

Comparison of adverse Pregnancy Outcomes between Hookah and Non-smoking Women

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ARTICLE INFO	ABSTRACT
<i>Article type:</i> Original article	Background & aim: Considering the epidemic of hookah smoking in young people, the main purpose of this study was to assess the adverse effects of hookah consumption in pregnant women and their fetus.
<i>Article History:</i> Received: 23-Oct-2017 Accepted: 30-Jun-2018	Methods: This prospective cohort study was carried out in a 13-month period in Isfahan, Iran, 2014. Data were collected using a questionnaire, interviewing, and examination. The study population consisted of 512 pregnant women, who were selected by convenience sampling method and assigned into two groups of smoker and non-smoker. The groups were matched considering the age, early pregnancy weight, parity, and family history of preeclampsia. Data analysis was performed using t-test and Chi-squared test in SPSS software, version 19.
<i>Key words:</i> Pregnancy hookah Non-smoking women	Results: According to the results, there was a direct relationship between preeclampsia, preterm labor, placental abruption, birth weight and APGAR score with hookah consumption during pregnancy. However, no significant correlation was seen between intrauterine fetal demise and hookah consumption during pregnancy ($P < 0.05$). Conclusion: Hookah smoking during pregnancy can make a significant difference in maternal and neonatal complications. Therefore, controlling hookah usage during pregnancy can reduce adverse pregnancy outcomes.

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Introduction

Globally, the increase in tobacco use is a critical issue. The World Health Organization (WHO) estimated that tobacco consumption annually caused 6,000,000 deaths worldwide (1). Nowadays, hookah smoking is considered as one of the increasing global problems, especially in the countries of the Eastern Mediterranean such as Arab countries, Turkey, and Iran (2).

Women are considered as one of the main pillars of family. Therefore, the development of a disease in them and its complications, especially during pregnancy, are associated with adverse consequences such as neuropsychiatric disorders in children, fetal abnormalities, infantile diseases, and severe economic impacts. In addition, this issue may

affect the society by incurring huge costs, using specialized staff and equipment for the treatment of these complications, and bearing the burden of social problems resulting from these disorders (1).

Recent epidemiological studies indicated that in some of the aforementioned regions, the prevalence of hookah smoking has increased in the populations, many of whom are women, children, and adolescents (3). The results of a study conducted in one of the Arab countries showed that 70% and 50% of male and female students smoke hookahs, respectively (4).

According to the literature, hookah exposes users to the high concentrations of carbon monoxide, nicotine, tar, and heavy metals (5).

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There are little researches carried out into the effects of hookah smoking on health status. Nevertheless, initial evidence indicates a relationship between hookah smoking and the incidence of a variety of diseases including respiratory and cardiovascular diseases, cancer, and dermatitis (1, 6).

Perhaps hookah smoking is the only way of tobacco consumption, which is common among Iranian women and socially accepted to some extent with unfortunately increased use among women and adolescents in recent years (2). On the other hand, the adverse effects of hookah were not well investigated as compared to those of cigarettes. The main reason is that hookah smoking is not among the habits of Western societies, while cigarettes are very common in the West (2).

So far, few studies have been conducted in Iran on the complications of hookah smoking. Additionally, only some of them have dealt with investigating its complications during pregnancy that reported its significant relationship with low birth weight (7). Nonetheless, many studies confirmed the adverse effects of cigarette smoking during pregnancy including the risk of hypertension, stillbirth, placental abruption, and low birth weight (5, 8).

Preeclampsia is now considered as the most common medical problem during pregnancy (9). It was reported as one of the three main causes of maternal and neonatal mortality worldwide. Meanwhile, its prevalence in Iran is higher than the global average (10). Preterm labor is one of the serious obstetric complications, which occurs in about 7% of pregnancies (11).

However, a higher prevalence of up to about 20% was reported in Iran, which was associated with neonatal mortality in 70% of the cases (10). Further, low birth weight is considered as another serious neonatal complication. Although its global prevalence is 6%, it has a minimum prevalence of 8% in Iran (6). In this regard, the WHO recommended further studies to find the relevant variables (12).

Intrauterine demise, with a global prevalence of 1% is one of the tragic obstetric incidents that reaches 2.2% in Iran (12). The above-mentioned complications impose a heavy economic burden on the society in addition to reducing the health

indices. As a result, it is essential to conduct researches on the relevant factors. It is worth mentioning evidence revealed the relationship of all the above-mentioned complications with cigarette smoking (11, 12, 13). Therefore, this study was conducted to compare maternal and neonatal outcomes of pregnancies between women smoking hookahs and women non-smokers.

Materials and Methods

This study was conducted in the form of a 13-month prospective cohort study from late March 2014 until late April 2015 with the approval of the Research Committee of Islamic Azad University, Falavarjan Branch under the code No. 5172. In the present study, hookah smoking was the independent variable, and preeclampsia, preterm labor, intrauterine demise, placental abruption, low birth weight, and 5-minute Apgar score were the dependent variables.

The study population consisted 512 pregnant women referred to healthcare centers in Isfahan, 2014, to receive prenatal care services. The samples were divided into two groups of smokers and non-smokers (256 individuals per group). The samples were selected through convenience sampling method. The subjects were followed up from the 24th week of pregnancy until the post-partum.

The sample size is necessary for comparing the binomial ratio taking into account the time, cost, and generalizability, and through the one-way test at a significance level of $\alpha=5\%$ and a power of $1-\beta=0.08$ (p_1). The probability of observing the complications of pregnancy in Iranian pregnant women smoking hookahs, which was 0.16 based on the conducted study (p_2), was calculated through substituting the values in the following equation (14).

$$n_1 = n_2 = \frac{[\sqrt{pq} z_{1-\alpha} + \sqrt{p_1q_1 + p_2q_2} z_{1-\beta}]^2}{\Delta^2}$$

The inclusion criteria entailed the Iranian race and gestational age less than 24 weeks (for preeclampsia follow-up). Prior to the study, a written informed consent was obtained from

each participant. In addition, the exclusion criteria included the history of diabetes, oligohydramnios or polyhydramnios, multiple births, hydatidiform moles, hydrops fetalis, intrauterine demise, chronic hypertension, surgery during the current pregnancy, Rh incompatibility, placenta previa, cervical incompetence, uterine abnormalities, fetal anomalies, placental insufficiency, premature rupture of membranes, as well as positive history of cardiac, renal, and infectious diseases, and cigarette smoking.

Data were collected using a questionnaire and through interviewing and examination. The questionnaire consisted of 34 questions divided into three parts. Parts I and II (the demographic and hookah smoking information) were completed during sampling. The third part was related to obstetric complications, which was completed by referring to the mothers' obstetric record and through the examination of the newborn.

A test-retest method was used to measure the reliability of the questionnaire. To perform the test-retest, the questionnaires were administered to 10 members of the study population including five hookah-smoker pregnant women and five non-smoker ones. They completed the questionnaires; then, within a week, the questionnaires were re-completed by the same people but different questionnaire.

Thereafter, every single question in the first test was compared with that in the retest, and because the correlation coefficient between the first and second tests was higher than 0.7 in each part, the questionnaire was approved. The first and second parts of the questionnaire were completed, and the respondents' addresses and phone numbers were recorded for future follow-up.

The case group was divided into three subgroups of light smokers, with a maximum smoking rate of twice a week, moderate smokers with a smoking rate of twice to seven times a week, and heavy smokers with a smoking rate of more than once a day. The control group consisted of the pregnant women referred to the same centers with no history of hookah smoking (before or during pregnancy), and who were matched to the case group in terms of age, parity, weight at the beginning of

pregnancy, and family history of preeclampsia. The first part of the questionnaire was completed for this group, as well.

The subjects' estimated dates of delivery were recorded. Both the case and control groups were asked to inform the researcher by phone immediately after entering the maternity ward for delivery. Additionally, they were asked to contact the researcher as soon as possible in case of emergency childbirth, pregnancy loss, hypertension, or proteinuria. To remind the subjects of following-up the issues, they were contacted by phone during the second and third trimesters of pregnancy. While renewing the previous appointment, the questions were asked of them about the symptoms or diagnosis of preeclampsia.

The interviewers, who all were midwifery experts, attended the maternity ward on the date scheduled for the subjects' deliveries and completed the third part of the questionnaire through observation, maternal and neonatal examinations, and their obstetric records. This process continued until the sampling was completed. Data analysis was performed using descriptive and analytical statistics including Chi-squared, t-test, Mann-Whitney U and Fisher's exact tests with the aids of the SPSS software, version 19.

Results

This study was conducted among a total of 512 pregnant hookah smokers and non-smokers. The groups were matched in terms of age, parity, weight at the beginning of pregnancy, and family history of preeclampsia. None of the subjects were excluded from the study. The demographic characteristics of the subjects are shown in Table 1. Out of 256 subjects in the case group, 58, 87, and 111 subjects were heavy, moderate, and light hookah smokers, respectively.

In addition, 55 (22.65%) and 28 (10.93%) subjects in the case and control group were affected by preeclampsia, respectively. Fisher's exact test was used to determine the relationship between preeclampsia and hookah smoking. In this case, the two-way significance level for Fisher's test was approximately zero. Therefore, at an error level of 5%, the assumption of independence between hookah smoking and

preeclampsia was rejected ($P < 0.001$).

It means that hookah smoking might change the risk of being affected by preeclampsia. Given the results, the risk of preeclampsia in

Table 1. Demographic characteristics of the participants

Variable	Group	Mean±Standard deviation	P-value*
Age	Control	28±3.11	(P<0.001)
	Case	27±3.11	
Weight	Control	53±7.92	(P<0.001)
	Case	51±9.13	
Body mass index	Control	27.25±1.31	(P<0.001)
	Case	25.26±1.54	
Number of children	Control	2±1.12	(P<0.001)
	Case	2±1.21	
The age of the first pregnancy	Control	24±2.1	(P<0.001)
	Case	23±3.1	
Duration of hookah smoking	Control	-	(P<0.001)
	Case	31±8.2 months	

* Determined using t-test

hookah smoker women was 4.11 times more than that of non-smokers. Additionally, 41.3%, 59.7%, and 54.05% of heavy, moderate, and light hookah smokers reported preeclampsia, respectively. There was no significant relationship between the light, moderate, and heavy levels of hookah smoking and preeclampsia in the case group ($P = 0.1$).

Moreover, 39 participants (15.23%) experienced preterm labor in the case group, whereas this figure was reported to be 20 (7.18%) in the control group ($P = 0.008$). There was a significant relationship between the prevalence of preterm labor and hookah smoking. It is worth mentioning that the risk of preterm labor among hookah smoker women was 3.8 times greater than that of non-smokers. In this study, 17.24%, 40.22%, and 15.31% of heavy, moderate, and light hookah smokers experienced preterm labor, respectively. Accordingly, a significant relationship was observed between hookah smoking and the rate of preterm labor ($P < 0.05$).

Intrauterine demise occurred in 13 (5.07%) and 3 subjects (1.17%) in the case and control groups, respectively ($P = 0.14$). Based on the results of the present study, there was no significant relationship between intrauterine demise and hookah smoking. Intrauterine demise occurred in 5.17%, 9.19%, and 1.8% of heavy, moderate, and light hookah smokers, respectively.

In addition, no significant difference was observed between diverse rates of hookah smoking in terms of the prevalence of intrauterine demise ($P < 0.05$). Placental abruption occurred in 32 subjects in the case group (12.5%) and 15 women in the control group (5.85%; $P < 0.001$). Regarding the results, there was no significant relationship between hookah smoking and placental abruption.

Additionally, the risk of placental abruption in hookah smoker women was 2.83 times greater than that in non-smokers. In the current study, 29.31%, 12.64%, and 2.7% of heavy, moderate, and light hookah smokers had placental abruption, respectively. There was a significant difference between diverse rates of hookah smoking and placental abruption ($P < 0.001$).

The birth weights lower than 2,500 g were reported in 46 subjects in the case group (17.96%) and 26 subjects in the control group (10.15%). The results obtained in the present study showed a significant relationship between the above variables ($P = 0.021$). There was a significant relationship between maternal hookah smoking and the prevalence of very low birth weight.

The 5-minute Apgar scores of 8 to 10 were reported in 159 subjects in the case group (62.1%) and 194 subjects in the control group (75.78%). Apgar scores lower than 4 were reported in 35 subjects in the case group

(13.67%) and 11 subjects in the control group (4.29%). A significant relationship was detected between the above variables ($P=0.013$). There was a significant relationship between maternal hookah smoking and 5-minute Apgar score.

Discussion

As explained above, a significant relationship was demonstrated between hookah smoking and the occurrence of preeclampsia ($P=0$). In line with the results obtained in this study, Hajivandi in 2009 and Wikstrom in 2010 reported a significant relationship between hookah smoking and the occurrence of preeclampsia (7, 9). Probably, the long-term impact of hookah smoking on vascular contraction might expose hookah smoker women to hypertension and preeclampsia.

In another study conducted in 2010, Negahban showed no significant relationship between maternal passive smoking and the prevalence of preeclampsia (10). Preterm labor was more prevalent among hookah smoker women in comparison to non-smokers. Morgen in 2009 reported a significant relationship between hookah smoking and preterm labor (11). Blank in 2011 stated that hookah smoking before and during pregnancy was associated with the increased risk of preterm labor due to lower Hb-O₂ affinity and increased uterine vascular sensitivity (1).

In another study performed in 2008, Delaram showed that the prevalence of premature births was higher in mothers exposed to cigarette smoke than in the control group (8). Moreover, Negahban in 2010 reported a significant relationship between maternal passive smoking and the occurrence of preterm labor (10). Perhaps cigarette and hookah smoking increase the risk of preterm labor through a similar mechanism.

Lucinda in 2010 explained that not only preterm labors but also the prevalence of intrauterine demise dramatically increased in smoker women. The mechanism of intrauterine demise was associated with reduced O₂ saturation and polycythemia (13). Consistent with our results, Blank in 2011 reported no significant relationship between intrauterine demise and smoking (1).

In another study in 2013, Moradi

demonstrated a significant relationship between intrauterine demise and hookah smoking during pregnancy (12). It is worth mentioning that race and genetic susceptibility should be considered as effective factors in several disorders. Furthermore, Lucinda in 2010 confirmed that there was a significant relationship between placental abruption and hookah smoking in American women.

In the mentioned study, it was stated that hookah smoking was a strong effective factor in increasing placental intravascular pressure (13). The present study also reported a significant relationship between hookah smoking and placental abruption. Moradi in 2013, Waziry in 2016, and Rachidi in 2013 demonstrated a significant relationship between low birth weight and hookah smoking (4, 6, 12). These results were in congruence with the results obtained in this study and in a study performed by Mirahmadzadeh in 2008 (15).

In another study carried out in 2007, Eghbalian stated that the risk of low birth weight in hookah smoker women was three times greater than that in non-smokers (16). Negahban in 2010 did not observe any relationship between maternal passive smoking and birth weight (10). The present study reported a significant relationship between hookah smoking and low 5-minute Apgar score.

Rachidi in 2013 stated that hookah smoking reduced neonatal Apgar scores (4). Negahban in 2010 stated that there was no significant relationship between maternal passive smoking and low neonatal Apgar score (10). Although near-birth events and fetal abnormalities account for the leading causes of decreased Apgar score, maternal tobacco consumption is another cause, as well.

During conducting this study, there have been other questions arising for the researcher, which require further studies. To this end, the researcher recommends the following studies for future research: a study of the relationship between hookah smoking and breastfeeding quality and a study of the relationship between hookah smoking and the growth of unweaned children.

Limitations of the Study

Cigarette and hookah smoking, especially in

women, is not easily accepted in our culture. Therefore, a number of participants might hide their smoking and were assigned to the control group. This issue would affect the result of the study, while it had been beyond the researcher's control. All the answers that the subjects provided to the questioners were considered correct, and there were not any criteria available to the researcher to assess their accuracy. Therefore, if the subjects had not properly remembered some information about hookah smoking, the consequent effects on the results would have been part of the research limitations.

In addition, although this study investigated the relationship between hookah smoking during pregnancy and the aforementioned complications, it neglected to investigate the results of hookah smoking before pregnancy. The strength of this study was the investigation of the effects of hookah smoking on pregnant women and its complications during pregnancy for the first time in Iran.

Conclusion

Based on the findings of this study, a significant relationship was reported between hookah smoking during pregnancy and the occurrence of preeclampsia, preterm labor, placental abruption, low birth weights, and low 5-minute Apgar score. There was a significant relationship between hookah smoking rate and the incidence of the above-mentioned complications.

This health problem requires strategies to identify its associated factors, and if investigated sufficiently, maybe we can correct or eliminate the incidence of tobacco consumption complications in women and neonates. The present study can be used as a glimmer of hope to identify complications associated with hookah smoking in Iran. By the help of the obtained results, health consultants can guide and encourage their clients to avoid tobacco consumption, and in particular, they can point out the risk factors to susceptible people during periodic examinations.

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Conflicts of interest

The authors declare no conflicts of interest.

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