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Original Research Article

Effect of nicotine exposure during pregnancy on birth weight among beedi rolling women

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ABSTRACT

Background: Exposure to nicotine can lead to increased morbidity and mortality among fetus and mothers. The objective was to study the effect of nicotine exposure on the birth weight of the babies.
Methods: During the study period of one year, it was possible to recruit the total 144 subjects. 36 were women who were exposed to nicotine as they were bidi rollers. The exposure was confirmed by history. 36 women delivered during the study period and these newborns were included in the present study. Control group were 36 pregnant women who were not exposed to nicotine. They were asked about the exposure history, like anyone in their family is smoking inside the house any time and their occupation. Among these all (36) delivered during the study period and their newborns were included in the present study.
Results: Both the groups were comparable in terms of age, hemoglobin, body mass index, gestational age. The mean birth weight of babies in the control group (whose mothers were not exposed) was 3.01kg with a standard deviation of 0.56 compared to mean birth weight of babies in the study group (whose mothers were not exposed) of 2.73kg with a standard deviation of 0.40. This difference in the mean birth weight of babies in the study group and the control group was found to be statistically significant ($p<0.05$). The mean serum cotinine value in study group mothers and babies was very high compared to zero value in mothers and babies of control group and statistically significant ($p<0.05$).
Conclusions: Maternal nicotine exposure through beedi rolling is associated with reduced birth weight.

Keywords: BMI, Beedi rolling, Gestational age, Low birth weight, Nicotine exposure

INTRODUCTION

Exposure to cigarette smoke can lead to increased morbidity and mortality among fetus and mothers. Placental development is adversely affected by damage caused due to cigarette smoke. This leads to reduced supply of oxygen and nutrients to fetus. Thus, it results in premature delivery, head size becomes small and there is restriction of the growth of the fetus. It can lead to low birth weight and not only that the effects can be seen till adult life.[1]

It has been said that there are more than 4000 chemical compounds in the smoke of the cigarette. Most commonly known are carbon monoxide and nicotine and aldehydes. They are well known to cause the perinatal damage. Nicotine is capable of crossing not only the blood brain barrier but also the placental barrier and affects the fetus and also the concentration increases in the fetus blood than the maternal blood. It has been estimated that about 161,000 deaths that occur during perinatal period and 4800 deaths that occur during infancy are attributed to exposure to smoke of the

cigarette. The SIDS risk is more in mothers who smoke during pregnancy compared to mothers who do not do so.[2]

The nicotine pathways and mode of action and disease-causing process due to nicotine has mostly been studied in animal models. Human research is limited to mostly on the epidemiologic approach. Hence, precise doses of nicotine and its effects in humans are not well documented. Most studies are based on recall method and hence, cannot be relied upon. Studies which use biologic measures are more reliable in terms of results but under reporting hamper the validity of the results. Study subjects may alter smoking behavior during the study period if they come to know about the details of the study and it can affect the results of the study. The half-life of cotinine is nine hours in women who are pregnant compared to 17-21 hours in women who are not pregnant. Hence, the results of the studies vary from 7% of new cases of maternal smoking to 33% of new cases of maternal smoking.[3,4]

Smoking by a woman during pregnancy is found to be associated with a lot of adverse outcomes like low birth weight, spontaneous abortion, etc. On the other hand, if a pregnant woman stops smoking during pregnancy or even if she reduces the degree of smoking, then it is likely that her risk of exposure to various obstetric complications is reduced significantly. This reduces the incidence of low birth weight and other complications.[5]

With this background present study was planned to study the effects of nicotine exposure during pregnancy on birth weight in beedi rolling women who were exposed to nicotine.

METHODS

This was cross sectional study carried out at Lady Goschen Hospital with total of 144 subjects were studied.

In this 36 were women who were working as bidi roller in the workplace and were thus exposed to nicotine during pregnancy. 36 were women who were housewives and were not exposed to nicotine in any form as confirmed by history. 36 were newborn who were born to study women who were having exposure to nicotine. 36 were newborns who were born to control women who were not exposed to nicotine.

Institutional Ethics Committee permission was taken. Informed consent was taken from individuals included in the present study.

Procedure

During the study period of one year, it was possible to recruit the total (including mothers and their babies) 144 subjects. 36 were women who were exposed to nicotine as they were bidi rollers. The exposure was confirmed by history. Out of these 36 women all delivered during the study period and these newborns (36) were included in the present study. Control group were 36 pregnant women who were not exposed to nicotine. They were asked about the exposure history, like anyone in their family is smoking inside the house any time and their occupation. Among these 36 women, all delivered during the study period and their newborns were included in the present study.

All women were asked about the age. Height and weight were measured using standard guidelines and standard instruments. Based on height and weight, body mass index was calculated as weight in kg divided by height in meter square. It was expressed as kg/m^2. Hemoglobin estimation was done for all women using standard guidelines and standard technique. The gestational age at birth weight was assessed for all women included in the present study. The birth weight of the newborn baby was taken from the hospital records.

Estimation of serum cotinine: cotinine is a metabolite of nicotic and the STC microplate enzyme immune-assay EIA kit is useful in the quantitative estimation of cotinine in serum after use of tobacco products or exposure to products containing nicotine.

The values were expressed as mean and standard deviation. The difference between the mean of the two groups was assessed by student's t test and a p value of less than 0.05 was considered as statistically significant.

RESULTS

Table 1 shows comparison of mean age of mothers in two groups. The mean age of mothers in the study group was 25.1 years with a standard deviation of 4.39 compared to mean age of the mothers in the control group of 23.6 years with a standard deviation of 2.95. This difference in the mean age of mothers in the study group and the control group was not found to be statistically significant ($p>0.05$).

Table 1: Comparison of mean age of mothers in two groups of mothers.

Mean age of mother (years)	Control group	Study group	P value
	23.6±2.95	25.1±4.39	0.29

Table 2 shows comparison of mean body mass index (BMI) of mothers in two groups of mothers. The mean BMI of mothers in the study group was 25 kg/m^2 with a standard deviation of 2.0 compared to mean BMI of the mothers in the control group of 24.91kg/m^2 with a standard deviation of 0.59.

This difference in the mean BMI of mothers in the study group and the control group was not found to be statistically significant ($p>0.05$).

Table 2: Comparison of mean body mass index (BMI) of mothers in two groups of mothers.

Mean BMI of mother (kg/m^2)	Control group	Study group	P value
	25±2.0	24.91±1.5	0.87

Table 3 shows comparison of mean hemoglobin of mothers in two groups of mothers. The mean hemoglobin of mothers in the study group was 10.52gm/dl with a standard deviation of 1.0 compared to mean hemoglobin of the mothers in the control group of 10.78gm/dl with a standard deviation of 1.5.

This difference in the mean hemoglobin of mothers in the study group and the control group was not found to be statistically significant (p>0.05).

Table 3: Comparison of mean hemoglobin of mothers in two groups of mothers.

Mean hemoglobin of mother (gm/dl)	Control group	Study group	P value
	10.52±1.0	10.78±1.5	0.09

Table 4 shows comparison of mean gestational age of baby of mothers in two groups of mothers. The mean gestational age of baby of mothers in the study group was 37.88 weeks with a standard deviation of 1.0 compared to mean gestational age of baby of the mothers in the control group of 38.73 weeks with a standard deviation of 1.5. This difference in the mean gestational age of baby of mothers in the study group and the control group was not found to be statistically significant (p>0.05).

Table 4: Comparison of mean gestational age of baby of mothers in two groups of mothers.

Mean gestational age of baby (weeks)	Control group	Study group	P value
	37.88±1.27	38.73±1.37	0.09

Table 5 shows comparison of mean birth weight in two groups of newborns. The mean birth weight of babies in the study group (whose mothers were not exposed) was 3.01kg with a standard deviation of 0.56 compared to mean birth weight of babies in the control group (whose mothers were not exposed) of 2.73kg with a standard deviation of 0.40. This difference in the mean birth weight of babies in the study group and the control group was found to be statistically significant (p<0.05).

Table 5: Comparison of mean birth weight in two groups of newborns.

Mean birth weight (kg)	Control group	Study group	P value
	3.01±0.56	2.73±0.40	0.04

Table 6 shows comparison of mean serum cotinine values in two groups of mothers and newborns. The mean serum cotinine value in study group mothers was 24.69 compared to zero in the control group mothers and this difference was found to be statistically significant. Similarly, in newborns the mean serum cotinine value was also very high and statistically significant (p<0.05).

Table 6: Comparison of mean serum cotinine values in two groups of mothers and newborns.

Groups	Serum cotinine (ng/ml)		T value	P value
	Study group	Control group		
Mothers	24.69±32.77	0±0	4.5206	<0.0001
Newborns	23.11±32.12	0±0	2.2752	0.0354

DISCUSSION

Author found that both the group of mothers was comparable in baseline parameters. The birth weight was significantly lower in babies who were born to mothers who were exposed to nicotine. The mean serum cotinine value in study group mothers was 24.69 compared to zero in the control group mothers and this difference was found to be statistically significant. Similarly, in newborns the mean serum cotinine value was also very high and statistically significant (p<0.05).

Lumley J et a, found that the smoking prevalence in the study group was 13.4%.[6] They observed that as the degree of smoking increased, the birth weight decreased. Author also found that the birth weight of babies born to mothers who were exposed to nicotine was significantly less compared to babies who were born to mothers who were not exposed. They noted that birth weight was 320gm lower in group of smoking 6-10 cigarettes and it was 435gm lower in group of smoking of 11-40 cigarettes. This is called as harm reduction model. As the harm of smoking reduced, the birth weight of the baby improved.[6]

Vlajinac H et al, noted that in their study sample smoker women were 42%.[7] In the smoker's group, occasional smokers were 111 and 312 were persistent smokers. They made three categories: one with nonsmokers, second with smoking of 1-9 cigarettes per day and the third one with more than 10 cigarettes per day. The birth weight was significantly less in heavy smoker group so was the length at birth. Head circumference and chest circumference was also significantly lower.[7]

Horta BL et al, studied relation between smoking during pregnancy and LBW, IUGR and preterm births.[8] They found that the birth weight was 142gm lower among those whose mother was smoked during pregnancy. The risk of low birth weight was 1.59 times more among those whose mother smoked during pregnancy. Author also found that the mean birth weight was significantly less among study group compared to control group. The

authors did not find any association between maternal smoking and preterm births. The babies of mothers whose mothers smoked were 2.07 times more than babies of mothers who were nonsmokers.[8]

Lockhart F et al, observed that low mean birth weight was associated with maternal cigarette smoking.[9]

Zheng W et al, demonstrated that maternal age has a modifying effect on the association between maternal smoking and birth weight.[10]

Suzuki K et al, concluded from their study that the child growth was affected in proportion to the degree of maternal smoking. More the smoking degree, lesser was the growth. All these study findings are in accordance with the present study findings.[11]

CONCLUSION

Maternal nicotine exposure is associated with reduced birth weight. Hence those employed in the bidi rolling occupation should be given paid maternal leave by the companies to avoid the harmful effects of maternal nicotine exposure on the fetus and pregnancy outcomes.

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