

# The Effect of Couple's Motivational Interviewing on Exposure to Secondhand Smoke Among Pregnant Women at Home

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Received December 2021; Revised and accepted April 2022

## Abstract

**Objective:** Secondhand smoke (SHS) during pregnancy is associated with many maternal-fetal complications. Iran has a high male smoking prevalence rate. This study aimed to determine the effect of motivational interviewing with couples on exposure to SHS at home in pregnant women referring to health centers in Urmia in 2019.

**Materials and methods:** A randomized control trial was performed on 112 non-smoking pregnant women with smoking husbands, randomly allocated into two groups (each with 56 members). The participants were asked to specify the daily average times and duration of exposure during the last week. Five motivational interviewing sessions were held for the members of the intervention group. Each session lasted 90 minutes and two sessions were held per week. The data were collected before and four weeks after the intervention. The data were analyzed using the repeated-measures analysis of variance (ANOVA) by SPSS-20 at a significance level of 0.05.

**Results:** Of 112 couples who were randomized, 102 (91.07%) completed the trial. There was a significant reduction in terms of the daily frequency and duration of SHS exposure of the husband one week and one month after the intervention in the intervention group. The daily frequency and duration of SHS exposure of people other than the spouse at home did not decrease over time.

**Conclusion:** Following the results of the study, the couple-based motivational interviewing approach can be used to reduce SHS exposure in women at home.

**Keywords:** Secondhand Smoke; Counseling; Motivation; Pregnancy

## Introduction

Secondhand smoke (SHS), for which there is no risk-

free level of exposure, causes some diseases and complications in nonsmokers (1). SHS contains more than 4,000 chemicals, at least 250 of which are toxic and may cause respiratory and cardiac problems, disability, and premature death (2). Exposure to SHS

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during pregnancy has been associated with many complications on the mother, fetus, and infant, including restricted fetal growth and miscarriage (3), stillbirth (4), preterm delivery (5, 6) rupture of membranes (7), increased risk of cesarean section (5), fetal distress (7, 8), sudden infant death syndrome (9), increased levels of cotinine in follicular fluid (10), and low birth weight (11, 12). In addition, attention deficit hyperactivity disorder (ADHD) may increase asthma and cancer in children (13). According to the WHO, 41.7% of people at home and 50.6% of people in public places in Iran are exposed to secondhand smoke (14). In one study, more than half of Iranian women reported exposure to secondhand smoke during pregnancy (15). Although during prenatal care, pregnant women are advised to avoid ETS exposure, SHS exposure is still a health problem for this group of women in Iran. In several studies, interventions were performed to reduce exposure to secondhand smoke in non-smoking pregnant women but these studies did not consider the role of men. Important factors in exposure to secondhand smoke for pregnant women include the inability of women to ask their husbands to quit smoking (16) and the low perceived severity and sensitivity in male smokers about the negative effect of secondhand smoke on the fetus (17).

Implementing effective interventions for non-smoking pregnant women who are exposed passively to second-hand smoke is important as a turning point in achieving a smoking-free home and workplace, and changing social attitudes toward smoking (18). According to the available evidence, traditional and short-term programs are initially associated with small positive changes, but if participants are not motivated, these changes will disappear quickly, and even traditional interventions in people who have no motivation to change may lead to resistance to change (3). To this end, motivational interviewing has been considered as an individual guidance and counseling approach to changing behavior by helping the client to investigate and resolve internal conflicts (19).

Motivational interviewing follows the principles of client-centered therapy that incorporate elements of empathetic and supportive counseling, along with continuous interpersonal interaction. The basis of this method is motivation from within the clients (20). Pregnant women are exposed to the highest dose of second-hand smoke at home (21). This study was conducted as a randomized controlled trial to assess the effect of couples' motivational counseling on

behavior change in pregnant women exposed to secondhand smoking at home.

## Materials and methods

This study was conducted as a randomized controlled clinical trial with a pretest-posttest design and a control group. At first, a pretest was administered to the members of both groups, and the participants in the intervention group attended the intervention program. Then, a posttest was administered to the participants in both groups after the intervention. This study was approved by the Ethics Committee of Urmia University of Medical Sciences, Urmia, Iran with ethical code IR.UMSU.REC.1398.083.

The study population consisted of pregnant women and their husbands who referred to comprehensive health centers in Urmia in 2019. Using the formula for determining the sample size for empirical studies, the sample size in this study was calculated as follows:

$$\frac{(Z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2(s_1^2 + s_2^2)}{(\mu_1 - \mu_2)^2}$$

According to the formula and following a similar study (Kazemi et al., 2011), considering the power of 95% and 95% confidence, the sample size was estimated as 46 couples (22). Considering the possible dropout rate of 12%, 56 persons were selected as the participants in each group.

The inclusion criteria were: 1) A pregnant woman who had never smoked before, 2) The pregnant woman's husband was a smoker and they lived together during her pregnancy, 3) Signing a written consent by the couples if they were willing to participate in the study, 4) women with 12 weeks of gestation or less based on last menstrual period, and 5) Having ETS exposure from at least six cigarettes per week or more within 2 months before or since pregnancy. The criteria for exclusion were the termination of pregnancy at the time of the study, using illicit substances, suffering from mental disorders, and lack of interest in continuing cooperation.

The data were collected using a questionnaire developed based on a review of the previous studies in the literature (22). The first section of the questionnaire assessed the participants' socio-demographic information including the wife's and husband's age, their number of children, the wife's and husband's occupation, the family economic status, the

number of rooms in the house, the number of smokers at home, history of abortion, home ownership status, and free space at home. The second section of the questionnaire assessed self-reported SHS exposure behavior at home using four items that measured the daily average number of times and duration of exposure to second-hand cigarette smoke (by the spouse and non-spouse) in the last week per minute. Bani Hosseini et al. (2014) confirmed the validity and reliability of a self-report checklist for exposure to cigarette smoke (23). The face and content validity indicators of the instrument were assessed qualitatively. The questionnaire was given to ten experts in the School of Nursing and Midwifery of Urmia University of Medical Sciences to review it and provide their comments. They were also asked to assess the items in terms of grammar including word choice, clarity, simplicity, and comprehensibility of the words and phrases. To determine the reliability of the questionnaire, external consistency (test-retest) and internal consistency (Cronbach's alpha) were used. To assess the external consistency, the checklist was completed twice within 2 weeks by 30 pregnant women who were selected using convenience sampling. The correlation coefficients were calculated for all items. Moreover, Cronbach's alpha was calculated to measure the internal consistency of the instrument.

For data collection, 2 centers from each socio-economic level were selected randomly (6 centers in total). The list of all pregnant women was extracted from selected centers. Then, the selected women were invited to attend a briefing session with a phone call

made by the second author. In the briefing session, the pretest tool (including the demographic checklist and SHS exposure behavior) was filled out by all women after explaining the research goals and procedure. Then, all the women signed an informed consent form, and the participants were allocated into intervention and control groups randomly using the block randomization method with units of 6 blocks, and an allocation ratio of 1: 1.

In this study, the interviews were conducted with the participants in the intervention groups based on Miller's eight motivational interview approaches (24) in six 90 minute sessions twice a week. One week and one month after the last session, they completed the questionnaires. The participants in the control group received routine prenatal care.

**Analysis:** The collected data were analyzed using SPSS statistical software (version 20). The normality of the data was confirmed using the Shapiro-Wilk test. To compare the scores of the normal variables before the intervention between the two groups, independent samples t-test and chi-square test were used. In addition, the data were analyzed using the repeated-measures analysis of variance (ANOVA) at the significance level of  $P < 0.05$ .

## Results

A total of 102 couples (52 couples in the intervention group and 50 couples in the control group) completed the study (Figure 1). Tables 1 and 2 show the socio-demographic characteristics of the individuals in the two groups.

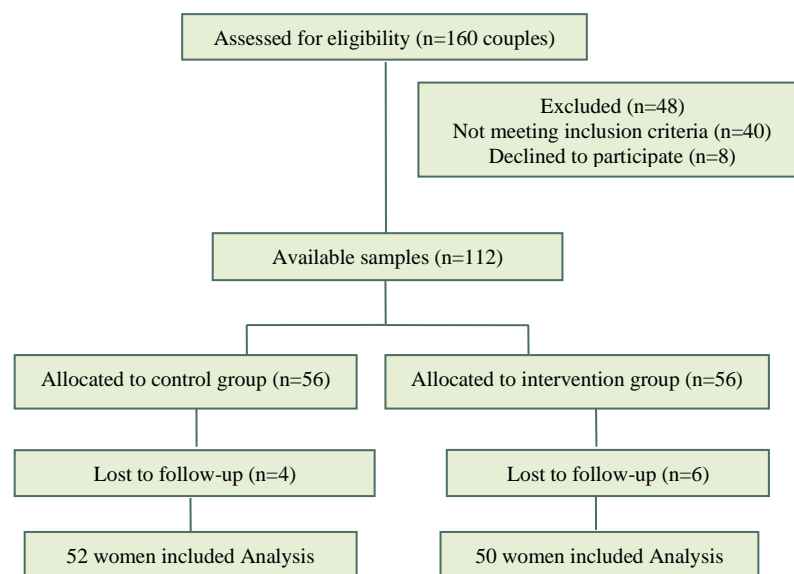


Figure 1: Study flow

**Table 1:** A comparison of qualitative demographic characteristics between the intervention and control groups

Variables	Intervention Frequency (%)	Control Frequency (%)	p*
Pregnant woman's level of education			
Primary school	18(32.1)	12(21.4)	X <sup>2</sup> = 3.68 df=3 P=0/29
Middle school	11(19.6)	17(30.4)	
Diploma	10(17.9)	14(25.0)	
University	17(30.4)	13(23.2)	
Level of man education			
Primary school	13(23.2)	8(14.3)	X <sup>2</sup> = 4.49 df=3 P=0/21
Middle school	17(30.4)	11(19.6)	
Diploma	13(23.2)	20(35.7)	
University	13(23.2)	17(30.4)	
Woman's employment			
Employed	7(12.5)	10(17.9)	X <sup>2</sup> = 0.62 df=1, P=0/43
Housewife	49(87.5)	46(82.1)	
Men's employment			
Unemployed	2(3.6)	1(1.8)	X <sup>2</sup> = 5.35 df=3 P=0/14
Worker	21(37.5)	11(19.6)	
Employee	11(19.6)	12(21.4)	
History of abortion			
Yes	20(35.7)	13(23.2)	X <sup>2</sup> = 2.10 df=1, P=0/14
No	36(64.3)	43(76.8)	
Home ownership status			
Personal	30(53.6)	24(42/9)	X <sup>2</sup> = 1.28 df=1, P=0/25
leased	26(46.4)	32(57.1)	
Income level			
Poor	28(50.0)	33(58.9)	X <sup>2</sup> = 2.78 df=2 P=0/24
Moderate	23(41.1)	15(26.8)	
Good	5(8.9)	8(14.3)	
Free space at home			
I don't have	8(14.5)	6(10.9)	X <sup>2</sup> = 5.25 df=3 P=0/15
Yard	30(54.5)	41(74.5)	
Balcony	10(18.2)	5(9.1)	
Backyard	7(12.7)	3(5.5)	
Number of rooms			
1	15(26.8)	23(41.1)	X <sup>2</sup> = 2.54 df=2 P=0.28
2	36(64.3)	29(51.8)	
2>	5(8.9)	4(7.1)	
Number of cigarette smokers at home			
1	34(60.7)	23(57/1)	X <sup>2</sup> = 0.98 df=2 P=0/61
2	17(30.4)	21(37/5)	
2>	5(8.9)	3(5.4)	
Number of children			
0	15(26.8)	20(35.7)	X <sup>2</sup> = 2.54 df=3 P=0/46
1	22(39.3)	18(32.1)	
2	15(26.8)	11(19.6)	
2>	4(7.1)	7(12.5)	

\*= Chi-squer test

To compare the research variables between the groups, the normal distribution of data was first checked using the Shapiro Wilk test. Following the results of repeated measures ANOVA, Mauchly's test of sphericity was performed for the dependent variable

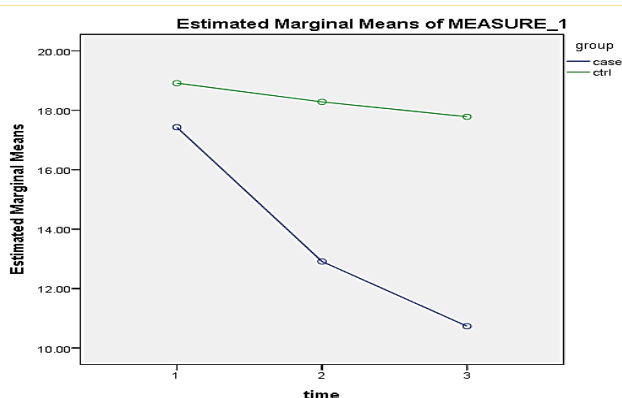
and the results indicated that the null hypothesis (H0) was rejected (P = 0.001) and the assumption of data sphericity was rejected. Since the ε value in this test was less than 0.75. The greenhouse-Geisser correction was used to analyze the test results.

**Table 2:** A comparison of quantitative demographic characteristics between the intervention and control groups

Variable	Intervention (mean±SD)	Control (mean±SD)	p*
Woman's age	6.49±28.46	27.98±7.60	t=0.36, df =110, P=0.71
Men's age	32.71±6.64	32.30±6.50	t=0.33, df =110, P=0.74

\*=t-test

Concerning the intergroup effects, the results ( $F = 41.834$ ;  $P < 0.0001$ ) indicated that there was a significant difference between the baseline data and the data on the number of daily exposure to the husband's cigarette smoke in the intervention group. Furthermore, the results for the intergroup effects ( $F = 21.551$ ;  $P < 0.0001$ ) indicated that there was a significant difference between the two groups in the frequency of daily exposure to the husband's cigarette smoke (Figure 2).

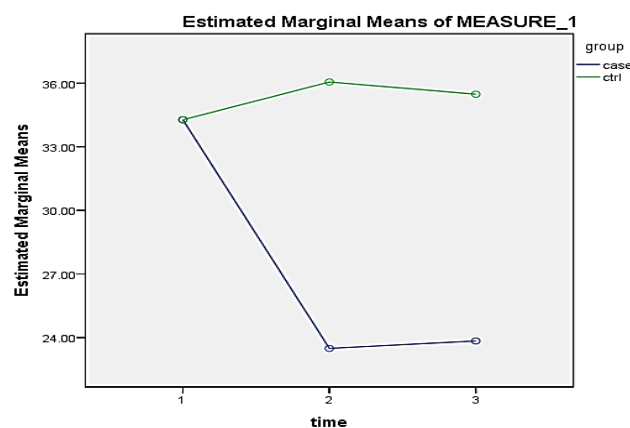


**Figure 2:** Frequency of daily exposure to the husband's cigarette smoke

Following the results of repeated measures ANOVA, Mauchly's test of sphericity was performed for the dependent variable and the results indicated that the null hypothesis ( $H_0$ ) was rejected ( $P = 0.001$ ) and the assumption of data sphericity was rejected. Since the  $\epsilon$  value in this test was less than 0.75. The

greenhouse-Geisser correction was used to analyze the test results. Concerning the intergroup effects, the results ( $F = 11.536$ ;  $P < 0.0001$ ) indicated that there was a significant difference between the baseline data and the data on the number of daily exposure to the husband's cigarette smoke in the intervention group. Furthermore, the results for the intergroup effects ( $F = 34.172$ ;  $P < 0.0001$ ) indicated that there was a significant difference between the two groups in the duration of daily exposure to the husband's cigarette smoke (Figure 3). All the detailed results are summarized in Table 3.

The results for the intergroup effects ( $F = 0.432$ ;  $P = 0.644$ ) showed no significant difference between the two groups in the frequency of daily exposure to the other people's cigarette smoke (Figure 4).

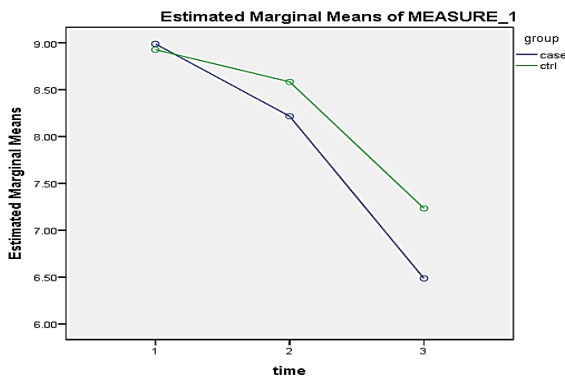


**Figure 3:** Duration of daily exposure to the husband's cigarette smoke

**Table 3:** A comparison of the frequency and duration of daily exposure to the husband's cigarette smoke between the control and intervention groups

Variable		Before intervention	One week after intervention	One month after intervention	p*
		mean±SD	mean±SD	mean±SD	
Frequency of daily exposure to the husband's cigarette smoke during the last week	Intervention	17.76± 10/12	12.74±8.56	10.28 ±7.30	P*= 0.018
	Control	18.42± 11.29	17.82± 11.25	17.40± 10.72	F= 5.798
Duration of daily exposure to the husband's cigarette smoke during the last week	Intervention	36.68±20.69	24.12± 12.91	33.62 ± 20.43	P* < 0.001
	Control	31/96± 19.12	34±22.24	33.86 ± 21.39	F=35.371

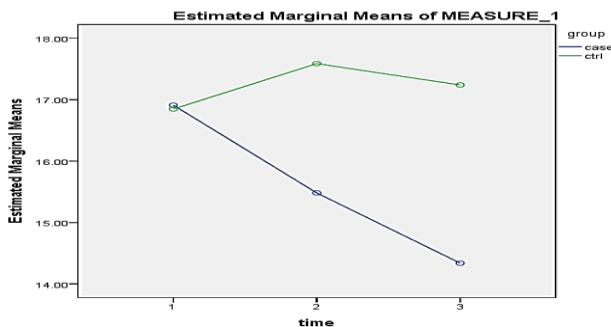
\*= Repeated measures ANOVA



Covariates appearing in the model are evaluated at the following values: moderate0 = 34.2745

**Figure 4:** Frequency of daily exposure to the other people's cigarette smoke

The results for the intergroup effects ( $F = 1.652$ ;  $P = 0.195$ ) showed no significant difference between the two groups in the duration of daily exposure to the other people's smoke (Figure 5). All the detailed results are summarized in Table 4.



**Figure 5:** Duration of daily exposure to the other people's cigarette smoke

## Discussion

The present study confirmed that motivational interviews could significantly reduce the exposure to secondhand smoke in the pregnant women in the intervention group compared to the control group. Similarly, Soltani et al. showed that family

counseling had a positive effect on decreasing the exposure to secondhand smoke at home among a sample of pregnant women (25).

Another study supported that educational interventions can lead to increased awareness of the harms of exposure to smoking and increased sensitivity of women to reduce exposure to SHS at home. It seems that behavioral change could be induced by the level of knowledge, attitude, self-efficacy, and practices of men. These results imply that if men are involved in educational programs, they can protect the woman's health during pregnancy (26). Furthermore, the participation of men in the health program organized for pregnant women can lead to social and behavioral changes and encourage them to take more responsibility for the health of mothers and children. Zhang et al. also reported that interventions changed spouses' smoking behavior and reduced pregnant women's exposure to secondhand smoke (27).

In contrast, a study comparing the effectiveness of face-to-face counseling and books and pamphlets based on the Health Belief Model in pregnant women exposed to secondhand smoke showed a slight change in the behavior of the members of both groups after the intervention and they were still exposed to cigarette smoke (28). The results of this study were not consistent with the findings of the present study. Perhaps the reason for this inconsistency was the difference in the procedures taken in these two studies because, in the above study, a 20-minute face-to-face counseling session was conducted for the participants. However, in the present study, five motivational counseling sessions were performed for the women and their husbands. It seems that men's participation has a positive influence on behavior change. In another study by Mohlman et al. (2013), the members of the intervention group were trained about the harms of second-hand smoke and ways to reduce its exposure.

**Table 4:** A comparison of the frequency and duration of daily exposure to the other people's smoke between the control and intervention groups

Variable		Before intervention	One week after intervention	One month after intervention	p*
		mean±SD	mean±SD	mean±SD	
Frequency of daily exposure to the other people's cigarette smoke during the last week	Intervention	8.78±3.67	8.72± 3.49	8.80± 3.82	P*= 0.434 F=0.511
	Control	8.94±3.10	8.90±3.68	8.88 ± 3.52	
Duration of daily exposure to the other people's cigarette smoke during the last week	Intervention	16.32±5.13	15.96±6.04	15.76± 5.29	P*= 0.016 F=5.970
	Control	16.78±5.33	17.03±4.63	17.01±6.69	

The participants in the intervention group showed an increased understanding of the risks associated with smoking and how to avoid second-hand smoke. However, the intervention did not affect smoking habits in smokers (29). This study was not consistent with the findings of the present study on reducing smoking. This discrepancy could be contributed to the samples under study. In the present study, pregnant women avoided secondhand smoke for fear of harming the fetus. Alemán et al. (2016) examined the effect of short-term counseling based on the 5As strategy on exposure to secondhand smoke at home and the workplace and the attitudes of non-smokers. The results of the study showed that the use of this strategy was not effective in reducing exposure to second-hand cigarette smoke at home and the workplace (30). The reason for the discrepancy in results was that in the present study, both couples were involved, while in the study conducted by Aliman et al. (2016), only women were involved. Thus, the involvement of spouses and other family members may have a significant effect on reducing exposure to secondhand smoke. As men are typically less likely to cooperate to participate in meetings due to employment, meetings were held for them in certain centers (30).

More research is needed to identify ways to tailor interventions to directly impact pregnant women's SHS exposure and to engage more families to make behavioral changes.

An important limitation was that the participants in this study were selected only from public health centers from Urmia, and this may restrict the transferability of the findings. Furthermore, the use of a self-report instrument could lead to bias in the data and thus might have not reflected women's actual practice.

## Conclusion

The findings of this study indicated that motivational interviewing with couples can reduce SHS exposure in pregnant women. Accordingly, midwives are recommended to provide motivational interviewing to couples with smoker men during pregnancy. The results of this study can motivate further research on accurate methods for follow-up, and engage other family members in inducing behavioral changes. Furthermore, some policy reforms are needed to provide incentives and financial resources for implementing intervention programs to improve mothers' and children's health and protect them

against secondhand smoke and its consequences.

## Conflict of Interests

Authors have no conflict of interests.

## Acknowledgments

The authors would like to appreciate all the participants in this study. There is no conflict of interest in this study.

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**Citation:** Bayrami R, Ebrahimi S, Rasouli J, Feizipour H. **The Effect of Couple's Motivational Interviewing on Exposure to Secondhand Smoke Among Pregnant Women at Home.** *J Family Reprod Health* 2022; 16(2): 139-46.