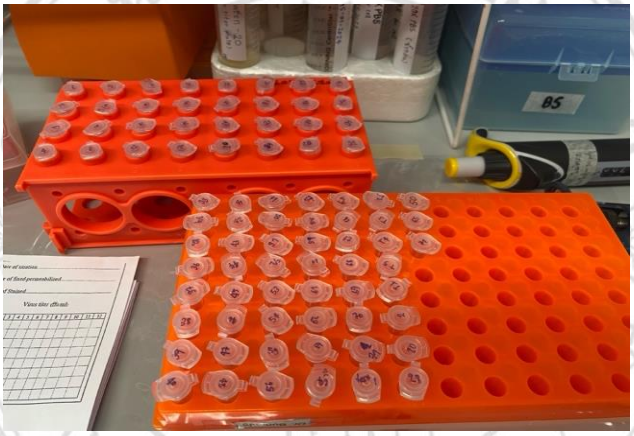


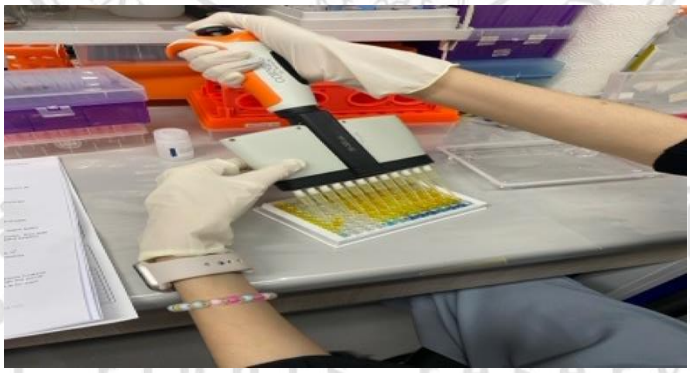


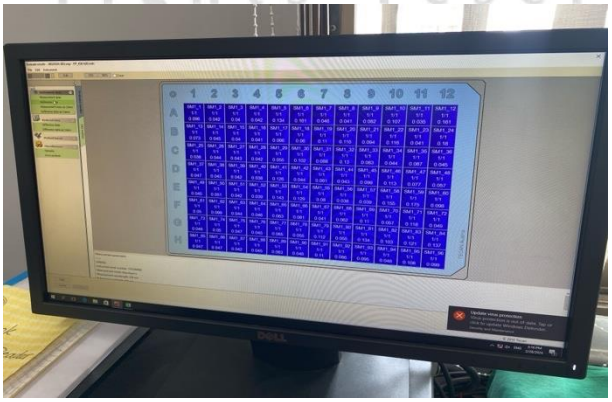












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