

Relationship between Maternal Second-Hand Smoke Exposure in Pregnancy and History of Abortion

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Abstract

Background and Aim: Cigarette smoke, due to its oxidative stress-causing substances, causes undesirable changes in the female reproductive system and may increase the incidence of abortion. Given that insufficient documentation is available in this area, this project was conducted with the aim of investigating the association between maternal second-hand smoke exposure in pregnancy and history of abortion.

Methods and Materials: This is a case-control study that was conducted to determine the impact of maternal second-hand smoke exposure in pregnancy and abortion in patients referred to the gynecology clinic of Bahar Hospital of Shahroud in 2019. Eligible patients were selected by simple census method to complete the sample size, based on having or not having a history of abortion, they are divided into case and control groups and entered the study and history of secondhand mothers' smoking in the past were studied.

Results: In this study, the mean age of the patients was 32.68 ± 11.16 years. In terms of maternal second-hand smoke exposure in pregnancy, in the case group, 127 cases (88.8%) and 96 (67.1%) were in the control group, which was significantly higher ($p = 0.001$) in the case group. Also, the results of logistic regression model showed that secondhand smoking could significantly increase the incidence of abortion so that maternal second-hand smoke exposure in pregnancy was increases the odds ratio [OR = 2.41 (95% Confidence: 3.405 - 1.587)] of abortion.

Conclusion: The results of this study showed that maternal second-hand smoke exposure in pregnancy can increase the risk of abortion and increase its odds ratio by about 2.5 times, but more definitive research is needed to confirm this finding.

Keywords: Maternal Second-Hand Smoke Exposure in Pregnancy; Abortion; Gynecologic Disorders

Abbreviations

IUGR: Intra Uterus Growth Retardation; LBW: Low Birth Weight; β HCG: β Human Chorionic Gonadotropin;

SPSS: Statistical Package for Social Science

Introduction

Smoking is one of the most common health problems. Smoking causes a lot of harm to the smoker. People around the smoker also suffer from various side effects of secondhand smoke. Smoking and even exposure to secondhand smoke increase the risk of lung cancer and cardiovascular disease [1]. Most of the effects of smoking are caused by smoke. The effects of cigarette smoke are very diverse and affect almost all body systems. People around the smoker are also unaware of these side effects and are being treated as secondhand smoking [2]. Some people with special conditions are more sensitive and suffer more complications. Elderly people with underlying illnesses, patients taking over-the-counter medications, infants and children, and ultimately pregnant women, are more susceptible to cigarette smoke [3-4]. Some of these complications are not diagnosed even at birth and develop in different forms as the child grows older [5]. One of the organs most likely to be harmed by exposure to cigarette smoke is the reproductive system that puts not only the pregnant mother but also her baby at risk [5-6]. Problems such as preterm labor, intra uterus growth retardation (IUGR), low birth weight (LBW) and even abortion are problems associated with exposure to cigarette smoke [7]. Cigarette smoke causes undesirable changes in the female reproductive system due to its oxidative stress-inducing substances such as quinine [4-5]. Therefore, it is expected that imposing an oxidative stress on the body not only reduces the probability of a person being exposed to cigarette smoke but also increases the incidence of abortion. The validity of this finding in previous studies of maternal smoking has shown that premature birth, abortion and low birth weight in infants of smoking mothers are higher than those who did not smoke [8]. But there is insufficient and documented information on the effects and risks that maternal second-hand smoke exposure in pregnancy can have on the mother and baby during pregnancy. However, in some societies up to 69% of non-smoking pregnant women are exposed to cigarette smoke at home [9-10]. In this regard, not only cigarette smoking, but also the rate of cigarette smoking has been effective so that the consumption of less than 10 cigarettes per day by the father is 1.04 times and the consumption of more than 10 cigarettes per day by the father up to 1.8 times increases the risk of adverse pregnancy outcomes compared to non-smoking fathers in pregnant women exposed to cigarette smoke [11]. In recent years, the number of pregnancy complications such as fetal abnormalities, intrauterine growth retardation, infections, as well as abortion and still-birth has increased significantly, and on the other hand, the number of pregnancies in the community has decreased. This causes special attention to be paid to healthy pregnancies. Cigarette smoking as well as exposure to secondhand smoke can, according to the available documentation, increase these side effects to some extent, but the exact amount is not known [8-10]. Given the importance of the issue, the high prevalence of cigarette smoking in the community, the exposure of cigarette smoke to large numbers of non-smoking pregnant women, and the lack of sufficient scientific documentation in the area, this study aims to the study of the association between maternal second-hand smoke exposure in pregnancy and history of abortion in patients referred to the gynecology clinic of Bahar Hospital in Shahroud was conducted.

Materials and Methods

This study is an intervention study on a human sample and in order to determine the relevance of abortion history and maternal second-hand smoke exposure in pregnancy, attendees to the gynecology clinic of Bahar hospital of Shahroud between January and December 2019. In this study, eligible patients were selected by simple census method to complete the sample size, based on having or not having a history of abortion, they are divided into case and control groups and entered the study. The case group included those who already had or had a history of abortion. Abortion means losing the pregnancy product (fetus or embryo) before week 20 of pregnancy. Abortion was diagnosed despite clinical manifestations of vaginal bleeding and abdominal pain, specialized genital examination, β HCG, and uterine ultrasound. Control group were included people without abortion in the past year. Then the patients in both groups were asked about secondhand smoking history and come with demographic information included age, abortion times, abortion date and educational level was registered in a special sheet. In this study, exposing women to cigarette smoke for two hours a day all week and for at least three months with a smoker (especially a partner) who smoked at least 7 cigarettes a day was another requirement.

Descriptive statistics including mean and standard deviation, as well as relative frequency were used to describe the data. To examine the relationships and comparisons between the two groups, was used the chi-square test and multivariate logistic regression was used

to evaluate the odds of each of the variables. All analyzes were performed using SPSS software version 16 and significant level ($p < 0.05$). Sample size using Epi info 7.2 at a significant level of 5% and a power of 80%, equal to 143 people in each group and a total of 286 people.

This study has an ethics code number (IR.SHMU.REC.1398.089) from research deputy of Shahroud University of Medical Sciences. The essential information and the objectives of the study were explained to the patients, and written consent was obtained for participation in the plan.

Results

In this study, the mean age of the patients was 37.64 ± 6.21 years that the age group of 31 - 40 years old with 43.1% had the highest frequency among patients in both groups. It was also found that, 63 (22.1%) patients did not use cigarettes or secondhand smoking at all. There is a significant difference between the two groups regarding secondhand smoking ($p < 0.001$). The results of secondhand smoking among pregnant women in both groups are shown in table 1. In this study independent variables with abortion were investigated in multivariate regression model. As shown in table 2, secondhand smoking variables were significantly associated with abortion and there was no significant relationship with other variables. The results of the multivariate logistic regression model are presented in table 2.

Maternal second-hand smoke exposure in pregnancy	Case group Number (%)	Control group Number (%)	Total Number (%)	p-value
Without consuming	16 (11.2)	47 (32.9)	63 (22.1)	P<0.001
Daily intake of less than 10 yarns of Cigarettes of your wife	68 (47.5)	50 (34.9)	118 (41.2)	
Daily intake of more than 10 yarns of Cigarettes of your wife	51 (35.7)	28 (19.6)	79 (27.6)	
Quit smoking of your wife	8 (5.6)	18 (12.6)	26 (9.1)	
Total patients	143 (100)	143 (100)	286 (100)	

Table 1: Frequency distribution of patients in two groups based on smoking.

Independent variables		Odds Ratio	95% Confidence	P- Value
Age category	18 to 35 years	1.000		
	Less than 18 years	1.089	1.342-0.0652	0.074
	More than 35 years	1.196	1.451-0.0912	0.055
BMI (kg/m ²)	18-25	1.000		
	<18	1.098	1.183-0.825	0.078
	>25	1.144	1.269-0.968	0.063
Degree of education	Under the diploma	1.000		
	Diploma	0.923	1.125-0.756	0.055
	Academic	0.875	1.035-0.612	0.051
Job	Housewife	1.000		
	Free job	0.851	1.123-0.671	0.117
	Employee	0.723	0.957-0.563	0.088
Abortion times	No abortion	1.000		
	One to two Aborts	1.105	1.248-0.811	0.085
	Three and more Aborts	1.284	1.439-0.986	0.057
History of gynecologic illness	Negative	1.000		
	Positive	1.326	2.142-1.309	0.052
History of chronic clinical disease	Negative	1.000		
	Positive	1.089	1.263-0.916	0.063
History of alcohol consumption	Negative	1.000		
	Positive	1.028	1.282-0.857	0.059
History of secondhand smoking	Negative	1.000		
	Positive	2.412	3.405-1.587	0.001

Table 2: Relationship between independent variables with abortion in multivariate logistic regression model.

Discussion

The results of this study showed that, among the measured variables, secondhand smoking significantly increased the risk of abortion in patients. This finding is consistent with the results of Marangoni [12]. Of course, given the limited scope of this study, the result cannot be attributed to the entire community, but it can highlight the importance of the need for greater attention and more comprehensive research. Smoking during pregnancy is one of the few preventable factors associated with pregnancy complications, stillbirths, low birth weight and preterm birth and has long-term consequences for women and infants [13-14]. Smoking during pregnancy is declining in developed countries but is strongly linked to poverty and is increasing in low- to middle-income countries [15]. The reported rate of smoking for women is typically low. However, many pregnant women are exposed to the environmental smoke of their surroundings which can affect their health and the developing fetus [16-18]. In some studies, exposure to secondhand smoking during pregnancy increased the risk of stillbirth by 23% and congenital malformations by 13% and reduced the birth weight of infants by an average of 60 g [19-20]. Also, a study has shown a significant association between being passive smoker and having intrauterine growth restriction (IUGR) and low birth weight [21].

In this study, it was found that maternal second-hand smoke exposure in pregnancy had a high prevalence among patients referred to the gynecology clinic, which is consistent with the study conducted by the Mahfoud and Yang [22-23]. In the study of Dunn, *et al.* it was found that smoking in patients with complications of pregnancy, especially vaginal bleeding disorders and abortion, is higher than that among normal people [24]. The study by Al-Shaikh, *et al.* found that daily smoking increases the risk of developing the first abortion and it is suspected that cigarette-related illnesses like lung disease can also instigate or exacerbate vaginal bleeding [25]. A study by Mejia, *et al.*, among individuals with infertility disorder, like repeated abortion, showed that the high prevalence of secondhand smoking was found to be similar to the results of this study [26]. In this study, it was found that the effect of secondhand smoking on abortion in different educational groups was not significantly different, which shows that maternal second-hand smoke exposure in pregnancy is increasing among those with both higher education and lower education.

The results of Tsuchida, *et al.* were in perfect agreement [27], but the results of Hammond and Meeker's studies showed that the rate of secondhand smoking was significantly lower in those with higher education than those without college education which contradicts the results of the present study. This may be due to the type of participants selected or the sample size of the studies [28-29].

This study found an impact of secondhand smoking on incidence of abortion in various occupational groups; although the influence in the housewife group was higher, there was no significant difference between them. Housewives are more likely to smoke because of their presence in the family, while those in their workplaces are less likely to smoke because of limited smoking. This finding is inconsistent with the research results of Zheng, *et al.* who showed that women are exposed to cigarette smoke, were more prone to abortion. This result is fully consistent with the findings of our study [30].

The results of this study showed that with decreasing or increasing body mass index (BMI) from normal range, the chance of abortion changes, although this difference is not statistically significant. This finding is consistent with the results of George and Pineles studies [31-32] but contradicts the findings of the Blanco-Muñoz study that increased BMI causes a significant increase in miscarriage, which may be due to differences in the selection of patients with recurrent miscarriages [33].

In reviewing the logistic regression model regarding factors affecting abortion, it was found that secondhand smoking (odds ratio, OR = 2.41) increased the chance of abortion, but other variables, such as age, educational level, BMI, occupation, and abortion times, did not have a significant effect on the incidence of abortion.

These findings are consistent with the results of Norsaadah, *et al.* [34] and with the results of Mahfoud and Yang [22-23] and Windham, *et al.* to some extent [30]. The most important reason for the incomplete outcome of these results may be the type of study designed or the sample size to be evaluated.

Conclusions

The results of this study showed that the rate of maternal second-hand smoke exposure in pregnancy was relatively high among in the abortion group. It was also found that secondhand smoking can increase the chance of abortion. Since secondhand smoking increases the incidence of abortion, controlling and reducing cigarette smoking in pregnant female companions, may lead to a significant reduction in the incidence of abortion. Therefore, in order to control and prevent abortion-related smoking, it is necessary to emphasize the non-smoking during pregnancy by the pregnant woman and her relatives. It is also necessary to improve the attitudes and practices of pregnant women and their relatives about the side effects of smoking or maternal second-hand smoke exposure in pregnancy, especially on abortion.

Limitations

Among the limitations of this research, patients' self-reported cigarette smoking or maternal second-hand smoke exposure in pregnancy, as well as gynecology disorders, and especially abortion, may have been reported to be inadequate that this problem was largely overcome by justifying patients and repeating the question. Also patients in the two groups were categorized only for the history of abortion and were not included in other matching cases between the two groups.

Declarations

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Consent for Publication

Consent for publication: All named authors have seen and agreed on the submitted version of the paper. All persons in the acknowledgments section have agreed to that inclusion.

Availability of Data and Material

The dataset used and / or analyzed during the present study is available from the corresponding author upon reasonable request.

Conflict of Interests

The authors declared that they have no conflict of interest.

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