Does environmental cigarette smoke affect breastfeeding behavior?

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Abstract

BACKGROUND: Exposure of lactating women to environmental cigarette smoke may increase cotinine in breast milk, which in turn may reduce the volume of milk and the duration of breastfeeding.

OBJECTIVES: To assess the relationship between exposure to environmental cigarette smoke and breastfeeding behavior.

MATERIALS AND METHODS: This prospective cohort study was conducted on 290 mothers in Babol - Iran, who had been breastfeeding for 3–5 days after delivery. The lactating mothers were divided into two groups: those exposed to environmental cigarette smoke, and those free from smoke exposure. The study questionnaire included demographic data, information on environmental cigarette smoke, and breastfeeding behavior. Data was collected through telephone interviews at 2, 4, and 6 months of follow-up. Statistical analysis included descriptive statistics, and test of significance using Chi-square test, t-test, log-rank test, and Cox proportional hazards model.

RESULTS: The continuation of breastfeeding for the group of exposed mothers and the unexposed group was (mean ± standard deviation) 5.57 ± 0.098 and 5.58 ± 0.109, respectively in 6 months of follow-up. There was no significant difference between the two groups (P = 0.93). The percentage of exclusive breastfeeding at 6 months in the group exposed to cigarette smoke was 65% compared to 76% of the nonexposed group. However, the difference was not statistically significant (P = 0.149).

CONCLUSIONS: In this study, no significant association was observed between the group exposed to environmental cigarette smoke and the nonexposed group in breastfeeding behavior, although the percentage of exclusive breastfeeding at 6 months was less in the group exposed to environmental cigarette smoke. Further exploratory studies are needed.

Key words: Breastfeeding behavior, environmental cigarette smoke, exclusive breastfeeding, lactating mothers

Introduction

Exposure to environmental smoke at home, the workplace, or in public is a major public health concern. According to the World Health Organization, 41.7% of people at home and 50.6% outdoors are exposed to cigarette smoke in Iran. In addition, more than half of pregnant women are exposed to environmental cigarette smoke. Smoking poses a serious risk to the health of mothers and future generations. It also affects all stages of women’s lives with regard to birth, fertility, middle-age and menopause, and endangers their quality of life. Toxic compounds in cigarette smoke such as nicotine and cotinine (a metabolite of nicotine) cause vasoconstriction and hypoxia that generate neurotoxins that cause symptoms such as intrauterine growth retardation, low birth weight, spontaneous abortion, infant mortality, perinatal mortality, and preterm delivery. Increased cotinine in the blood of women exposed to cigarette smoke during lactation is followed by vasoconstriction and decreased blood flow in the breasts and the reduction of the levels of oxytocin, which in turn diminishes the production of milk. Because of the low volume of milk, the process of lactation changes and the duration of breastfeeding is shortened.

Breast milk is known as the best food source for infants, especially in the 1st year of life. The World Health Organization considers exclusive breastfeeding until 6 months as the most desirable and important food for the child. Breastfeeding provides substantial protection from diseases such as bacterial meningitis, otitis media, urinary tract infection, diabetes, and obesity cancers, and gastrointestinal problems in infants.

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Cotinine, the most important metabolite of nicotine in cigarettes, can be used as a biomarker for the diagnosis of exposure of infants with mothers who smoke or those exposed to cigarette smoke and is 10 times higher than that of formula-fed infants. The results of some studies showed that women who had been exposed to environmental cigarette smoke had higher nicotine level in their breast milk and that the cessation of breastfeeding by these mothers in the first 6 months after delivery was higher than mothers who were not exposed to cigarette smoke. However, other researchers have reported no such relationship between any kind of cigarette smoke and exposure to cigarette smoke and the duration of breastfeeding.

No studies have been conducted on the relationship between exposure to cigarette smoke during pregnancy and lactation with breastfeeding behavior in Iran. Because of the importance of exclusive breastfeeding in the first 6 months of infants’ life, increased exposure to cigarette smoke during pregnancy and lactation, and the priority given to the prevention of adverse effects of smoking by the Ministry of Health and Medical Education; this study was designed to assess the relationship between exposure to environmental cigarette and breastfeeding behavior.

Materials and Methods

This was a prospective cohort study of 290 pregnant women during 3–5 days postnatal counseling on under-breastfeeding in urban and rural health centers of Babol, South of the Caspian Sea, Iran, in 2014. The participants were divided into two groups according to whether they were exposed (n = 141) or not exposed to cigarette smoke (n = 149). This sample size was able to detect the effect size of 0.35 in proportion to the continuation of breastfeeding of the two groups with 95% confidence level and 80% power. Their responses showed that the exposed group included nonsmokers, who lived with smokers or were exposed to cigarette smoke at work (as defined by the World Health Organization, a smoker is a person who smokes at least one cigarette a day). In addition, according to their own statements, the nonexposed group included nonsmoker subjects who were not exposed to passive smoking at home or at work.

Inclusion criteria included singleton pregnancy, the birth of a healthy baby without any problems, and an Apgar score of more than 7, 5 min after birth. Exclusion criteria include mothers with chronic or mental diseases, smokers and those who took prescribed drugs that interfered with breastfeeding or had a child who had to be formula fed on the account of a doctor’s diagnosis (or health problem of the mother or baby).

After explaining the purpose of the study to the mothers and obtaining their consent, the questionnaire on demographics and exposure to smoke was completed by the researcher for each participant by an interview. The breastfeeding behavior questionnaire which included initiation of breastfeeding, breastfeeding at night, education about breastfeeding in hospital, rooming-in after delivery, duration of lactation, and the type of milk (breast, formula, and cow’s milk) was then completed by the researcher by telephone interviews at 2, 4, and 6 months for each participant. The information obtained was analyzed using SPSS software version 19 (Chicago, Illinois: SPSS Inc.) and statistical analysis, such as Chi-square, survival analysis, Cox regression model, and log-rank test on the significance level of 0.05.

Results

The results showed that the average age of mothers was 25.5 years. No significant relationship was found with respect to mothers’ and husbands’ age, the number of pregnancies, parity, and live children between the two groups. There was, however, a significant difference between the two groups with respect to mothers’ education (P = 0.001), husbands’ education (P = 0.001), mothers’ occupation (P = 0.002), and husbands’ occupation (P = 0.001) [Table 1].

Between the two groups, there was no statistical difference in terms of initiation of breastfeeding in the 1st h after birth, breastfeeding at night, being taught breastfeeding at the hospital, breastfeeding on the mother’s prompting [Table 2].

The trend of exclusive breastfeeding based on the survival analysis using Kaplan–Meier method showed the duration of breastfeeding in the nonexposed group as (mean ± standard deviation) 5.57 ± 0.098 months, and 5.58 ± 0.109 months in the exposed group, with no significant difference between the two groups (P = 0.93) [Figure 1]. After adjusting the effects of occupation and education using the Cox regression model, no significant difference was found in the risk to breastfeeding in the two groups (P = 0.98).

The trend of exclusive breastfeeding based on survival analysis using the Kaplan–Meier method in the two groups showed that the possibility of survival in the exposed group to cigarette smoke was less than the nonexposed group. Breastfeeding rate at 6 months was 65% in the exposed group and 76% in the nonexposed group. Although the difference between the groups was not significant using the above-mentioned tests (P = 0.149) [Figure 2], again, after adjusting for occupation and education using the Cox regression model, there was no statistically significant difference (P = 0.48).

Discussion

The results of this study indicate that about 71% of children (65% of children in the exposed and 76% in the nonexposed group) were exclusively breastfed up to 6 months, but there was no statistically significant difference between the two groups. The results of this study in relation to exclusive breastfeeding were higher than the results of Ssenyonga et al. of 35.1%, and 61.6% for Naserpour et al. and 47% for Noughabi et al. Initiation of breastfeeding in the first 2 h after birth wanted...
and the cessation of breastfeeding in the first 6 months after delivery was higher for these mothers than those who were not exposed to cigarette smoke. The results of these studies were not consistent with the present study. Consistent with our results, however, are the results of the Leung et al. study, in which no relationship was found between all kinds of smoking and exposure to cigarette smoke and the duration of breastfeeding.

Cotinine is the main and first nicotine metabolite and is measured in breast milk. It is also known as pollutant and a harmful factor in breast milk, and some studies show that cigarette smoke is the main cause of an increase in the amount of this substance in mother’s milk.

| Variable                          | Exposed group (n=141) | Non-exposed group (n=149) | Statistical test | p-value |
|-----------------------------------|-----------------------|---------------------------|------------------|---------|
| Age (year), mean±SD*              | 25.5±4.9              | 25.5±4.5                  | t-test           | 0.653   |
| Husband’s age, mean±SD            | 29.5±5.3              | 30.5±5.1                  | t-test           | 0.155   |
| Number of pregnancy, mean±SD      | 1.74±0.67             | 1.64±0.75                 | t-test           | 0.416   |
| Number of live children, mean±SD  | 1.46±0.56             | 1.4±0.58                  | t-test           | 0.983   |
| Number of childbirth, mean±SD     | 1.72±0.86             | 0.75±1.88                 | t-test           | 0.691   |
| Mother’s education, n (%)         |                       |                           |                  |         |
| Primary school                    | 76 (53.9)             | 36 (24)                   | Chi-square       | 0.001** |
| High school                       | 65 (46.1)             | 107 (70.7)                |                  |         |
| College                           | -                     | 8 (5.3)                   |                  |         |
| Husband’s education, n (%)        |                       |                           |                  |         |
| Primary school                    | 17 (12.1)             | 5 (3.3)                   | Chi-square       | 0.001** |
| High school                       | 115 (81.6)            | 87 (58)                   |                  |         |
| College                           | 9 (6.4)               | 58 (38.7)                 |                  |         |
| Mother’s occupation, n (%)        |                       |                           |                  |         |
| Housewife                         | 137 (97.2)            | 131 (87.3)                | Chi-square       | 0.002** |
| Employed                          | 4 (2.8)               | 19 (12.7)                 |                  |         |
| Husband’s occupation, n (%)       |                       |                           |                  |         |
| Employed                          | 7 (5)                 | 34 (22.7)                 | Chi-square       | 0.001** |
| Worker                            | 14 (9.9)              | 19 (12.70)                |                  |         |
| Self-employed                     | 120 (85.1)            | 97 (64.7)                 |                  |         |

*SD: Standard deviation, **Statistically significant
effects vasoconstriction and decreased blood flow in the breast, lowering the level of oxytocin and thus reducing milk production. Cotinine levels in mother’s milk are associated with the level of exposure to cigarette smoke (that is, the number of cigarettes per day). In this study, the exposure to cigarette smoke was 3 min, and the number of cigarettes smoked was almost two cigarettes per day, which was lower than the previous studies with an average of 10 cigarettes a day, which may explain the absence of a difference between the two groups in the duration of breastfeeding.

In this study, 96% of exposure of lactating women to environmental cigarette smoke was because of husbands who smoked. Unfortunately, 32% of husbands smoked in the presence of their lactating wives. This is consistent with the results of the previous studies on the smoking status in the country. According to this study, the smoking ban is not respected in the homes of many families. Health interventions in this area are essential because these factors call for a ban on smoking in the family.

The limitations of our study were the inability to lack of determine serum cotinine and evaluate its relationship with the duration of breastfeeding. However, the number of cigarettes smoked per day and duration of exposure were examined, which was helpful. Exposure was defined by the minimal dose of one cigarette per day. In addition, we had little information about husband’s smoking behavior in the exposed group and the number of cigarettes smoked per day. The small sample size in this study could have affected the significant difference between the two groups.

Conclusions

The findings showed that exclusive breastfeeding in the exposed group was shorter than the nonexposed group, but this difference was not statistically significant. The results of this study indicate that there should be more prospective studies with larger samples, to compare lactating women exposed to varying quantities of cigarette smoke, the percentage of exclusive breastfeeding, and to continued breastfeeding.

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Conflicts of interest

There are no conflicts of interest.

References

1. Wdowiak A, Wiktor H, Wdowiak L. Maternal passive smoking during pregnancy and neonatal health. Ann Agric Environ Med 2009;16:309-12.
2. World Health Organization. WHO Report on the Global Tobacco Epidemic, 2008. The MPOWER package, 2008. Geneva: World Health Organization; 2012.
3. Baheiraei A, Banhosseini S, Heshmat R, Mohsenifar A. Relationship between self-reported exposure to passive smoking and maternal urinary cotinine level in pregnant women. J Gorgan Univ Med Sci 2012;14:112-8.
4. Bahiraii A, Faghihi RS, Mirmohammad AM, Kazemnezhad A. Predictors of home smoking ban in households in pregnant women. PAYESH 2012;11:511-7.
5. Rogers JM. Tobacco and pregnancy. Reprod Toxicol 2009;28:152-60.
6. Nakata A, Takahashi M, Swanson NG, Ikeda T, Hojou M. Active cigarette smoking, secondhand smoke exposure at work and home, and self-rated health. Public Health 2009;123:650-6.
7. Berlin I, Heilbronner C, Georgiue S, Meier C, Spreux-Varoquaux O. Newborns’ cord blood plasma cotinine concentrations are similar to that of their delivering smoking mothers. Drug Alcohol Depend 2010;107:250-2.
8. Blood-Siegfried J, Rende EK. The long-term effects of prenatal nicotine exposure on neurologic development. J Midwifery Womens Health 2010;55:143-52.
9. Kyu HH, Georgiades K, Boyle MH. Maternal smoking, biofuel smoke exposure and child height-for-age in seven developing countries. Int J Epidemiol 2009;38:1342-50.
10. Milberger S, Biederman J, Faraone SV, Chen L, Jones J. Is maternal smoking during pregnancy a risk factor for attention deficit hyperactivity disorder in children? Obstet Gynecol Surv 1997;52:213-4.

11. Jeyabalan A, Powers RW, Durica AR, Harger GF, Roberts JM, Ness RB. Cigarette smoke exposure and angiogenic factors in pregnancy and preeclampsia. Am J Hypertens 2008;21:943-7.

12. Seong MW, Hwang JH, Moon JS, Ryu HJ, Kong SY, Um TH, et al. Neonatal hair nicotine levels and fetal exposure to paternal smoking at home. Am J Epidemiol 2008;168:1140-4.

13. Ward C, Lewis S, Coleman T. Prevalence of maternal smoking and environmental tobacco smoke exposure during pregnancy and impact on birth weight: Retrospective study using Millennium Cohort. BMC Public Health 2007;7:81.

14. Agostoni C, Marangoni F, Grandi F, Lammardo AM, Giovannini M, Riva E, et al. Earlier smoking habits are associated with higher serum lipids and lower milk fat and polyunsaturated fatty acid content in the first 6 months of lactation. Eur J Clin Nutr 2003;57:1466-72.

15. Matheson I, Rivrud GN. The effect of smoking on lactation and infantile colic. JAMA 1989;261:42-3.

16. Chou SY, Hsu HH, Kuo HW. Association between exposure to environmental tobacco smoke (ETS) and breastfeeding behaviour. Acta Paediatr 2008;97:76-80.

17. Thome M, Alder EM, Ramel A. A population-based study of exclusive breastfeeding in Icelandic women: Is there a relationship with depressive symptoms and parenting stress? Int J Nurs Stud 2006;43:11-20.

18. Islami Z, Razieh F, Golestan M, Shajaree A. Relationship between delivery type and successful breastfeeding. Iran J Pediatr 2008;18 Suppl 1:47-52.

19. Ogunlesi TA. Maternal socio-demographic factors influencing the initiation and exclusivity of breastfeeding in a Nigerian semi-urban setting. Matern Child Health J 2010;14:459-65.

20. Yilmaz G, Hizli S, Karacan C, Yurdakök K, Coskun T, Dilmen U. Effect of passive smoking on growth and infection rates of breast-fed and non-breast-fed infants. Pediatr Int 2009;51:352-8.

21. Jedrychowski W, Perera F, Mroz E, Edwards S, Flak E, Raush V, et al. Prenatal exposure to passive smoking and duration of breastfeeding in nonsmoking women: Krakow inner city prospective cohort study. Arch Gynecol Obstet 2008;278:411-7.

22. Caraballo RS, Giovino GA, Pechacek TF, Mowery PD. Factors associated with discrepancies between self-reports on cigarette smoking and measured serum cotinine levels among persons aged 17 years or older: Third National Health and Nutrition Examination Survey, 1988-1994. Am J Epidemiol 2001;153:807-14.

23. Ssenyonga R, Mwonge R, Nankya I. Towards a better understanding of exclusive breastfeeding in the era of HIV/AIDS: A study of prevalence and factors associated with exclusive breastfeeding from birth, in Rakai, Uganda. J Trop Pediatr 2004;50:348-53.

24. Rakhshani F, Ansari MA, Mohammadi M, Imani M, Mobarak F. Breastfeeding Continuation and associated factors in 2-6 years children at Zahedan health centers in 2001. Pazhohande 2005;6:349-54.