

# Exposure to secondhand smoke in Iranian pregnant women at home and the related factors

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## ABSTRACT

**INTRODUCTION** Fetus health is of high importance in pregnant women and exposure to secondhand smoke (SHS) endangers maternal and fetal health. Therefore, in this study we examined the prevalence of exposure to SHS in pregnant women at home and the related factors.

**METHODS** This cross-sectional study was conducted with 255 pregnant women who were referred to the Isfahan health care center from July to September 2018. A questionnaire that was designed by the research team was applied to collect data about the participants' prevalence of exposure, attitude-emotional dimension, perceived susceptibility, perceived severity, and perceived barriers. The questionnaire used was self-administered. The validity and reliability of the questionnaire were confirmed by a panel of experts. Cronbach's alpha of attitude-emotional dimension, perceived susceptibility, perceived severity, and perceived barriers were also calculated as 0.81, 0.91, 0.92, and 0.89, respectively. Statistically significant differences were examined using chi-squared test and Mann-Whitney test.

**RESULTS** We found that the prevalence of exposure to SHS in pregnant women was 23.1%. The age of the husband ( $p=0.041$ ), education level of the smoking husband ( $p=0.005$ ), the education level of the pregnant woman ( $p=0.002$ ), employment status of husband ( $p=0.010$ ), and whether the pregnancy was planned ( $p=0.010$ ) had significant association with the participant prevalence of exposure to SHS. Thus, older age of husbands, lower education levels of husbands and wives, unwanted pregnancies, and unemployment of husbands resulted in higher exposure to SHS. The mean scores of knowledge and perceptions were lower in women exposed to smoke than in non-exposed women ( $p<0.05$ ).

**CONCLUSIONS** The rate of SHS exposure was high in pregnant women. The knowledge and perception scores of exposed women to SHS were lower than those of non-exposed women. Low levels of education of husbands and women, unemployment and higher age of husbands, and unwanted pregnancies were considered as health risk factors. Therefore, effective training programs should be designed to educate pregnant women and their husbands.

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## INTRODUCTION

Habits of smoking are frequently observed among various social groups with the rates of men smoking

in developing and developed countries being 50% and 35%, respectively<sup>1</sup>. Non-smokers are exposed to health hazards by breathing the SHS from smokers<sup>2,3</sup>.

Exposure to smoke includes breathing smoke emanating from burning cigarettes and indirectly from exhaled smoke<sup>4,5</sup>. The exposure to SHS causes several severe complications in pregnant women such as preterm labor<sup>6-10</sup>, rupture of membranes<sup>11</sup>, increased probability of a cesarean operation<sup>7</sup>, decreased growth of fetus, delayed intrauterine growth<sup>1,6,10</sup>, low birth weight of fetus<sup>6,8-10</sup>, distressed fetus<sup>8,9</sup>, small embryo for the gestational age<sup>7</sup>, sudden infant-death syndrome<sup>6,10</sup>, and increased level of cotinine in follicular fluid<sup>12</sup>. Although the prevalence of female smokers is low in Middle-East countries, especially Iran, the high prevalence of smoking among men puts women at risk of SHS harms<sup>13</sup>. A study reported that more than half (56.2%) of Iranian women were exposed to SHS during pregnancy<sup>14</sup>. The risk factors of SHS exposure for the pregnant women included poverty and illiteracy<sup>15</sup>, low level of education and unemployment<sup>7</sup>, inability of women to ask their husbands to quit smoking<sup>16</sup>, and existence of smokers in the family. Other factors examined include the belief of pregnant women that secondhand smoke harms the fetus<sup>14</sup>, lack of smoking laws at home<sup>17</sup>, lack of knowledge about smoking complications and dangers to family members<sup>18</sup>, perceived intensity and sensitivity of male smokers<sup>19</sup>, and finally male smokers not being informed about the negative effects of smoke on the fetus<sup>20</sup>. The WHO recommended that health care providers inform all the pregnant women about the complications of SHS exposure and strategies to avoid SHS<sup>21</sup>. In some countries of the developing world, women spent most of their time at home, so the main source of SHS is their husbands smoking<sup>22</sup>. Although the health training programs conducted for the pregnant women suggest that they avoid smoking and SHS, it remains a problem for Iranian pregnant women. Exposure to SHS is a significantly dangerous problem for the women in Middle-East countries and women in such communities are faced with various barriers to protecting their health and well-being<sup>23</sup>. The statistics showed higher rates of SHS exposure at home in countries with low and middle income<sup>24</sup>. Therefore, it is essential to encourage pregnant women to pursue preventative strategies<sup>23</sup>. In this regard, some studies investigated the decrease in SHS exposure on the basis of the Health Belief Model by changing the participants' health beliefs<sup>8,23</sup>. The Health Belief Model is based on behavioral patterns

and includes individuals' vulnerability to diseases, effects of diseases on a person's life, as well as the effect of health performances in decreasing intensity and sensitivity<sup>25</sup>. Determination of the related factors and inequalities in SHS exposure can help to identify opportunities to reduce the inadequacies of health programs. The results of this study can help authorities to design and implement future educational interventions. Regarding the lack of studies on SHS exposure in Iran, we studied pregnant women's prevalence of exposure to SHS at home and the related factors.

## METHODS

### Study design and population

In this cross-sectional study, we selected 255 pregnant women who were referred to the Isfahan health centers from July to September 2018. The random sampling was conducted using the participant national codes registered in the electronic system of health centers by considering the maximum variation. Sample size was calculated according to a similar study<sup>14</sup> using the statistical indicators, 95% confidence interval, (the SHS prevalence in pregnant women) P=60%, and Standard Error 6%. The inclusion criterion was that all married and pregnant women in all age groups are eligible for selection. The exclusion criteria included participants' unwillingness to participate in the research, active smoker women, presence of other sources of exposure such as other smokers at home, smokers at work, and women's active smoking, etc. The participants were first assured about the confidentiality of the information, oral consents were then obtained from them before the questionnaires were distributed to them. After the goals of the study were explained, individuals were asked to complete the questionnaire if they had the willingness and gave informed consent to participate in the study. Thus, only those who gave informed consent completed the questionnaire.

### Measures

In order to collect the required information, we used a questionnaire that was designed by the research team, based on the Health Belief Model. The questionnaire used was self-administered.

The first section of the questionnaire included the participants' sociodemographic information:

their age and husband's age, number of children, occupation and that of their husband, the family economic status, the gravid, gestational age, and type of pregnancy (wanted or unwanted).

The second section of the questionnaire was about the prevalence of exposure and included questions about the number of cigarettes smoked by the participant's husband per day, the number of cigarettes that the participant was exposed to and the duration of exposure per day. It also asked about the reaction of the participant's husband to her request about quitting smoking.

The third section of the questionnaire was about related factors affecting the prevalence of exposure, namely the participants' awareness and attitude towards SHS. In this section, 15 items were designed to investigate the women's knowledge about the complications of SHS on pregnancy and the fetus. Women needed to answer the questions using one of the available responses: 'Yes', 'No', and 'I do not know'. The attainable score in this part ranged from zero to 15; one point was given for the 'Yes' answer, whereas, the other response options got zero. Answers to questions 3 and 15 were scored reversely. Some examples of the questions asked in this part of the questionnaire include: 'What are some complications of exposure to SHS during pregnancy?' with some options being 'preterm labor' (item 1), 'higher probability of cesarean operation' (item 4), 'high-risk pregnancy' (item 5), etc. Another item was: 'What are the effects of SHS exposure for the fetus?' with possible answers being 'neonatal premature' (item 7), 'low birth weight' (item 9), 'decreased growth' (item 13), 'probability of stillbirth' (item 14), etc.

The attitude section included the emotional dimension (4 questions), perceived susceptibility (10 questions), perceived severity (10 questions), and perceived environmental and personal barriers (12 questions). The items of these sections were answered on a 5-point Likert scale using the options: 'Completely disagree' (1), 'Disagree' (2), 'No idea' (3), 'Agree' (4), and 'Completely agree' (5).

The attitude-emotional dimension questions consisted of 4 questions with a score range of 4–20. The examples of questions in this section were: 'I prefer a place without the smoke of cigarettes', 'I do not like spending pregnancy in a smoke-filled

environment', etc.

The perceived susceptibility section included 10 questions with a score range of 10–50. Examples of items in this section were statements such as: the pregnant women experienced preterm labor because they were exposed to smoke, the fetus showed low growth because of the mother's exposure to smoke, etc.

The perceived severity included 10 questions with a score range of 10–50. Examples of items in this section were statements such as: preterm labor has happened in many cases due to the exposure to smoke and the danger of low birth weight of the fetus is caused by smoke exposure, etc.

Moreover, the perceived environmental and personal barriers included 12 questions with a score range of 12–60. Examples of items in this part included the low level of education of husbands resulting in higher levels of smoking near their pregnant women and smoking husbands do not have free space to smoke, etc.

The content and visual validity of the questionnaire was measured using Content Validity Ratio, CVR=0.49, Content Validity Index, CVI=0.79, and the comments received from the panel of experts. The panel of experts included eight professionals from health education, one expert from the health promotion sector, five professionals from reproductive health and one expert from psychology. The validity of the questionnaire was confirmed considering the values CVR=0.6 and CVI=0.81. The reliability of the tool was also calculated based on the internal consistency. Cronbach's alpha for 'Attitude emotional dimension', 'Perceived Susceptibility', 'Perceived Severity', and 'Perceived Barriers' was 0.81, 0.91, 0.92, and 0.89, respectively.

## Statistical analysis

The data were analyzed using SPSS 18 and descriptive statistics were used to summarize and organize the data. Sociodemographic variables related to SHS were compared using chi-squared and Fischer non-parametric tests. The Mann-Whitney U test was used to compare mean scores of knowledge, attitude emotional dimension, perceived susceptibility, perceived severity and perceived barriers. The level of significance was set, a priori, at 0.05, as the data did not have a normal distribution.

## Ethical approval

This study is part of a PhD dissertation in Health Education with ethical code IR.SSU.SPH.REC.1396.133. All the data were confidential and the results were presented for participants while oral consent was obtained from all participants.

## RESULTS

Sociodemographic information is presented in Table 1. A total of 255 pregnant women were investigated with a mean age of  $29.63 \pm 7.87$  years. The mean age of the participants' husbands was  $33.40 \pm 5.14$  years. The results showed that of the 255 studied participants, 180 (70.6%) husbands did not smoke, 59 (23.1%) smoked, while 16 (6.3%) of the husbands smoked but their wives were not exposed to SHS as

**Table 1.** The frequency distributions of the sociodemographic variables

VARIABLES		n (%)	Mean $\pm$ SD
Age (years) of woman	$\leq 30$	138 (54.1)	$29.63 \pm 4.78$
	$>30$	117 (45.9)	
Age (years) of husband	$\leq 35$	169 (66.3)	$33.40 \pm 5.14$
	$>35$	86 (33.7)	
Number of children	0	141 (53.3)	-
	1	78 (30.6)	
	$\geq 2$	36 (14.1)	
Education of woman	Reading and writing	47 (18.4)	-
	High school diploma	109 (42.7)	
	Bachelor degree and higher	99 (38.8)	
Education of husband	Reading and writing	63 (24.7)	-
	High school diploma	123 (48.2)	
	Bachelor degree and higher	69 (27.1)	
Occupation of woman	Housewife	219 (58.9)	-
	Employed	36 (14.1)	
Occupation of husband	Government employed	52 (20.4)	-
	Self-employed	140 (54.9)	
	Laborer	58 (22.7)	
	Jobless	5 (2)	
Income level	Poor	22 (8.6)	-
	Moderate	209 (82)	
	Good	24 (9.4)	
Pregnancy	Planned pregnancy	214 (83.9)	-
	Unplanned pregnancy	41 (16.1)	
Gravid	1	147 (57.6)	-
	$\geq 2$	108 (42.4)	
Month of pregnancy	First trimester	48 (18.8)	-
	Second trimester	117 (45.9)	
	Third trimester	90 (35.3)	

SD: standard deviation

the husband never smoked at home or near the wife in order to protect her health and that of the child.

About 54.7% of husbands smoked 2–5 cigarettes per day and about 48% of pregnant women were exposed to 2–5 cigarettes per day. However, most women were exposed to SHS for less than one hour per day. Considering the results of Table 2, the majority of women selected the options 'He goes to another place' and 'He puts out the cigarette' in responding to the question regarding the husband's reaction after being asked to quit smoking.

The age of husbands ( $p=0.041$ ), the education level of husbands ( $p=0.005$ ) and the education level of pregnant women ( $p=0.002$ ), the employment status of husbands ( $p=0.010$ ), and the type of pregnancy ( $p=0.010$ ) had a significant association with the proportion exposed. The older age of husbands, lower education level of husbands and women, unwanted pregnancy, and unemployment of husbands, resulted in increased exposure to smoke. No significant difference was observed in sociodemographic characteristics of the participants ( $p>0.05$ ). The proportion of exposure was also higher among unemployed women of younger age, more than two children, and weak economic situation (Table 3).

**Table 2.** The frequency distributions of the responses to questions about the exposure to cigarette smoke

RESPONSES		n (%)	Mean $\pm$ SD
Number of cigarettes consumed by husband per day	1	10 (13.3)	
	2–5	41 (54.7)	$5.12 \pm 4.26$
	6–10	19 (25.3)	1–20 cigarettes
	$>10$	5 (6.7)	
The number of cigarettes exposed to their smoke per day	0	16 (21.3)	
	1	12 (16)	$3.29 \pm 3.91$
	2–5	36 (48)	0–20 cigarettes
	6–10	9 (12)	
	$>10$	2 (2.7)	
Hours of exposure to cigarette smoke per day	$\leq 1$	34 (45.3)	
	1–2	21 (28)	
	$>2$	4 (5.3)	-
Not exposed		16 (21.3)	
Husband's reaction to your request to quit smoking?	Put out the cigarette	24 (32)	
	Opened the window	7 (9.3)	
	Went to another place	25 (33.3)	
	Requested that I go to another place	6 (8)	
	Indifference	13 (17.3)	

**Table 3.** The comparison of sociodemographic variables based on exposure of pregnant women to cigarette smoke

VARIABLES		Exposed	Not exposed	Total	P
		n (%)	n (%)	n (%)	
Age (years) of woman	≤30	32 (23.2)	106 (76.8)	138 (100)	0.552
	>30	27 (23.1)	90 (76.9)	117 (100)	
Age (years) of husband	≤35	33 (19.5)	136 (80.5)	169 (100)	0.041**
	>35	26 (30.2)	60 (69.8)	86 (100)	
Education of woman	Reading and writing	17 (36.2)	30 (63.8)	47 (100)	0.005*
	High school diploma	29 (26.6)	80 (73.4)	109 (100)	
	Bachelor degree and higher	13 (13.1)	86 (86.9)	99 (100)	
Education of husband	Reading and writing	24 (38.1)	39 (61.9)	63 (100)	0.002*
	High school diploma	26 (21.1)	97 (78.9)	123 (100)	
	Bachelor degree and higher	9 (13)	60 (87)	69 (100)	
Occupation of husband	Government employed	4 (7.7)	48 (92.3)	52 (100)	0.010*
	Self-employed	36 (25.7)	104 (74.3)	140 (100)	
	Laborer and unemployed	19 (30.2)	44 (69.8)	63 (100)	
Occupation of woman	Housewife	52 (23.7)	167 (76.3)	219 (100)	0.371
	Employed	7 (19.4)	29 (80.6)	36 (100)	
Pregnancy	Planned pregnancy	43 (20.1)	171 (79.9)	214 (100)	0.010**
	Unplanned pregnancy	16 (39)	25 (61)	41 (100)	
Number of children	0	31 (22)	110 (78)	141 (100)	0.523
	1	17 (21.8)	61 (78.2)	78 (100)	
	≥2	11 (30.6)	25 (69.4)	36 (100)	
Income level	Poor	9 (40.9)	13 (59.1)	22 (100)	0.099
	Moderate	46 (22)	163 (78)	209 (100)	
	Good	4 (16.7)	20 (83.3)	24 (100)	

\* Chi-squared test. \*\* Fisher's exact test.

**Table 4.** The comparison of mean score of structures based on exposure of pregnant women to cigarette smoke

STRUCTURES	Exposed	Mean ± SD	P
Knowledge	Yes	7.62 ± 4.53	0.049*
	No	8.89 ± 4.04	
Attitude-emotional dimension	Yes	15.52 ± 3.95	0.000*
	No	17.78 ± 2.84	
Perceived susceptibility	Yes	35.66 ± 5.15	0.000*
	No	38.58 ± 6.09	
Perceived severity	Yes	34.37 ± 6.20	0.000*
	No	37.96 ± 7.14	
Perceived barriers	Yes	41.94 ± 8.03	0.449
	No	42.11 ± 8.38	

\* Mann-Whitney test

The mean scores of knowledge ( $p=0.049$ ), attitude-emotional dimension ( $p=0.000$ ), perceived susceptibility ( $p=0.000$ ), and perceived severity ( $p=0.000$ ) were significantly different between the exposed and non-exposed participants; the mean scores of knowledge, attitude-emotional dimension, perceived susceptibility, and perceived severity, were

lower in the exposed group. However, the mean scores of the perceived barrier were not significantly different between the two studied groups ( $p=0.449$ ) (Table 4).

## DISCUSSION

Evaluation of the exposure to cigarette smoke and its avoidance strategies is a crucial part of the pregnancy care programs<sup>9</sup>. To the best of our knowledge, this study was the first conducted in Iran to determine the prevalence of exposure to SHS in pregnant women and the related factors. The findings of this study on the risk factors of SHS exposure and the controversies of this area can help authorities to identify opportunities for reducing the existing inequalities. They are also recommended to conduct educational interventions in order to improve the knowledge of pregnant women and their families of the harms of SHS.

In our study, we found that 23.1% of pregnant women were exposed to SHS from their husband's cigarettes, which is a relatively low rate in comparison with the level of exposure of Iranian pregnant women to secondhand smoke (56%)

according to the results of the study conducted by Baheiraei et al.<sup>14</sup>. However, this rate is higher or similar to the prevalence of exposure of other countries. A review study suggested that the rate of SHS exposure at home ranged from 17–73 per cent in different countries<sup>17</sup>. According to the results of the studies conducted by Goel et al.<sup>9</sup> in India, Alghamdi et al.<sup>7</sup>, Wahabi et al.<sup>26</sup> in Saudi Arabia, and Aurrekoetxea et al.<sup>27</sup> in Spain, a total of 24, 24, 37 and 24.7 per cent of the pregnant women were exposed to smoke, respectively. The husband's amount of smoking was reported as the main predictive factor for the SHS prevalence of exposure of pregnant women at home<sup>22</sup>. Sarraf-Zadegan et al.<sup>13</sup> studied the smoking rate of men in Isfahan in Iran (18.7%) and reported that it was lower than national rates. Considering the above study and the low level of smoking in men in the region of the study compared to the national level, the lower exposure of pregnant women to secondhand smoke from the husband's cigarettes can, therefore, be justified in this study. Although most women were concerned about the unfavorable effects of cigarettes on their family members, they preferred to keep the smoker husbands in the house. They believed that the physical presence of husbands with the family and in the home was necessary<sup>28</sup>. These beliefs, arising from cultural and social backgrounds, created the situation for the family member's higher SHS exposure.

The most likely number of daily cigarettes to which the pregnant women were exposed was about 2–5 for less than one hour. Alghamdi et al.<sup>7</sup> in Saudi Arabia reported that the exposure time to smoke was less than one hour for most of the women. Loke et al.<sup>22</sup> reported that the women living with smoking husbands were exposed to cigarette smoke for about 4.2 hours per day. The rate of cigarette smoking in men per day is directly correlated with their level of dependency<sup>29</sup>. Therefore, the dependency of husbands results in a high prevalence of exposure of pregnant women to smoke. Patriarchy and inability of women to go against their husband's smoking habit were reported as factors by Mao et al.<sup>30</sup>. However, in the current study, the positive response of husbands in avoiding smoking or leaving the shared environment demonstrated their concern about the health of the wife and child. The pregnancy of women can provide a good opportunity

for the husbands to quit smoking or reduce it.

The pregnant woman's age had no significant association with the prevalence of exposure whereas the husband's age had a significant association. The prevalence of exposure was higher in women living with older husbands. However, Alghamdi et al.<sup>7</sup> in Saudi Arabia and Lee et al.<sup>31</sup> in China found a significant relationship between the age of pregnant women and the prevalence of exposure to SHS. Moreover, Aurrekoetxea et al.<sup>27</sup> in Spain indicated that young women had a high level of prevalence of exposure to SHS. Quitting smoking was found to be difficult when the rate of smoking increased with age<sup>32</sup> and when men were more depended on the smoking<sup>29</sup>.

The education levels of pregnant women and their husbands were significantly related to the prevalence of exposure; exposure increased with lower education level. Alghamdi et al.<sup>7</sup> and Wahabi et al.<sup>26</sup> in Saudi Arabia, Aurrekoetxea et al.<sup>27</sup> in Spain, Lee et al.<sup>31</sup> in China, Kelly et al.<sup>15</sup> in India, and Nazar et al.<sup>24</sup> in 15 countries with low and middle income, indicated lower education level was a predictor of high prevalence of exposure. Moreover, there was a direct and significant relationship between weak awareness of the harms of exposure to SHS and low-level education, as well as unemployment or low-income jobs<sup>33</sup>, a factor that increased the possibility of being home and making the pregnant woman more susceptible to SHS exposure.

Although the employment status of women did not show any significant relationship with the prevalence of exposure in the present study, we found that housewives had a higher prevalence of exposure than the employed women. The women with unemployed husbands reported higher prevalence of exposure. The studies of Alghamdi et al.<sup>7</sup> and Wahabi et al.<sup>26</sup> in Saudi Arabia confirm the above findings. Jobless and laborer husbands (because of unknown employment condition) increased the possibility of being home with their housewives, resulting in higher exposure to SHS.

Unwanted or wanted pregnancy also had a significant association with SHS prevalence of exposure; the women who experienced unwanted pregnancies had higher exposure. The association of unwanted pregnancy with low education level and social factors has been shown<sup>34</sup>; hence, an unwanted pregnancy can be considered a predictor of higher

prevalence of exposure to SHS requiring special care for the child.

We observed no relationship between the number of children and the prevalence of exposure to SHS; however, the prevalence of exposure in women who had more than two children was higher than in women with fewer children. Wahabi et al.<sup>26</sup> in Saudi Arabia and Aurrekoetxea et al.<sup>27</sup> in Spain indicated that women with fewer pregnancies had a lower prevalence of exposure. The results of these studies are aligned with our current (non-significant) patterns. The relationship between low education level and the number of children was also confirmed<sup>35</sup>, which can justify the higher prevalence of exposure of women with more than two children.

In addition, we found that the economic condition had no significant relationship with the prevalence of exposure; however, the women who had weaker economic conditions reported higher prevalence of exposure. Kelly et al.<sup>15</sup> indicated that poverty was a risk factor for SHS exposure for women and children<sup>15</sup>. Alghamdi et al.<sup>7</sup> in Saudi Arabia and Aurrekoetxea et al.<sup>27</sup> in Spain showed that the families of lower social class experienced higher exposure to SHS. Yang et al.<sup>36</sup> studied rural women in China and found that despite the existence of a smoking prohibition law for homes, they were exposed to smoke. Considering the proved relationship between low levels of education and awareness<sup>15</sup>, education level can be considered as a predictor of SHS exposure rate.

In this regard, we found that the mean score of knowledge was lower in pregnant women exposed to SHS than for the non-exposed group. Passey et al.<sup>37</sup> indicated that lack of knowledge and awareness acted as a barrier to avoiding SHS exposure. Having knowledge about the hazards of SHS motivated them to change their situation and improve their health. Yang et al.<sup>36</sup> carried out a study in China and reported that rural women, who were not provided with enough knowledge about SHS had high rates of exposure. In another study, the lack of knowledge about SHS exposure complications on family members and fetus was considered as an important risk factor for the prevalence of exposure<sup>18-20</sup>.

Vivilaki et al.<sup>38</sup> in Greece indicated that awareness about the health problem for the fetus and attitude to smoke during pregnancy were the main factors in

pregnant smoker women. Bahiraii et al.<sup>14</sup> reported that presence of a smoking individual and false beliefs of pregnant women about the effects of smoke on the health of the fetus could be important elements to consider in order to improve the prevalence of exposure. Kazemi et al.<sup>23</sup> in Isfahan reported that the training supposed to be effective in increasing the health beliefs and decreasing the prevalence of exposure seem inadequate to avoid smoke at home.

From the findings of the present study, it is clear that we need to increase the knowledge of pregnant women about the effects of SHS during pregnancy. The health care providers are also recommended to follow this idea seriously. The lack of proper strategies to decrease the prevalence of exposure indicate weak knowledge. However, several strategies have been recommended to have a smoke-free home: ask the smoking people to smoke in another room, outdoors or near an open window; use a ventilator; and keep a distance from the smokers<sup>37</sup>.

### Limitations

One limitation of this study was the self-reporting method of data collection; this method is affected by memory deficiencies. We suggest other researchers conduct studies using the cotinine index to confirm the results. Another limitation of this study was that we only measured the husbands' smoking status and did not investigate other sources of exposure, such as presence of other smokers in the home, smokers at work, and women's active smoking. The other limitation was the low participation rate and avoidance of women in talking about the smoking habits of their husbands. In our investigations throughout the participants' profiles available at the health care centers, we found many blank spaces in response to the questions about the smoking status of husbands in the family, which was considered as another limitation. This deficiency should be considered while updating the profiles in the health care centers. Despite the limitations, our findings are valuable.

### CONCLUSIONS

This study reported that 23.1 per cent of pregnant women were exposed to SHS at home from their husbands' smoking. Furthermore, the knowledge and attitude scores of women about smoking were low and

showed an unfavorable condition. Unemployment and older age of husbands, low levels of education, and unwanted pregnancies were considered as risk factors for the women's higher prevalence of exposure. Therefore, we recommend that health care providers plan and implement educational training programs regarding these risk factors for the pregnant women and their husbands. Training programs provided should increase the women's awareness, change their attitudes, increase their ability to protect themselves and their child against smoke, and help them to have a smoke-free home.

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The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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