 http://doi.org/10.18231/j.ijcbr.2019.033

Oxidative stress in beedi rolling pregnant women and their newborns

Astagimath MN[1], Veena A[2*]

[1]Associate Professor, [2]Assistant Professor, Dept. of Biochemistry, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

***Corresponding Author: Veena A**
Email: veena.karatagi@gmail.com

Received: 14th January, 2019 **Accepted:** 15th February, 2019

Abstract

Introduction: Though it is knows that tobacco consumption and exposure to environmental tobacco smoke causes health hazards there is no parameter that can predict the extent of damage in pregnant women. There is no parameter that measures the fetal exposure to toxic of cigarette smoke.

Objective: To study oxidative stress in beedi rolling pregnant women and their newborns.

Materials and Methods: The study group consists of 36 mothers, 36 newborns and the control group consists of 10 mothers and 10 newborns. The cases were the pregnant women who were exposed to nicotine. The controls were the pregnant women who were not exposed. Estimation of TBARS was done by oxidative lipid peroxidation and non –oxidative lipid peroxidation methods.

Results: In this study it was observed that the duration of tobacco free period before delivery showed significant negative correlation with the serum cotinine levels. The duration of beedi rolling showed negative correlation with the serum cotinine levels. There was no relation found between either the duration of beedi rolling or the tobacco free period and lipid peroxidation levels. The above findings may be due to the adaptive changes in the metabolism of nicotine.

Conclusion: From the study it appears that there may not be much role of oxidative stress in the causation of low birth weight through the increased production of lipid peroxides or oxidative stress, but it cannot be rules out that tobacco exposure thought beedi rolling is a causative factor.

Keywords: Oxidative stress, Adaptive changes, Pregnancy, Serum cotinine.

Introduction

India ranks thirds in the world in tobacco production.[1] It is well known by now that tobacco consumption is hazardous to health. In western countries smoking is most common addiction in women where as in India women chew tobacco more commonly than they do smoke.[2]

It is also knows that tobacco smoking and use of smokeless tobacco by pregnant women are deleterious both to pregnancy and to perinatal outcome Apart from their bad effect on causation of anemia pregnancy induced hypertension etc.[2]

The most consistent observation is reduction in the birth weight among infants of smokers.[3] Current understanding of the effect of the maternal smoking on pregnancy and on the developing fetus and child is based on clinical physiological pathological, experimental and especially epidemiological studies.[3]

In the recent years many studies have shows have the effect of tobacco smoke on lipid peroxidation which results from oxidative damage by free radicals[4] the decreased levels of antioxidants in the blood of smoke explain the oxidative stress by tobacco simultaneously studies have also shows that many complication of pregnancies which are slightly more in smokers are associated with increased lipid peroxidation studies have suggested that maternal exposure to environmental oxidant can increase the risk of pregnancy complication through stimulation of formation of cell damaging lipid peroxides and from a decrease in maternal antioxidant reserves passive smoking as well as direct inhalation of cigarette smoke causes the oxidative stress environmental tobacco smoke also increases the stress.

Beedi rolling is one of the major small scale industry in and nearby places of Dakshina Kannada district where 84 beedi rolling organizations are present according to the government register. There are 181,168 workers working in these beedi factories in Dakshina Kannada district itself and women contribute a major proportion to this number. These lady folk utilize this work often as a part time job as a mean of earning an additional income for their family.[5]

Beedi rolling is rolling of the finely crushed dried tobacco in beedi leaves. Beedi rolling is one of the occupational modes of exposure to tobacco. Most studies are conducted on tobacco smoking group. It appears that there are no studies done on oxidative stress in this occupational work. In a previous study[6] increased incidences was found it was of interest to know the oxidative stress in the pregnant beedi rolling mother and hence the present study was under taken.

Though it is knows that tobacco consumption and exposure to environmental tobacco smoke causes health hazards there is no parameter that can predict the extent of damage in pregnant women. There is no parameter that measures the fetal exposure to toxic of cigarette smoke.

In the present study lipid peroxide levels with simultaneous serum cotinine levels were measured with the interest to know the effect of environmental exposure to tobacco dust in beedi rolling pregnant women. This information may give clue to pathogenesis prediction of the effect of beedi rolling on pregnancy and its outcome those populations.

Materials and Methods

All the blood samples were collected from the 'Lady Goschen Hospital', Mangalore. The cases were the pregnant women admitted to the labor room for delivery, whose occupation was 'Beedi Rolling' and delivered without any complications either to the mother or to the new born.

The controls were the pregnant women of the same age groups, admitted to labor room for delivery whose occupation was not 'Beedi rolling' and delivered without complication either to the mother or to the new born.

The study group consists of 36 mothers, 36 newborns and the control group consists of 10 mothers and 10 newborns.

Chemicals and reagents

The entire chemicals used for estimation of lipid peroxidation were of analytical grade and were obtained locally. The serum cotinine was assayed using the kit obtained from the STC Technologies, Inc.1745 Eaton Avenue Bethlhem, PA 18018-1799.

Collection of blood sample

Maternal blood sample (5ml) was collected using sterile disposable plastics syringes (5ml capacity) by venepuncture. A Blood sample (5ml) of the newborns is directly collected from the umbilical cord immediately after delivery. From each of 5ml blood 3ml is collected in the heparinized glass tubes for the estimation of lipid peroxides and 2ml is collected in the plain glass tubes for estimation of serum cotinine. Blood in the plain glass tubes is allowed to clot and then centrifuged to separate serum (0.5ml), which is collected in special plastic containers these serum specimens are stored at -20^{o}c until they were tested for cotinine content.

Estimation of Thiobarbituric Acid Reactive Substance (TBARS) by lipid peroxidation

Lipid peroxidation in erythrocytes was measured colourimetrically by measuring malondialdehyde (MDA) according to the method of Stock and Dormandy with some modification.[7]

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.

Results

The mean lipid peroxidation value in both control group and study group value measured and compared. The mean oxidative peroxidation levels in mothers of control group and study group were 2.35 and 2.48 mol/dl, respectively.

Table 1: Lipid peroxidation values in mother and babies

	Control group	Study group	P value
Oxidative lipid peroxidation in mother (in µmol/dl)	2.35 ± 0.73	2.48 ± 0.58	0.56
Oxidative lipid peroxidation in babies (in µmol/dl)	3.10 ± 0.92	3.36 ± 0.79	0.38
Non Oxidative lipid peroxidation in mother (in µmol/dl)	0.79 ± 0.27	0.80 ± 0.25	0.91
Non Oxidative lipid peroxidation in babies (in µmol/dl)	0.95 ± 0.36	0.95 ± 0.27	0.99
*values are expressed in mean± standard deviation			

Table 2: Correlation among parameters

Parameters in mother	Parameters in baby	Correlation coefficient	P value
Serum cotinine	Serum cotinine	0.92	0.0001
Oxidative lipid peroxidation in control group	Oxidative lipid peroxidation in control group	0.58	0.076
Oxidative lipid peroxidation in study group	Oxidative lipid peroxidation in study group	0.37	0.02
Non Oxidative lipid peroxidation in control group	Non Oxidative lipid peroxidation in control group	0.92	0.0001
Non Oxidative lipid peroxidation in study group	Non Oxidative lipid peroxidation in study group	0.88	0.0001

The mean oxidative lipid peroxidation levels in babies of control group and study group were 3.10 and 3.36 µmol/dl, respectively. The mean non-oxidative lipid peroxidation levels in mother of control group and study group were 0.79 and 0.8 µmol/dl, respectively. The mean non-oxidative lipid peroxidation levels in babies of control group and study group were 0.95 and 0.95, respectively. When compared there was no statistically significant differences between controls groups and study groups in the either oxidative lipid peroxidation levels or non oxidative lipid peroxidation levels.

Further various correlations were calculated among the parameters studied. All correlation calculations were done using simple linear regression. When compared, serum cotinine levels of the mother were positively correlated with that of baby is control group with correlation coefficient (r) = 0.92 and with P value 0.0001, which is highly significant. When the oxidative lipid peroxidation values of mother and baby of control group and study group were correlated, significant positive correlation was found in the study group with 'r' = 0.37 and 'p' values 0.025, where as in control group it is slightly above the significant level with 'r'=0.58 and 'p' values 0.076. When non oxidative lipid peroxidation levels of mothers and baby of control group and study group were correlated, it was found that a significant positive correlation exists between them with 'r'=0.92 and 'p' values 0.0001 for control group and 'r'=0.88 and 'p' values 0.0001 for study group.

Significant correlation was not found between the lipid peroxidation values (both oxidative and non-oxidative) and the serum cotinine values in both mothers and babies (study groups).

Duration of beedi rolling was correlated with the mother's and baby's serum cotinine levels, which showed no significant correlation. In the mothers of study group, there was no significant correlation between the lipid peroxidation of study levels (both oxidative and non-oxidative) and duration of beedi rolling. In the babies of the study group, there was significant negative correlation between the non oxidative lipid peroxidation levels and duration of beedi rolling, where as with oxidative lipid peroxidation v/s duration of beedi rolling no significant correlation was found.

Duration of tobacco free period before the delivery when compared with mothers and babies serum cotinine showed a significant negative correlation with r = - 0.39 and - 0.39 respectively with 'p' value < 0.05 in both cases. When the lipid peroxidation levels of the mothers and baby (study group) were correlated with duration of tobacco free period

Table 3: Correlation between lipid peroxidation and serum cotinine in study group

		Correlation coefficient	P value
Oxidative lipid peroxidation in mothers	Serum cotinine in mother	0.007	0.97
Oxidative lipid peroxidation of baby	Serum cotinine in baby	–0.07	0.70
Non Oxidative lipid peroxidation of mother	Serum cotinine in mother	0.15	0.39
Non Oxidative lipid peroxidation of baby	Serum cotinine in baby	0.17	0.33

Table 4: Correlation between duration of beedi rolling and parameters in study group

		Correlation coefficient	'p' Value
Duration of beedi rolling	Serum cotinine in mother	–0.32	>0.05
Duration of beedi rolling	Serum cotinine in baby	–0.31	>0.05
Duration of beedi rolling	Mothers oxidative lipid peroxidation	–0.015	0.93
Duration of beedi rolling	Mothers non oxidative lipid peroxidation	–0.27	0.11
Duration of beedi rolling	Baby's oxidative lipid peroxidation	0.09	0.61
Duration of beedi rolling	Baby's non oxidative lipid peroxidation	–0.38	0.02

Table 5: Correlation between duration of tobacco free period before delivery and the parameters in study group			
	Parameters	**Correlation coefficient**	**'p' Value**
Duration of tobacco free period	Serum cotinine in mother	–0.39	<0.05
Duration of tobacco free period	Serum cotinine in baby	–0.39	<0.05
Duration of tobacco free period	oxidative lipid peroxidation in mother	–0.003	0.93
Duration of tobacco free period	oxidative lipid peroxidation in baby	0.14	0.42
Duration of tobacco free period	Non oxidative lipid peroxidation in mother	0.42	0.01
Duration of tobacco free period	Non oxidative lipid peroxidation in baby	0.16	0.33

before the delivery, there was no significant correlation found.

Discussion

In the study, the lipid peroxidation in the RBC membranes in estimated as a measure of oxidative stress. Further, oxidative stress is also induced in the RBC using hydrogen peroxide to know the susceptibility of red cell membrane to undergo further oxidation. Cotinine, a metabolite of nicotine is also estimated both in mother and baby to correlate with the lipid peroxidation.

There are extensive studies carried out about exposure to tobacco and its effects on pregnancy and its outcome. Most of the studies are carries out in the tobacco smoking group. Tobacco smoking can be considered as active exposure and beedi rolling as passive exposure. Also plenty of literature is available about exposure to tobacco and lipid peroxidation. However there appears to be no published studies in relation to tobacco exposure by beedi rolling on oxidative stress in pregnant women and their newborns.

Serum cotinine levels found in study groups were low compared to the serum cotinine levels of tobacco smoking women.[8] This difference in the serum cotinine levels may be attributed to the different mode of exposure to tobacco, and also usually pregnant women tends to abstinate from her beedi rolling during last stages of pregnancy and thus exposure to tobacco will be reduced. These low levels of serum cotinine may also be due to the altered metabolism and distribution of nicotine during pregnancy.[9]

Though low levels of serum cotinine was found in the study group, significant difference in the birth weight of new born babies was found being lower in beedi rollers. This difference can be attributed to the beedi rolling occupation and chronic exposure to tobacco dust. This finding is consistent with more than 50 studies, which have confirmed that women exposed to tobacco have less weighing babies.[3] Similar findings are also found in the women exposed to environment tobacco smoke in the work place.[10]

Significant cotinine levels in the cord serum samples (new born baby) suggest that nicotine crosses the placental barrier and exerts its effect on the fetus. This is consistent with many other studies.[11]

The lipid peroxide levels in the mother and baby, which have high correlation, suggest that the oxidative stress in the mother induce an oxidative stress in the fetus and also its consequences. These results further support the hypothesis that maternal exposure to environmental oxidants can increase the risk of pregnancy complications by stimulating the formation of cell damaging lipi peroxides.[12]

Although tobacco exposure is known to cause increased lipid peroxidation,[13] there was no significant increase in the lipid peroxides in the study group. This finding can be attributed to the defense mechanisms of the body which prevent the oxidative damage by enhanced levels of antioxidant enzymes[13] and /or decreased antioxidant reserves.[14] This also may be due to low level of exposure to free radicals, by beedi rollers when compared to tobacco smokers where the smoke contains more abundant free radicals in its gas phase.[15]

Eiserich et al[16] found that protection of erythrocytes against free radicals may be sufficient to prevent lipid peroxidation and may manifest local and adaptive response of metabolism for tobacco by pregnant women. Thus in pregnancy lipid peroxidation is controlled by adequate antioxidative response.[17]

Conclusion

From the study it appears that there may not be much role of oxidative stress in the causation of low birth weight through the increased production of lipid peroxides or oxidative stress, but it cannot be rules out that tobacco exposure thought beedi rolling is a causative factor.

Conflict of Interest: None.

References

1. Sanghavi ID, Notani P. Tobacco and health: The Indian acene, UICC Tata memorial centre, 1989; p9,
2. Mehta A, Mehta A. Tobacco use in pregnancy, In Pregnancy at risk: current concepts, Drugs and environment, 1999; p.307-208.
3. Berkowitz GS. Smoking and pregnancy. In: Jennfer R, Niebyl, editor. Drug use in pregnancy, 2nd ed.USA; Lea and Febiger; 1982, p.173.
4. Panda K, Chattopadhyay R, Chattopadhyay DJ, Chatterjee IB, Vitamin C prevents cigarette smoke-induced oxidative damage in vivo. *Free Radic Biol Med* 2000;29(2):115-24.
5. Official document of the office of Asst. labor commissioner, Mangalore division, Mangalore. (2000) No. BCA/CR-2 99-2000.
6. Balaraman V. Effect of tobacco exposure on neonatal

anthropometric measurements. Dissertation. 1997. Dept. of Pediatrics, Kasturba Medical College, Mangalore.

7. Stock J, Dormady TL. The auto oxidation of human red cell lipids induced by hydrogen peroxide. *Br. J. Haematol* 1971;20:95-110.
8. Haddow JE, Night GJ, Palomaki GE, Kloza EM, Wald NJ. Cigarette consumption and serum cotinine levels in relation to birth weight. *Br J Obstet Gynaecol* 1987;94:678-81.
9. Rebagliato M, Bolumar F, Charles du V et al. Variations in cotinine levels in smokers, during and after pregnancy. *Am J Obstet Gynaecol* 1998;178:568-71.
10. Misra DP, Nguyen RH. Environmental tobacco smoke and low birth weight: A hazard in the work place? *Environ Health Perspect* 1999;Suppl 16:897-904.
11. Rogers MS, Wang W, Mongelli M, Pang CP, Duley JA, Chang AM. Lipid peroxidation in cord blood at birth: a marker of fetal hypoxia during labour. *Gynecol Obstet Invest* 1997;44(4):.229-33.
12. Uotila JT, Tuimala RJ, Aarnio TM, Pyykko KA, Ahotupa MO. Findings on lipid peroxidation and antioxidant function in hypertensive complications of pregnancy. *Br J Obstet. Gynaecol* 1993;100(3):270-6.
13. Baskaran S, Lakshmi S, Prasad PR. Effects of cigarette smoke on lipid peroxidation and antioxidant enzymes in albino rat. *Indian J Exp Biol* 1999;37(12):1196-2000.
14. Codandabany U. Erythrocyte lipid peroxidation and antioxidants in lipid peroxidation. *Cell Biochem* Funct. 2000;18(2):99-102.
15. Preston AM. Cigarette smoking: nutrition implications. *Prog Food Nutri Sci* 1991;15(4):183-217.
16. Eiserich JP, Vander VIeit A, Handelman GJ, Halliwell B, Cross CE. Dietary antioxidants and cigarette smoke induced damage; a complex interaction. *Am J Clin Nutr Sci* 1995;62 suppl6: 1490s-1500s.
17. Laskowska Klita T, Szymborski J, Chelchowska M. Compensatory antioxidant activity in blood of woman whose pregnancy is complicated by cigarette smoking. *Med Weiku Rozwoz* 1999;3(4):485-94.

How to cite this article: MN Astagimath, Veena A. Oxidative stress in beedi rolling pregnant women and their newborns. *Int J Clin Biochem Res* 2019;6(2):138-42.