ORIGINAL ARTICLE

Detectable Serum Cotinine Levels in self-reported non-tobacco smoke pregnant women

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ABSTRACT

Aim: To determine serum cotinine levels in pregnant women who are non-smokers and not exposed to second hand tobacco smoke.
Methodology: It was a descriptive study conducted on pregnant women presenting in obstetric department and gave no history of exposure to second hand tobacco smoke. 28 women were included. Serum cotinine was measured to see the exposure status of the women.
Results: Out of 28 women, 14 (50%) women had serum cotinine levels above 0.05ng/ml. There was no difference in the mean years of education of the women or their husbands.
Conclusion: Only history alone cannot be used to identify the population who is at risk of harmful effects of tobacco smoke via SHS.Biochemical measurements should be done before labelling a person as non-exposed. Education had no role in reporting of second hand tobacco smoke exposure.
Keywords: Second hand smoke, cotinine, tobacco smoke, pregnancy

INTRODUCTION

There are three sources of exposure to cigarette smoke:

1. The mainstream smoke which is inhaled by the smoker himself.
2. The side stream smoke, which is the smoke produced at the smouldering end of cigarette.The side stream smoke is 4 times moretoxic as compared to main stream; however it is diluted rapidly in the air.
3. Smoke which is exhaled by the smoker into the atmosphere.

The characteristics and components of all these sources vary slightly from each other. The persons who smoke themselves are called active smokers and are exposed to all the three kinds of smoke. Those persons who themselves do not smoke can still be exposed to the side stream smoke and the smoke exhaled by smokers and are called second hand smoke exposed or SHS exposed[1].

Various biomarkers have been used to determine the extent of SHS exposure including nicotine, cotinine, nitrosamines, 4 amino phenyl, benzopyrene, polycyclic aromatic hydrocarbons and carboxy hemoglobin[2,3].

Cotinine is a metabolite of nicotine. Cotinine is further metabolised in the liver to cotinine glucorunide, cotinine N'-oxide, hydroxyl cotinine and nor-cotinine. These metabolites appear in urine.[2,4] In majority of the studies, cotinine has been used as a biomarker to reflect the tobacco use and second hand tobacco smoke exposure. It's salivary, urinary and serum levels all have been used.[5,6,7] The advantage of using serum concentration instead of urine or saliva is that there is no need to do any adjustments according to the hydration status. Serum cotinine levels also show little fluctuation throughout the day making it the preferred biomarker.[3]Serum cotinine levels between 0.05 ng/ml to 15ng /ml depict SHS exposure while active smokers have serum cotinine levels above 15ng/ml[2,5,6,7].

US Environment Protection Agency classified Second hand smoke (SHS) as class A known human carcinogen in 1992.[8]The second hand tobacco smoke exposure during pregnancy may produce many deleterious effects including ectopic pregnancy, implantation failure, congenital anomalies, intrauterine growth retardation, placenta previa, placental abruption, miscarriages and neurological and behavioural abnormalities.[8,9]According to WHO (2017), adults' daily smoking prevalence in Pakistan during 2015 was 20.3% after standardizing for the age and sex.[10] SHS exposure is a very big problem in our country due to poverty and lack of education. There is also lack of data on the extent of SHS exposure in pregnant women by using a biomarker like cotinine in Pakistan. There might be bias in self-reporting of SHS exposure by the pregnant women due to social pressure. The present study was planned to determine serum cotinine levels in pregnant women who are non-smokers and not exposed to second hand tobacco smoke.

SUBJECTS AND METHODS

It was a descriptive study, conducted in six months duration, in the Department of Physiology and Cell Biology, University of Health Sciences, Lahore, in collaboration with Obstetrics and Gynaecology Department, Services Hospital Lahore. Study population was pregnant women presenting in obstetric department. Sampling technique was convenient sampling. 70pregnant women were interviewed. 28 women were included in the study were 18-35 years of age, having no history of smoking or exposure to second hand tobacco smoke exposure, presenting in obstetric department during first trimester, having no complication of pregnancy or systemic illness and were willing to participate in the study.

Informed consent was taken. A detailed history was taken and a questionnaire was filled by the same interviewer for all the subjects. Venous blood was collected using aseptic measures. Serum cotinine was measured

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quantitatively by immunoenzymometric assay with an automated EIA analyser CODA, Bio-Rad laboratories, Hercules, CA, USA with the kit (Calbiotech Cotinine Direct ELISA Kit CO096D).

Statistical Analysis: The data was entered and analysed using IBM Statistical Package for Social Sciences (SPSS), version 20.Frequencies and percentages were calculated for qualitative variables. For quantitative variables, mean ±SD (Standard deviation) were calculated for normally distributed variables. Student's t-test was applied for comparison of normally distributed data. p value less than 0.05 was considered significant.

RESULTS

Out of 28 women who gave no history of exposure to SHS, 14 women had serum cotinine levels>0.05ng/ml and were included in group I and labelled as SHS-exposed, while group II contains 14 women whose serum cotinine levels were <0.05ng/ml and labelled as non SHS exposed.[5]None of the subject had serum cotinine level in the range to be labelled as smoker.Mean years of education of the subjects of group I was 9.57±4.52 and group II was 7.79±3.42 years. There was no significant difference p=0.25. There was no significant difference (p=0.07) in mean years of education of husbands of group I was 10.57±3.63 years and group II was 7.71±4.45.

Table 1: Comparison of years of education of the subjects and their husbands.

	Group I (SHS-Exposed) (n=14)	Group II (Non SHS-Exposed) (n=14)	P value
Years of education of the subjects Mean**±S.D**	9.57±4.52	7.79±3.42	0.25*
Years of education of the husbands Mean**±S.D**	10.57**±**3.63	7.71**±**4.45	0.07*

p- value> 0.05 is considered statistically non-significant

DISCUSSION

In order to improve maternal and child health, SHS exposure is needed to be reduced during pregnancy. SHS exposure is determined on the basis of self-reporting by the pregnant women. This is not a very accurate method as because of increasing awareness of harmful effects of SHS exposure to fetal wellbeing and due to social and medical pressures; many women deny exposure to SHS.In our study we specifically asked the pregnant women if any person smokes in front of them at their home or work place or public places. And if there was any history of exposure the women were excluded from the study. Many studies have reported discrepancy between self-reported exposure and cotinine levels[11,12,13].

Some studies show that self-reported smoking is a reliable tool to assess smoking status. The misclassification rate of smoker as non-smoker is small in self-reported status of smoking. [14,15] However, self-reported smoking status may lead to underestimation of exposure status.[12] Some studies found a high prevalence of SHS exposure when cotinine levels were done as compared to self-reported exposure.[12,16]According to Shipton et al. self-reported smoking status can lead to an underestimation of true smoking by 25% as compared to cotinine measurement[12]. Aurrekoetxea et al. found 36.6% of the women who reported non-SHS exposure had urinary cotinine levels in the ranges of SHS- exposure.[17] In our study 50% of the women had detectable serum cotinine levels, although they had denied the exposure on history. So in our population history alone is not a reliable tool for measuring SHS exposure. A biomarker like cotinine must be checked along with history.

Pakistan Government spent Rupees 3,600,000 on tobacco control in year 2014. In 2015, in Pakistan smoking prevalence in men was 36.9% and in women, it was 3% in 2015.[10]This high prevalence of smoking in men subjects a high risk of SHS exposure during pregnancy because of lack of knowledge about the hazards of SHS exposure.Some authors have linked the accuracy of self-reported exposure with the education level of the women.[12,17]However in our study there was no significant difference in the education level of the pregnant women who misreported their SHS exposureas compared to non-exposed.Table 1According to Yang et al the risk of SHS exposure was high if the husbands of pregnant women had a rural background and lack knowledge about hazards of antenatal exposure to SHS.[18] But in our study the education level of the husbands was also not different (Table 1).

CONCLUSION

The problem of SHS exposure is much bigger than actually what it seems to be. Pregnant women are reluctant to give history of exposure to SHS. Only history alone cannot be used to identify the population who is at risk of harmful effects of tobacco smoke via SHS. Biochemical measurements should be done before labelling a person as non-exposed.

Health education programs should be initiated to aware the people about the hazards of SHS exposure. Education level of the subjects do not effect in under reporting of the exposure.

Conflict of interest: The authors declare no conflict of interest

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