Research Article

Effects of passive smoking (environmental tobacco smoke) on pregnancy outcome at district hospital, Jhansi, Uttar Pradesh

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Abstract

Background: Adverse effects of exposure to environmental tobacco smoke (ETS) during pregnancy are associated with small-for-gestational age babies, increased perinatal mortality and morbidity, and early preterm delivery.

Objective: (1) To assess prevalence of passive smoking during pregnancy. (2) To assess the effects of exposure to ETS on outcome in pregnancy.

Material and Methods: It is a hospital-based cross-sectional study conducted at a district hospital from June 2014 to November 2014. Three hundred non-smoking women (20–35 years) delivering a singleton live baby were studied. A pre-tested, semi-structured questionnaire was used for data collection. SPSS version 16.0 was used for the analysis of data. Chi-square was used for categorical variable and unpaired student's *t*-test for continuous variable for comparison.

Results: Among the 300 women studied, 26% (78) were exposed to ETS. Those exposed to ETS, there was a significantly higher incidence of preterm births (32%) and small-for-gestational age babies (27%) compared to the unexposed. The mean birth weight of babies born to exposed mothers was 282 g less compared to those born to non-exposed mothers.

Conclusion: The awareness about the harmful effects of passive smoking is poor. Evaluation of ETS exposure and steps to avoid it during pregnancy should be an important part of antenatal care.

KEY WORDS: Environmental tobacco smoke (ETS), preterm, LBW, SGA, smoking-related knowledge

Introduction

Exposure from breathing airborne tobacco smoke products is what is commonly called environmental tobacco smoke (ETS).[1] Over the last two decades, there has been increased public health concern regarding the harm caused to non-smokers who are involuntarily exposed to ETS. The term "passive smoking" usually refers to the inhalation of smoke that is either exhaled by a smoker or released as side-stream smoke from a burning cigarette.[2] Another name for passive smoking is "involuntary smoking," or "second-hand smoking" (SHS) because the person who inhales it often has no choice in the matter.[2,3] Side-stream smoke constitutes about 85% of the smoke present in the room and contains many potentially toxic gases in higher concentrations than in the main-stream smoke.[1] The effects of cigarettes on the pregnant woman and developing fetus are numerous with a wide range of squeals that will remain with the fetus for the rest of her life. The literature on the association between ETS and pregnancy outcome has shown that exposure to ETS increases the risk of adverse birth outcomes.[4] The International Consultation on Environmental Tobacco Smoke (ETS) and Child Health concluded that maternal exposure to smoking during pregnancy is a major cause of reduced birth weight, decreased lung

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function, and sudden infant death syndrome (SIDS).[2,3] There is no safe level of SHS exposure. The World Health Organization has estimated that globally almost half of all children are exposed to ETS.[5] The toxins in SHS (nicotine and carbon monoxide) directly cause harmful effects on the fetus.[7] Exposure during pregnancy is associated with low birth weight (LBW), small-for-gestational age (SGA), perinatal death, and reduced lung function.[2–4] There is strong consistent evidence that exposure to ETS in childhood increases the risk of early respiratory infections, causes chronic respiratory symptoms, and increases exacerbation. The adverse health effects of passive smoking have been studied in developing and underdeveloped countries only occasionally. Most of the studies from India are on the pulmonary effects of passive smoking.[3] In this study, we examined the effects of exposure to ETS on the maternal and fetal outcome in pregnancy. Further knowledge is needed about the type of SHS exposure (at home, work, or outside home/work), the quantity of ETS exposure (average number of exposure hours per week), and the timing of ETS exposure (first, second, and third trimesters).

Objectives

(1) To assess the prevalence of ETS exposure among pregnant women. (2) To assess the effects of exposure to ETS on outcome in pregnancy. (3) To assess the anthropometric measurements of babies born to ETS-exposed mothers and ETS-unexposed mothers.

Material and Methods

It is a hospital-based cross-sectional study conducted at a district hospital in Jhansi, Uttar Pradesh from June 2014 to November 2014. Three hundred non-smoking women aged between 20 and 35 years delivering a singleton live baby were studied. Younger than 20 and older than 35 years old women were excluded to eliminate age-related complications of pregnancy and still births were also excluded. Inclusion criteria were based on the following conditions: (1) women with singleton pregnancy; (2) term and preterm delivery (≥37 and <37 gestation week counted from the last menstrual period and/or early ultra-sound scan); (3) women who did not smoke during the index pregnancy; and (4) women both exposed and non-exposed to passive smoking were included. After obtaining the permission of chief superintendent of the district hospital, data were collected from the Medical Birth Registry of hospital, and obstetric and medical details of the mothers were also noted from the hospital records. Women who gave consent for participation were interviewed as soon as possible after birth and before leaving the hospital. Following the delivery, each woman was interviewed according to a pre-tested, semi-structured questionnaire to enquire if they had been exposed to ETS. All neonates in our study were weighed on an electronic scale and other anthropometric measurements (such as length and head circumference) were completed by the interviewers. The outcome variables considered in this analysis were mean birth weight, LBW, preterm delivery, and SGA, and Apgar score at 1 and 5 min was also considered. The outcomes of variables were as follows: LBW (weight < 2500 g at birth), preterm delivery (gestational age < 37 weeks), and SGA (birth weight > two standard deviations below the reference median birth weight for the infant's gestational age).

Estimation of sample size

The sample size was calculated using the formula:

$$n = 4pq/L^2$$

Where Considering 95% confidence interval and taking passive smoking prevalence (p) of 24% and "L", absolute error in the estimate of p as 10%.The sample size was estimated to be 292, but for the convenience of the statistical analysis the sample size was rounded off to 300.

Statistical analysis

Data were entered into a Microsoft Excel spreadsheet and then transferred to Statistical Package for Social Sciences (SPSS®) (trial version 16.0) for the analysis of data in this study. Chi-square was used for categorical variable and unpaired student *t*-test for continuous variable for comparison, and *p*-value < 0.05 was considered statistically significant. All women were free to participate and they were assured of confidentiality of their personal information.

Results

Table 1 shows the socio-demographic characteristics of the study participants. Fifty percent of the women aged between (26–30 years). Almost 50% of the participants were illiterate. As per occupation, most of the study participants were housewife. More than 90% of the women belonged to middle (38%) and lower (54%) socio-economic class. Almost 26% of the women had the history of smoking exposure in family or outside.

Figure 1 shows the sources of exposure of ETS. Out of 300 women, 78 were exposed to ETS, in which 40 women were exposed from both husband and others (outside, work, relatives), 28 were exposed exclusively from husband only.

Figure 2 shows the hour of exposure of ETS through different sources (home, work, outside) in all three trimesters. Maximum exposure was seen in the first trimester compared to the second and third trimesters. The number of hours was almost same in all trimesters when home was the source of ETS. In the third trimester, the number of hours of exposure from work and outside was low compared to the first and second trimesters, which indicates that during the third trimester there is restriction of movements and limitations of pregnant women.

Table 2 shows that while majority of variables have not shown significant association between pregnancy outcome

Table 1: Distribution of the study sample according to socio-demographic data (*n* = 300)

Characteristics	Frequency	%
Age (years)		
20–25	67	22.4
26–30	148	49.4
31–35	85	28.3
Religion		
Hindu	123	41
Muslim	143	47.7
Others	34	11.3
Education		
Illiterate	149	49.6
Primary and middle education	111	37
Secondary and high education	40	13.4
Occupation		
Housewife	227	75.6
Employed	73	24.4
Monthly income (per capita)		
<3000	138	46
>3000–10000	140	46.6
>10000	22	7.4
SES		
Upper and upper middle	25	8.3
Middle	115	38.4
Lower	160	53.3
Family type		
Nuclear	50	16.6
Joint	250	83.4
Residency		
Rural	138	46
Peri-urban	59	19.6
Urban	103	34.4
History of passive smoking in family/outside		
Yes	78	26
No	222	74

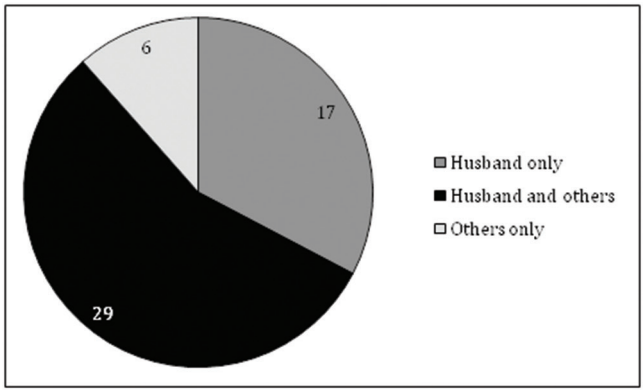

Figure 1: Distribution of sources of passive smoking among the study respondents (n = 78)[a].
[a]Out of 300 respondents, 78 exposed to ETS, while 222 were non-exposed.

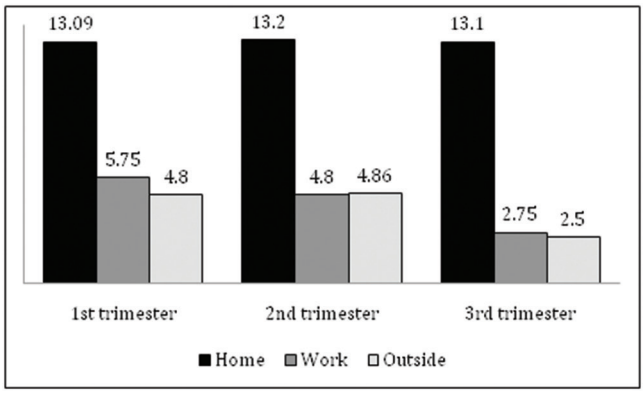

Figure 2: Mean ETS exposure in hours/week from home, work, and outside in the first, second, and third trimesters.

and ETS exposed or non-exposed, but there is more prevalence of preterm birth, SGA, LBW, and Apgar score at 5th minute in the ETS-exposed group compared to the non-exposed, and it was statistically significant.

Table 3 shows that the mean birth weight of newborn in the exposed group is 282 g less than that of the non-exposed group, and it was statistically significant. There is no significant difference seen between the exposed and the non-exposed groups for birth length, head circumference, and chest circumference.

Discussion

In this study, it was found that exposure to ETS in pregnant women was significantly associated with a higher risk of SGA birth and LBW. Several epidemiological studies have shown similar effects. A meta-analysis of studies conducted before mid-1995 reported an overall relative risk (RR) of 1.2 (95% CI, 1.1 to 1.3) for LBW at term or SGA among the infants born to mothers exposed to ETS during pregnancy.[6] A recent small, case-control study found an association of IUGR with detectable nicotine level in mothers' hair samples.[7] In this study, self-reported exposure is also taken into account for quantifying the exposure. The validity of self-reported exposure to ETS has been tested in a large multi-country, multi-centered collaborative trial.[8] The study demonstrated that non-smoking women could provide appropriate estimates of their exposure, which correlated well with their biochemically measured exposure levels. A recently published study has stated that self-reporting could be underestimating the low levels of exposure.[9] The mean birth weight of babies born to mothers exposed to ETS, in this study, was lower than that of babies born to unexposed

Table 2: Association of ETS exposed and non-exposed with effects on pregnancy outcome, prenatal problems ($n = 300$)

Items	ETS		χ^2	*p*-value
	Exposed ($n = 78$)	Non-exposed ($n = 222$)		
Birth				
Preterm birth	25	41	6.206	0.01*
Full-term birth	53	181		
Fetal distress				
No	60	180	0.624	0.429
Yes	18	42		
Labor				
Spontaneous	53	170	2.252	0.133
Induced	25	52		
Delivery				
NVD	63	182	0.057	0.811
Csarean section	15	40		
SGA				
No	57	190	6.209	0.01*
Yes	21	32		
Abortion				
No	71	207	0.418	0.51
Yes	7	15		
Congenital mal				
No	70	211	2.735	0.098
Yes	8	11		
LBW (<2500gms)				
No	55	187	6.96	0.008*
Yes	23	35		
Apgar score (1st min)				
<7	6	8	2.16	0.14
7+	72	214		
Apgar score (5th min)				
<7	12	14	6.01	0.01*
7+	66	208		

*p-value < 0.05 is considered statistically significant.

Table 3: Comparison of anthropometric measurements of babies born to ETS-exposed and ETS non-exposed women

Items	ETS		*p*-value
	Exposed ($n = 78$)[a]	Non-exposed ($n = 222$)[a]	
Birth weight	2407 ± 0.46	2689 ± 3.22	0.0001*
Birth length	49.62 ± 3.05	49.87 ± 2.42	0.549
Head circumference	34.05 ± 1.44	34.14 ± 1.72	0.735
Chest circumference	32.05 ± 1.32	32.16 ± 2.32	0.692

[a]Mean ± SD (standard deviation).
*p-value < 0.05 is considered statistically significant.

mothers, Similarly, the birth weights have been found to be lower in studies that have compared self-reported ETS exposure from all sources (home and work).[9] Another study shows that exposure to SHS among non-smoking pregnant women can also cause a decrease in birth weight.[10–12] Our findings on the association between ETS exposure and preterm births are more in accord with findings of the studies.[11–13] Few other studies give almost the same result.[14,15] There are limited data available from India. In a study from Vellore, India, it was shown that "passive smoking was associated with a decrease in birth weight of 63 g (95% CI 12-114 g) even after adjusting for other variables known to affect birth weight".[14] In a study from Mumbai, shown the levels of nicotine and minor tobacco alkaloids in the main-stream and side-stream smoke.[15] A study demonstrated that ETS exposure for at least 2 h per day resulted in a mean birth weight reduction of 85 g and a twofold increased risk of LBW among the infants of non-smokers.[14] A study carried out among pregnant women in north western India has shown that most women believed that smoking was harmful to the developing fetus and did not take any preventive steps to avoid exposure to environmental tobacco.[4] In a study reported from Australia, it was shown that men, whose partners were pregnant, were largely unaware that their own smoking could pose a specific risk to the fetus and were reluctant to quit smoking.[16] Studies have also shown that women exposed to ETS were slightly more likely to deliver an SGA infant or to experience preterm delivery.[2,4,10] There are certain limitations of this study. First, deliveries in the district hospital do not represent the whole population. Second, exposure to ETS was based on women's self-report that is likely to be imprecise and subject to recall bias. Third, we did not assess the long-term outcome on growth and neurodevelopment of the babies. Last, we have not included active smoking in our study, though its effect is disastrous on pregnancy outcome.

Conclusion

The prevalence of exposure of pregnant women to ETS in our study is high at 26% and it is associated with reduced birth weight, and SGA babies. Evaluation of ETS exposure and steps to avoid it during pregnancy should be an important part of antenatal care. Programs to raise awareness and motivate behavioral change among pregnant women and their partners are needed to reduce the harmful effects of prenatal and postnatal exposure to tobacco smoke. ETS awareness and control strategies for the home, in addition to smoking cessation strategies, should be incorporated into tobacco education programs in schools. Smokers could be reminded that, as they do not expose their co-workers among the general public in many places to smoke, they should extend the same protection to their children and partners.

Recommendations

On the basis of findings of the study, the following issues should be considered:

- Public health implication-behavioral change communication is required toward smoking in public places.
- Smoking cessation programs for husband and also for public.

- Surveillance of passive smoking on target groups (young married women, less educated women, unmarried, women of rural areas and low socio-economic backgrounds)
- Regular antenatal checkups and child health clinic is a must.

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